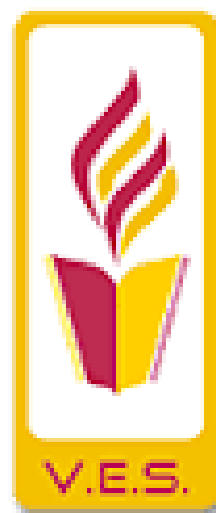


Syllabus Appendix / Curriculum Book



Since 1962

Program: Bachelor of Pharmacy
Choice Based Credit System (CBCS)
Revised 2019
Duration: 4 Years / 8 Semesters

**VIVEKANANAD EDUCATION SOCIETY'S COLLEGE OF
PHARMACY**

Hashu Advani Memorial Complex, Behind Collectors Colony, Chembur(E), Mumbai-400074

Curriculum Book
Bachelor of Pharmacy
Choice Based Credit System (CBCS)
Duration 4 Years / 8 Semesters

ABBREVIATIONS

Sr. No.	Abbreviations	Full form
1.	MSE	Mid Semester Exam
2.	ESE	End Semester Examination
3.	PPT	Periodic Practical test
4.	PTT	Periodic Theory test
5.	CBCS	Choice Based Credit System

TABLE OF CONTENTS

Sr. No.	Course	Course Code
<u>SEMESTER-I</u>		
1	Human Anatomy and Physiology I (Theory)	BP101T
2	Pharmaceutical Analysis I (Theory)	BP102T
3	Pharmaceutics I (Theory)	BP103T
4	Pharmaceutical Inorganic Chemistry (Theory)	BP104T
5	Communication Skill (Theory)	BP105T
6	Remedial Biology (Theory)	BP106RBT
7	Remedial Mathematics (Theory)	BP106RMT
8	Human Anatomy and Physiology (Practical)	BP107P
9	Pharmaceutical Analysis I (Practical)	BP108P
10	Pharmaceutics I (Practical)	BP109P
11	Pharmaceutical Inorganic Chemistry (Practical)	BP110P
12	Communication Skill (Practical)	BP111P
13	Remedial Biology (Practical)	BP112RBP
<u>SEMESTER-II</u>		
14	Human Anatomy and Physiology II (Theory)	BP201T
15	Pharmaceutical Organic Chemistry I (Theory)	BP202T
16	Biochemistry (Theory)	BP203T
17	Pathophysiology (Theory)	BP204T
18	Computer Applications in Pharmacy (Theory)	BP205T
19	Environmental Sciences (Theory)	BP206T
20	Human Anatomy and Physiology II (Practical)	BP207P
21	Pharmaceutical Organic Chemistry I (Practical)	BP208P
22	Biochemistry (Practical)	BP209P
23	Computer Applications in Pharmacy (Practical)	BP210P
<u>SEMESTER - III</u>		
24	Pharmaceutical Organic Chemistry II (Theory)	BP301T
25	Physical Pharmaceutics I (Theory)	BP302T
26	Pharmaceutical Microbiology (Theory)	BP303T
27	Pharmaceutical Engineering (Theory)	BP304T
28	Pharmaceutical Organic Chemistry II (Practical)	BP305P
29	Physical Pharmaceutics I (Practical)	BP306P
30	Pharmaceutical Microbiology (Practical)	BP307P
31	Pharmaceutical Engineering (Practical)	BP308P
<u>SEMESTER – IV</u>		
32	Pharmaceutical Organic Chemistry III (Theory)	BP401T
33	Medicinal Chemistry I (Theory)	BP402T
34	Physical Pharmaceutics II (Theory)	BP403T
35	Pharmacology I (Theory)	BP404T
36	Pharmacognosy and Phytochemistry I (Theory)	BP405T

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

37	Medicinal Chemistry I (Practical)	BP406P
38	Physical Pharmaceutics II (Practical)	BP407P
39	Pharmacology I (Practical)	BP408P
40	Pharmacognosy and Phytochemistry I (Practical)	BP409P
<u>SEMESTER-V</u>		
41	Medicinal Chemistry II (Theory)	BP501T
42	Industrial Pharmacy I (Theory)	BP502T
43	Pharmacology II (Theory)	BP503T
44	Pharmacognosy and Phytochemistry II (Theory)	BP504T
45	Pharmaceutical Jurisprudence (Theory)	BP505T
46	Industrial Pharmacy I (Practical)	BP506P
47	Pharmacology II (Practical)	BP507P
48	Pharmacognosy and Phytochemistry II (Practical)	BP508P
<u>SEMESTER – VI</u>		
49	Medicinal Chemistry III (Theory)	BP601T
50	Pharmacology III (Theory)	BP602T
51	Herbal Drug Technology (Theory)	BP603T
52	Biopharmaceutics and Pharmacokinetics (Theory)	BP604T
53	Pharmaceutical Biotechnology (Theory)	BP605T
54	Quality Assurance (Theory)	BP606T
55	Medicinal Chemistry III (Practical)	BP607P
56	Pharmacology III (Practical)	BP608P
57	Herbal Drug Technology (Practical)	BP609P
<u>SEMESTER-VII</u>		
58	Instrumental Methods of Analysis (Theory)	BP701T
59	Industrial Pharmacy II (Theory)	BP702T
60	Pharmacy Practice (Theory)	BP703T
61	Novel Drug Delivery System (Theory)	BP704T
62	Instrumental Methods of Analysis (Practical)	BP705P
63	Practice School	BP706PS
<u>SEMESTER-VIII</u>		
64	Biostatistics and Research Methodology (Theory)	BP801T
65	Social and Preventive Pharmacy (Theory)	BP802T
66	Pharma Marketing Management (Theory)	BP803ET
67	Pharmaceutical Regulatory science (Theory)	BP804ET
68	Pharmacovigilance (Theory)	BP805ET
69	Quality Control and Standardization of Herbals (Theory)	BP806ET
70	Computer Aided Drug Design (Theory)	BP807ET
71	Cell and Molecular Biology (Theory)	BP808ET
72	Cosmetic Science (Theory)	BP809ET
73	Experimental Pharmacology (Theory)	BP810ET
74	Advanced Instrumentation Techniques (Theory)	BP811ET
75	Dietary Supplements and Nutraceuticals (Theory)	BP812ET

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

76	Pharmaceutical Product Development (Theory)	BP813ET
77	Project Work	BP814PW

SEM I

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Course: Human Anatomy and Physiology I (Revised 2019)					
Course Code: BP101T	First Year B. Pharm				Semester: I
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	<ul style="list-style-type: none"> Basic knowledge of biology related to cell and systems of human body 				
Course Objectives:	<ul style="list-style-type: none"> To familiarize the learner with the anatomical organization and physiology of the human body. To familiarize the learner with the anatomical organization and physiology of the different systems of the human body. 				
Course Outcomes:					PO Mapped
Upon completion of this course the learner should be able to:					
CO1	Outline and categorize the various body structural levels (cells, tissues, organs, and systems) and recall the structure, composition and functions of plasma membrane and methods of movement of substances across plasma membrane				1, 3, 6, 8, 9
CO2	Recall the anatomy of skeletal, cardiac and smooth muscle, explain the transmission at the neuromuscular junction and energy metabolism in the muscle as well as the mechanism of skeletal muscle contraction and demonstrate various types of skeletal muscle contraction				1, 3, 6, 8, 9, 10
CO3	Explain the anatomy and physiology of the Cardiovascular system, Lymphatic system, Peripheral Nervous system and sensory organs and appreciate coordinated working pattern of different organs of each system				1, 3, 6, 8, 9, 10
Topics covered:					
Unit I:					Hours: 10
<p>1.1 Introduction to human body Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology</p> <p>1.2 Cellular level of organization Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine</p> <p>1.3 Tissue level of organization Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues</p>					
Unit II:					Hours: 10

<p>2.1 Integumentary system Structure and functions of skin</p> <p>2.2 Skeletal system Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system. Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction</p> <p>2.3 Joints Structural and functional classification, types of joints movements and its articulation</p>		Hours: 10
Unit III:		
<p>3.1 Body fluids and blood Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.</p> <p>3.2 Lymphatic system Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system</p>		Hours: 08
Unit IV:		
<p>4.1 Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.</p> <p>4.2 Special senses Structure and functions of eye, ear, nose and tongue and their disorders</p>		Hours: 07
Unit V:		
<p>Cardiovascular system Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and hear beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.</p>		
Reference material:	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none"> Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A. 45 Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi. <p>Reference Books:</p> <ol style="list-style-type: none"> Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A. 	

	3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterje ,Academic Publishers Kolkata
--	--

Course: Pharmaceutical Analysis I (Revised 2019)					
Course Code: BP102T	First Year B. Pharm				Semester: I
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic chemical concepts relevant to the chemical analysis. Knowledge and understanding of some basic quality control aspects				
Course Objectives:	1. To introduce the learner to the scope and importance of sample preparation and analytical procedures, pharmacopoeial methods of analysis, and errors associated with analytical procedures. 2. To introduce the learner to the different titrimetric analytic methods like acid-base titrations, complexometric titrations, etc. 3. To introduce the learner to gravimetric and electro-analytical methods of analysis.				
Course Outcomes: Upon completion of this course the learner should be able to:					PO Mapped
CO1	Explain the role of pharmaceutical analysis in the field of pharmacy and industry and delineate between qualitative- quantitative, manual, automatic and electrochemical methods of analysis.				1,3,4,8,11
CO2	Describe volumetric, gravimetric, electrochemical methods of analysis.				1,3,4,8,11
CO3	Solve numerical problems related to volumetric, gravimetric methods of analysis and apply simple statistics to numerical data.				1,3
Topics covered:					
Unit I:					Hours:10
1.1 Pharmaceutical analysis- Definition and scope i) Different techniques of analysis ii) Methods of expressing concentration					

iii) Primary and secondary standards. iv) Preparation and standardization of various molar and normal solutions-Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate 1.2 Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures 1.3 Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.		
Unit II:		Hours: 10
2.1 Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curve 2.2 Non aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl		
Unit III:		Hours: 10
3.1 Precipitation titrations: Mohr's method, Volhard's, Modified volhards. Fajans method and estimation of sodium chloride 3.2 Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium Gluconate 3.3 Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate 3.4 Basic Principles, methods and application of diazotisation titration		
Unit IV:		Hours: 08
4.1 Redox titrations Concepts of oxidation and reduction 4.2 Types of redox titrations (Principles and applications) 4.3 Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate		
Unit V:	Electrochemical methods of analysis	Hours:07
5.1 Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications 5.2 Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications 5.3 Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications		
Reference material:	Recommended Books: (Latest Editions) 1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London 2. A.I. Vogel, Text Book of Quantitative Inorganic analysis 3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry 4. Bentley and Driver's Textbook of Pharmaceutical Chemistry 5. John H. Kennedy, Analytical chemistry principles 6. Indian Pharmacopoeia	

Course: Pharmaceutics- I Revised (2019)		
Course Code: BP103T	First Year B. Pharm	Semester: I

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Type of course: Theory	Contact Hours: 3 Hours/week (4L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Fundamental knowledge of physical chemistry and basics such as weights, measures and, communication skill				
Course Objectives:	The course aims to impart: <ol style="list-style-type: none"> 1. Knowledge about the history of profession of Pharmacy. 2. Basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations. 3. Professional approach of handling the prescription. 4. Preparative methods for various conventional dosage forms 				
Course Outcomes:					PO Mapped
Upon completion of this course the learner should be able to:					
CO1	Have knowledge of different Pharmacopoeias, various monophasic and biphasic, liquid and semisolid dosage forms, prescription and compatibilities.				1,6,7,8,9,11
CO2	Explain evaluation of solutions, suspensions, and emulsions, semisolid dosage forms suppositories.				1,2,3,4,6,7,8,9,10,11
CO3	Perform related calculations and prepare liquid and semisolid dosage forms.				1,3,4,6,7,8,9,10,11
CO4	Analyze the errors in the prescription and identify physical and chemical incompatibilities among different active ingredients.				1,3,6,7,8,9,11
CO5	Devise the composition of monophasic and biphasic dosage forms, considering the pharmaceutical incompatibilities.				1,2,3,4,5,6,7,8,9,10,11
Topics covered:					
Unit:1					Hours: 10
1.1 Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.					
1.2 Dosage forms: Introduction to dosage forms, classification and definitions					
1.3 Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription.					
1.4 Posology: Definition, Factors affecting posology. Pediatric dose Calculations based on age, body weight and body surface area.					
Unit II:					Hours:10

<p>2.1 Pharmaceutical calculations: Weights and measures–Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.</p> <p>2.2 Powders: Definition, classification, advantages and disadvantages, Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.</p> <p>2.3 Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques</p>	
Unit III:	Hours: 10
<p>3.1 Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.</p> <p>3.2 Biphasic liquids:</p> <p>Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.</p> <p>Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.</p>	
Unit IV:	Hours: 08
<p>4.1 Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.</p> <p>4.2 Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.</p>	
Unit V:	Hours: 07
<p>Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semisolid dosages forms.</p>	
Reference material:	<p>Recommended Books (Latest edition)</p> <ol style="list-style-type: none"> 1. H. C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi. 2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi. 3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh. 4. Indian pharmacopoeia. 5. British pharmacopoeia. 6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea& Febiger Publisher, The University of Michigan. 7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi. 8. Carter S.J., Cooper and Gunn 's. Tutorial Pharmacy, CBS Publications, New Delhi. 9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA. 10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

	<p>11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.</p> <p>12. Françoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.</p>
--	---

Course: Pharmaceutical Inorganic Chemistry (Revised 2019)					
Course Code: BP104T	First Year B.Pharm				Semester: I
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	The student must have some basic knowledge of chemical properties of inorganic chemicals. He/she should also have clear knowledge of elements, radicals, functional groups and acid base theory.				
Course Objectives:	<p>Upon completion of course student shall be able to</p> <p>i. know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals</p> <p>ii. understand the medicinal and pharmaceutical importance of inorganic compounds</p>				
Course Outcomes:					PO Mapped
Upon completion of this course the learner should be able to:					
CO1	Describe the principles and methods of limit tests to control common impurities in pharmaceutical substances				1,2,3,4,6
CO2	Explain different pharmaceutical buffers, their preparations, uses in pharmaceutical system, measurement of tonicity.				1,2,3,4,6,8
CO3	Explain the medicinal importance of pharmaceutical inorganic compounds.				1,2,3,4,6,8
Topics covered:					
Unit I:					Hours: 10
<p>1.1 Impurities in pharmaceutical substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate</p> <p>1.2 General methods of preparation, assay for the compounds superscripted with asterisk (*), properties and medicinal uses of inorganic compounds belonging to the following classes</p>					
Unit II:					Hours: 10

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

2.1 Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.	
2.2 Major extra and intracellular electrolytes: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.	
2.3 Dental products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.	
Unit III:	Gastrointestinal agents Hours: 10
3.1 Acidifiers: Ammonium chloride* and Dil. HCl	
3.2 Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture ²	
3.3 Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite	
3.4 Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations	
Unit IV:	Miscellaneous compounds Hours: 08
4.1 Expectorants: Potassium iodide, Ammonium chloride*.	
4.2 Emetics: Copper sulphate*, Sodium potassium tartarate	
4.3 Haematinics: Ferrous sulphate*, Ferrous gluconate	
4.4 Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite	
4.5 Astringents: Zinc Sulphate, Potash Alum	
Unit V:	Hours: 07
Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α , β , γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I131, Storage conditions, precautions & pharmaceutical application of radioactive substances.	
Reference material:	Recommended Books: (Latest Editions)
	1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
	2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
	3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition
	4. M.L Schroff, Inorganic Pharmaceutical Chemistry
	5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
	6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
	7. Indian Pharmacopoeia

Course: Communication Skills (Revised 2019)					
Course Code: BP105T	First Year B. Pharm				Semester: I
Type of course: Theory	Contact Hours: 2 Hours/week			Total Contact Hours: 30	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Max. Marks:	10	2	1.5	1.5	35
Pre-requisites:	Basic knowledge about various ethics of communication, leadership attitude, and other soft skills required for better communication.				
Course Objectives:	<ol style="list-style-type: none"> The course aims to prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business. 				
Course Outcomes					PO Mapped
Upon completion of the course the learner will be able to:					
CO1	Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation				1, 6,8
CO2	Effectively develop presentation skills with confidence to crack interviews				6,7,11
CO3	Effectively manage the team as a team player. Apply skills learnt to confidently stand in a group discussion				5,8
CO4	Apply skills learnt to communicate effectively technically/businesswise				4,5,8,9,11
Topics covered:					
Unit I					Hours: 07
1.1 Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process- Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context. 1.2 Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers. 1.3 Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.					
Unit II					Hours: 07
2.1 Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body language (Non-verbal communication), Verbal Communication, Physical Communication. 2.2 Communication Styles: Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style					
Unit III					Hours:07
3.1 Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations Communication 3.2 Effective Written Communication: Introduction, When and When Not to Use Written communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication 3.3 Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message					
Unit IV					Hours:05
4.1 Interview Skills: Purpose of an interview, Do's and Dont's of an interview 4.2 Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery					
Unit V					Hours:04

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Group Discussion: Introduction, Communication skills in group discussion, Do's and Dont's of group discussion	
Reference material:	<p>Recommended Books: (Latest Edition)</p> <ol style="list-style-type: none"> 1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011 2. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011 3. Organizational Behaviour, Stephen .P. Robbins, 1st Edition, Pearson, 2013 4. Brilliant- Communication skills, Gill Hasson, 1 stEdition, Pearson Life, 2011 5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013 6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010 7. Communication skills for professionals, Konar nira, 2nd Edition, New arrivals – PHI, 2011 8. Personality development and soft skills, Barun K Mitra, 1st Edition, Oxford Press, 2011 9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011 10. Soft skills and professional communication, Francis Peters SJ, 1st Edition, Mc Graw Hill Education, 2011 11. Effective communication, John Adair, 4th Edition, Pan Mac Millan,2009 12. Bringing out the best in people, Aubrey Daniels, 2nd Edition, Mc Graw Hill, 1999

Course: Remedial Biology (Revised 2019)					
Course Code: BP106RBT	First Year B. Pharm				Semester: I
Type of course: Theory	Contact Hours: 2 Hours/week				Total Contact Hours: 30
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	10	2	1.5	1.5	35
Pre-requisites:	<ul style="list-style-type: none"> • Basic knowledge about cell, evolution of living world, classification of kingdoms. • Basic knowledge of plant and animal body parts and their functions. • Basic knowledge related physiological processes in human body and plants. 				
Course Objectives:	This Course aims to : <ul style="list-style-type: none"> • Know the classification and salient features of five kingdoms of life. • Understand the basic components of anatomy & physiology of plant. • Understand the basic components of anatomy & physiology of human body 				
Course Outcomes: After completion of this course the learner will be able to					PO Mapped
CO1	Understand the cell biology (Basic Nature of Plant cell and Animal cell) and Classification System of both Plants & Animals				1,6,8,9,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

CO2	Learn and comprehend various tissue system and organ system in plant and animals	1,6,8,9,10,11
CO3	Understand and explain anatomy and Physiology of plants and animals.	1,6,8,9,10,11
Topics covered:		
Unit I:		Hours 07
<p>1.1 Living world:</p> <ul style="list-style-type: none"> • Definition and characters of living organisms • Diversity in the living world • Binomial nomenclature • Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus. <p>1.2 Morphology of Flowering plants</p> <ul style="list-style-type: none"> • Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed. • General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledones. 		
Unit II:		Hours 07
<p>2.1 Body fluids and circulation</p> <ul style="list-style-type: none"> • Composition of blood, blood groups, coagulation of blood • Composition and functions of lymph • Human circulatory system • Structure of human heart and blood vessels • Cardiac cycle, cardiac output and ECG • Human alimentary canal and digestive glands • Role of digestive enzymes • Digestion, absorption and assimilation of digested food <p>2.2 Breathing and respiration</p> <ul style="list-style-type: none"> • Human respiratory system • Mechanism of breathing and its regulation • Exchange of gases, transport of gases and regulation of respiration • Respiratory volumes 		
Unit III:		Hours 07

3.1 Excretory products and their elimination		
<ul style="list-style-type: none"> • Modes of excretion • Human excretory system- structure and function • Urine formation • Rennin angiotensin system 		
3.2 Neural control and coordination		
<ul style="list-style-type: none"> • Definition and classification of nervous system • Structure of a neuron • Generation and conduction of nerve impulse • Structure of brain and spinal cord • Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata 		
3.3 Chemical coordination and regulation		
<ul style="list-style-type: none"> • Endocrine glands and their secretions • Functions of hormones secreted by endocrine glands 		
3.4 Human reproduction		
<ul style="list-style-type: none"> • Parts of female reproductive system • Parts of male reproductive system • Spermatogenesis and Oogenesis • Menstrual cycle 		
Unit IV:		Hours 05
4.1 Plants and mineral nutrition:		
<ul style="list-style-type: none"> • Essential mineral, macro and micronutrients • Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation 		
4.2 Photosynthesis: Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.		
Unit V:		Hours 04
5.1 Plant respiration		
<ul style="list-style-type: none"> • Respiration, glycolysis, fermentation (anaerobic). 		
5.2 Plant growth and development		
<ul style="list-style-type: none"> • Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators 		
5.3 Cell - The unit of life		
<ul style="list-style-type: none"> • Structure and functions of cell and cell organelles. • Cell division 		
5.4 Tissues		
Definition, types of tissues, location and functions.		
Reference material:	<p>Text Books</p> <ol style="list-style-type: none"> 1. Text book of Biology by S. B. Gokhale 2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram. <p>Reference Books</p> <ol style="list-style-type: none"> 1. A Text book of Biology by B.V. Sreenivasa Naidu 2. A Text book of Biology by Naidu and Murthy 3. Botany for Degree students By A.C.Dutta. 4. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthakrishnan. 5. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate 	

Course: Remedial Mathematics (Revised 2019)		
Course Code: BP 106RMT	First Year B. Pharm	Semester: I

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Type of course: Theory	Contact Hours: 2 Hours/week				Total Contact Hours: 30
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	10	2	1.5	1.5	35
Pre-requisites:	Basic mathematics and calculus covered in higher secondary school				
Course Objectives:	<ol style="list-style-type: none"> To teach the learner the basic principles of fractions, calculus, differentiation and integration, and determinants and matrices, logarithms and their application in several other specialized pharmacy subjects. To convey to the learner the importance of fractions, logarithms, matrices and statistical methods in data analysis and results interpretation and as an extension in pharmaceutical calculations and experimental design 				
Course Outcomes					PO Mapped
Upon completion of the course the learner will be able to:					
CO1	Know the theoretical concepts of various topics and their application in Pharmacy				1,3
CO2	Solve the different types of pharmaceutical problems by applying theoretical concepts				1,3,4
CO3	Appreciate the important application of mathematics and statistics in Pharmacy				1,3,4,7
Topics covered:					
Unit I					Hours: 06
<p>1.1 Partial fraction: Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics</p> <p>1.2 Logarithms: Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.</p> <p>1.3 Function: Real Valued function, Classification of real valued functions,</p> <p>1.4 Limits and continuity : Introduction , Limit of a function, Definition of limit of a function</p>					
Unit II					Hours: 06
<p>Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer’s rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations</p>					
Unit III					Hours:06
<p>Calculus Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof, Derivative of x^n w.r.t.x, where n is any rational number, Derivative of e^x , Derivative of $\log_e x$, Derivative of a^x , Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application</p>					
Unit IV					Hours:06

Analytical Geometry	
4.1 Introduction: Signs of the Coordinates, Distance formula,	
4.2 Straight Line: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line	
4.3 Integration: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application	
Unit V	Hours:06
5.1 Differential Equations: Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations	
5.2 Laplace Transform: Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations	
Reference material:	Recommended Books (Latest Edition) 1. Differential Calculus by Shanthinarayan 2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H. 3. Integral Calculus by Shanthinarayan 4. Higher Engineering Mathematics by Dr.B.S.Grewal

Course: Human Anatomy and Physiology I (Revised 2019)				
Course Code: BP107P	First Year B. Pharm			Semester: I
Type of course: Practical	Contact Hours: 4 Hours/week		Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Students must be aware about the following: a) Basic concepts about tissues and its types b) Blood and its functions c) Parts of microscope and skeletal system			
Course Objectives:	This Course aims to: a) Teach the parts of microscope and help to apply this understanding to study microscopic histological details about different types of tissues and organs b) Explain skeletal system and identify the parts of this system c) Teach and help to apply the principles of methods used in the diagnosis of diseases using hematological tests d) Explain the basic principles of cardiovascular system and teach the techniques to measure the heart rate, pulse rate and blood pressure			
Course Outcomes: After completion of this course the learner will be able to				PO Mapped

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

CO1	Explain the parts of microscope, apply this knowledge to study histology of different tissues and organs	1,4,6,7,8,9,10,11
CO2	Explain the components of the skeletal system and identify and describe each part in detail	1,4,6,7,8,9,10,11
CO3	Perform the methods used in diagnosis of diseases using hematological tests like bleeding time, clotting time, haemocytometry and erythrocyte sedimentation rate and explain the principals of these methods	1,4,6,7,8,9,10,11
CO4	Explain the basic principles of cardiovascular system and able to assess heart rate, pulse rate and blood pressure	1,4,6,7,8,9,10,11
CO5	Plan, execute and conclude the experiment using various methodologies	1,3,4,6,7,8,9,10,11
Topics covered:		
Unit I:	UNIT I – Study of histology of tissues and organs	Hours 08
	<ul style="list-style-type: none"> • Study of compound microscope. • Microscopic study of epithelial and connective tissue • Microscopic study of muscular and nervous tissue 	
Unit II:	UNIT II – Study of the skeletal system	Hours 12
	<ul style="list-style-type: none"> • Identification of axial bones • Identification of appendicular bones 	
Unit III:	UNIT III –Study of blood and haematological tests using microscope	Hours 10
	<ul style="list-style-type: none"> • Introduction to hemocytometry. • Enumeration of white blood cell (WBC) count • Enumeration of total red blood corpuscles (RBC) count • Determination of bleeding time • Determination of clotting time • Estimation of hemoglobin content • Determination of blood group. • Determination of erythrocyte sedimentation rate (ESR). 	
Unit IV:	UNIT IV Study of anatomy, physiology and functions of cardiovascular system	Hours 08
	<ul style="list-style-type: none"> • Determination of heart rate and pulse rate. • Recording of blood pressure 	
Reference material:	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none"> 1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi. 2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York 3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA 4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A. 5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A 6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi. 7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi. 	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

	<p>8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.</p> <p>9. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA</p> <p>10. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.</p> <p>11. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata.</p>
--	--

Course: Pharmaceutical Analysis (Revised 2019)				
Course Code: BP108P	First Year B. Pharm			Semester: I
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Basic concepts related to the chemical laboratory. Basic idea of handling chemicals and instruments			
Course Objectives:	1. To introduce the learner to pharmacopoeial methods of analysis. 2. To teach the learner the procedures for conducting different limit tests, titrimetric analysis like acid-base titrations, complexometric titrations, etc. 3. To teach the learner electro-analytical methods of analysis			
Course Outcomes: After completion of this course the learner will be able to				PO Mapped
CO1	Employ practice of calibration and proper handling of volumetric apparatus, electronic analytical balance and safety measures in the laboratory			1,2,4,11
CO2	Demonstrate eye- hand coordination required for titrimetric analysis			1,2,4,11
CO3	Perform and record, calculate and interpret data obtained for experiments related to limit tests, volumetric and electro analytical methods of analysis			1,2,4,11
CO4	Conduct and evaluate various tests mentioned in a pharmacopoeial monograph			1,2,4,11
TOPICS				
Unit I:	Limit Test of the following			
	<ul style="list-style-type: none"> ▪ Chloride ▪ Sulphate ▪ Iron ▪ Arsenic 			
Unit II:	Preparation and standardization of			

	<ul style="list-style-type: none"> ▪ Sodium hydroxide ▪ Sulphuric acid ▪ Sodium thiosulfate ▪ Potassium permanganate ▪ Ceric ammonium sulphate
Unit III:	Assay of the following compounds along with Standardization of Titrant
	<ul style="list-style-type: none"> ▪ Ammonium chloride by acid base titration ▪ Ferrous sulphate by Cerimetry ▪ Copper sulphate by Iodometry ▪ Calcium gluconate by complexometry ▪ Hydrogen peroxide by Permanganometry ▪ Sodium benzoate by non-aqueous titration ▪ Sodium Chloride by precipitation titration
Unit IV:	Determination of Normality by electro-analytical methods
	<ul style="list-style-type: none"> ▪ Conductometric titration of strong acid against strong base ▪ Conductometric titration of strong acid and weak acid against strong base ▪ Potentiometric titration of strong acid against strong base
Reference material:	<ol style="list-style-type: none"> 1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London 2. A.I. Vogel, Text Book of Quantitative Inorganic analysis 3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry 4. Bentley and Driver's Textbook of Pharmaceutical Chemistry 5. John H. Kennedy, Analytical chemistry principles 6. Indian Pharmacopoeia

Course: Pharmaceutics I (Revised 2019)				
Course Code: BP109P	First Year B. Pharm			Semester: I
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Basic knowledge of various dosage forms available in market, weights and measures.			
Course Objectives:	<ol style="list-style-type: none"> 1. The course aims to train the learners in preparation of various monophasic, biphasic, powders and semi solid formulations. 2. It will train them to carry out their Q.C tests and labeling process. 			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Course Outcomes: After completion of this course the learner will be able to		PO Mapped
CO1	Prepare monophasic, biphasic, powders and semi solid systems, justify the components and method of preparation	1,2,3,5,6,7,10,11
CO2	Perform experiments as per GLP and record in the journals	1,2,3,5,6,7,10,11
CO3	Plan, execute and conclude the experiment using various methodologies (defined protocol or qualitative or quantitative techniques).	1,2,3,5,6,7,10,11
TOPICS		
Unit I:	Syrups	
	<ul style="list-style-type: none"> • Syrup IP'66 • Compound syrup of Ferrous Phosphate BPC'68 	
Unit II:	Elixirs	
	<ul style="list-style-type: none"> • Piperazine citrate elixir • Paracetamol pediatric elixir 	
Unit III:	Linctus	
	<ul style="list-style-type: none"> • Terpin Hydrate Linctus IP'66 • Iodine Throat Paint (Mandles Paint) 	
Unit IV:	Solutions	
	<ul style="list-style-type: none"> • Strong solution of ammonium acetate • Cresol with soap solution • Lugol's solution 	
Unit V:	Suspensions	
	<ul style="list-style-type: none"> • Calamine lotion • Magnesium Hydroxide mixture • Aluminium Hydroxide gel 	
Unit VI:	Emulsions	
	<ul style="list-style-type: none"> • Turpentine Liniment • Liquid paraffin emulsion 	
Unit VII:	Powders and Granules	
	<ul style="list-style-type: none"> • ORS powder (WHO) • Effervescent granules • Dusting powder • Divded powders 	
Unit VIII:	Suppositories	
	<ul style="list-style-type: none"> • Glycero gelatin suppository • Coca butter suppository • Zinc Oxide suppository 	
Unit IX:	Semisolids	
	<ul style="list-style-type: none"> • Sulphur ointment • Non staining-iodine ointment with methyl salicylate • Carbopal gel 	
Unit X:	Gargles and Mouthwashes	
	<ul style="list-style-type: none"> • Iodine gargle • Chlorhexidine mouthwash 	

Reference material:	<ol style="list-style-type: none"> 1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi. 2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi. 3. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh. 4. Indian pharmacopoeia. 5. British pharmacopoeia. 6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan. 7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi. 8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi. 9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA. 10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York. 11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York. 12. Françoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York
----------------------------	---

Course: Pharmaceutical Inorganic Chemistry (Revised 2019)				
Course Code: BP110P	First Year B. Pharm			Semester: I
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	He/she should have basic knowledge of handling of chemicals, elemental analysis.			
Course Objectives:	After the successful completion of the course , students should be able to: <ol style="list-style-type: none"> i. Explain the effects of impurities in pharmaceuticals. ii. Describe the principles and methods of limit tests to control common impurities in pharmaceutical substances iii. Explain the medicinal importance of pharmaceutical inorganic compounds. 			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Course Outcomes: After completion of this course the learner will be able to		PO Mapped
CO1	Perform qualitative analysis of given inorganic mixtures.	1,2,4,6,8
CO2	Cary out identification test of given inorganic compounds	1,2,3
CO3	Perform limit test for chlorides, sulphates etc.	1,2,4,6,8
CO4	Prepare inorganic compounds	1,2,4,6,8
TOPICS		
Unit I:	Limit tests for following ions	
	<ul style="list-style-type: none"> • Limit test for Chlorides and Sulphates • Modified limit test for Chlorides and Sulphates Limit test for Iron • Limit test for Heavy metals Limit test for Lead • Limit test for Arsenic 	
Unit II:	Identification test	
	<ul style="list-style-type: none"> • Magnesium hydroxide Ferrous sulphate Sodium Bicarbonate Calcium gluconate Copper sulphate 	
Unit III:	Test for purity	
	<ul style="list-style-type: none"> • Swelling power of Bentonite • Neutralizing capacity of aluminum hydroxide gel • Determination of potassium iodate and iodine in potassium Iodide 	
Unit IV:	Preparation of inorganic pharmaceuticals	
	<ul style="list-style-type: none"> • Boric acid • Potash alum • Ferrous sulphate 	
Reference material:	Recommended Books (Latest Editions) 1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition. 2. A.I. Vogel, Text Book of Quantitative Inorganic analysis 3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition 4. M.L Schroff, Inorganic Pharmaceutical Chemistry 5. Bentley and Driver's Textbook of Pharmaceutical Chemistry 6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry 8. 7. Indian Pharmacopoeia	

Course: Communication Skills (Revised 2019)		
Course Code: BP111P	First Year B. Pharm	Semester: I
Type of course: Practical	Contact Hours: 2 Hours/week	Total Contact Hours: 30
Course assessment Methods:	Continuous mode of assessment	Semester-end assessment

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	5	2	3	15
Pre-requisites:	Basic knowledge of using Computer software, using Microsoft presentation, interview background etc.			
Course Objectives:	<ol style="list-style-type: none"> 1. The course aims to train the learners in various aspects of communication with professions and common man around. 2. The course will help learners to effectively write emails, enhance presentation skills, appear for interviews without the fear of failure. 			
Course Outcomes: After completion of this course the learner will be able to				PO Mapped
CO1	Practice the Basic Communication attributes required during meeting people, making friends, asking questions using Wordsworth® English language lab software			4,6,8,11
CO2	Learn the Advanced techniques involved in effective communication, writing skills, interview handling skills, presentation skills, E-mail writing using Wordsworth® English language lab software			1,4,6,7,8,11
CO3	Plan, execute and conclude the tasks using various methodologies (defined protocol or qualitative or quantitative techniques).			1,2,3,4,6,8,9,11
TOPICS				
Unit I:	Basic communication covering the following topics			
<ul style="list-style-type: none"> ▪ Meeting People ▪ Asking Questions ▪ Making Friends ▪ What did you do? ▪ Do's and Dont's 				
Unit II:	Pronunciations covering the following topics			
<ul style="list-style-type: none"> ▪ Pronunciation (Consonant Sounds) ▪ Pronunciation and Nouns ▪ Pronunciation (Vowel Sounds) 				
Unit III:	Advanced Learning			
<ul style="list-style-type: none"> ▪ Listening Comprehension / Direct and Indirect Speech ▪ Figures of Speech ▪ Effective Communication ▪ Writing Skills ▪ Effective Writing ▪ Interview Handling Skills ▪ E-Mail etiquette ▪ Presentation Skills 				
Reference material:	<ol style="list-style-type: none"> 1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011 2. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011 3. Organizational Behaviour, Stephen .P. Robbins, 1st Edition, Pearson, 2013 4. Brilliant- Communication skills, Gill Hasson, 1st Edition, Pearson Life, 2011 			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

	<p>5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013</p> <p>6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010</p> <p>7. Communication skills for professionals, Konar nira, 2nd Edition, New arrivals – PHI, 2011</p> <p>8. Personality development and soft skills, Barun K Mitra, 1st Edition, Oxford Press, 2011</p> <p>9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011</p> <p>10. Soft skills and professional communication, Francis Peters SJ, 1st Edition, Mc Graw Hill Education, 2011</p> <p>11. Effective communication, John Adair, 4th Edition, Pan Mac Millan, 2009</p> <p>12. Bringing out the best in people, Aubrey Daniels, 2nd Edition, Mc Graw Hill, 1999</p>
--	---

Course: Course: Remedial Biology (Revised 2019)				
Course Code: BP112RBP	First Year BPharm			Semester: I
Type of course: Practical	Contact Hours: 2 Hours/week			Total Contact Hours: 30
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	5	2	3	15
Pre-requisites:	<ul style="list-style-type: none"> • Prior knowledge about cell biology, morphology of plants, anatomy of bones. • Basic understanding of concepts of blood pressure, blood group and respiratory volumes. 			
Course Objectives:	<p>This Course aims to achieve the following :</p> <ul style="list-style-type: none"> • Handle microscope independently • To teach techniques of section cutting, mounting and staining, permanent slide preparation. • Understanding about stem, root, leaf and its modification • By using computerized simulated software able to learn about various experimental study of frog. • Help to understand microscopic histological details about different types of tissues and organs of plants and animals. • Identify the bones of human body. • Explain and teach the techniques to measure the blood pressure, tidal volume also identification of blood group. 			
COURSE OUTCOMES: On completion of the course the learner will be able to				PO Mapped

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

CO1	Demonstrate Handling of microscope independently & able to demonstrate understanding of section cutting techniques, mounting and staining, permanent slide preparation. Able to apply this knowledge to study histology of different tissues and organs of plants and animals.	1,2,3,4,6,7,8,9,10,11
CO2	Understand and explain morphology of plant with respect to stem, root, leaf and its modification	1,6,8,10,11
CO3	Identify the bones and understand and explain about determination of blood group, blood pressure, tidal volume which basal characteristics are commonly assessed during physical examination for clinical diagnosis.	1,2,3,4,6,7,8,9,10,11
CO4	Explain about study of frog by using computerized simulated software.	1,3,4,6,7,8,,9,10,11
CO5	Plan, execute and conclude the experiment using various methodologies	1,2,3,4,6,7,8,9,10,11
TOPICS		
1	Introduction to experiments in biology	
	<ul style="list-style-type: none"> a) Study of Microscope b) Section cutting techniques c) Mounting and staining d) Permanent slide preparation 	
2	Study of cell and its inclusions	
3	Study of Stem, Root, Leaf, seed, fruit, flower and their modifications	
4	Detailed study of frog by using computer models	
5	Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower	
6	Identification of bones	
7	Determination of blood group	
8	Determination of blood pressure	
9	Determination of tidal volume	
Reference material:	<ul style="list-style-type: none"> 1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale. 2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava. 3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi 	

SEM-II

Course: Human Anatomy and Physiology II (Revised 2019)					
Course Code: BP201T	First Year B. Pharm				Semester: II
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	<ul style="list-style-type: none"> • Basic knowledge of biology, commonly used terminologies in anatomy, physiology and pathophysiology. • Concepts of homeostasis, feedback mechanisms, mitosis and meiosis, dietary constituents, and transport across cell membrane. 				
Course Objectives:	To familiarize the learner with the anatomical organization and physiology of the different systems of the human body.				
Course Outcomes					PO Mapped
Upon completion of this course the learner should be able to:					
CO1	Explain the anatomy and physiology of Nervous System and Endocrine system and their role in hoemeostasis.				1, 3, 6, 8, 9, 10
CO2	Describe and illustrate the anatomical features of the Respiratory system, Digestive system and Urinary system and demonstrate an understanding of physiology of the same.				1, 3, 6, 8, 9, 10
CO3	Identify, illustrate and describe the anatomical and physiological features of Reproductive System with basic understanding of genetics.				1, 3, 6, 8, 9, 10
Topics covered:					
Unit I:	Nervous system				Hours: 10
<p>1.1 Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.</p> <p>1.2 Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, and cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity).</p>					
Unit II:	Digestive system and Energetics				Hours: 06
<p>2.1 Digestive system Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.</p>					

2.2 Energetics Formation and role of ATP, Creatinine Phosphate and BMR.		
Unit III:	Respiratory System and Urinary System	Hours: 10
3.1 Respiratory system Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.		
3.2 Urinary system Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.		
Unit IV:	Endocrine system	Hours: 10
Endocrine system Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.		
Unit V:	Reproductive System and Genetics	Hours: 9
5.1 Reproductive system Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition		
5.2 Introduction to genetics Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance		
Reference material:	Recommended Books (Latest Editions)	
	1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi. 2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York 3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA 4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A. 45 5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A. 6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi. 7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi. 8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.	
	Reference Books:	
	1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA 2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A. 3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata	

Course: Pharmaceutical Organic Chemistry I (Revised 2019)		
Course Code: BP202T	First Year B. Pharm	Semester: II

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Classification of organic compounds and basic rules of nomenclature				
Course Objectives:	<ul style="list-style-type: none"> To introduce the system of naming organic compounds and concepts of isomerism. To describe the reactivity/stability of organic compounds. To introduce properties of organic compounds dictated by their functional groups & their structures. 				
Course Outcomes					PO Mapped
CO1	Classify and give IUPAC nomenclature of various organic compounds along with the type of isomerism present.				1,8
CO2	Describe and explain the hybridization & stability in alkanes, alkenes & conjugated dienes along with the elimination, electrophilic & free radical addition reactions in alkenes with orientation.				1,3,8
CO3	Describe and explain the different nucleophilic substitution & addition reactions in Alkyl halides & Carbonyl compounds along with stereochemistry.				1,3,8
CO4	Describe and explain the method of preparation, reactions, chemical properties, uses, structures & the qualitative identification tests for compounds of different functional groups like alcohols, carbonyl compounds, carboxylic acids, aliphatic amines.				1,3,8,11
Topics covered:					
Unit I:	Classification, nomenclature and isomerism				Hours: 07
<ul style="list-style-type: none"> Classification of Organic Compounds, Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds) Structural isomerisms in organic compounds. 					
Unit II:	Alkanes, Alkenes and Conjugated dienes				Hours: 10
<ul style="list-style-type: none"> SP³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins., Stabilities of alkenes, SP² hybridization in alkenes. E₁ and E₂ reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E₁ verses E₂ reactions, Factors affecting E₁ and E₂ reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. 					

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

<ul style="list-style-type: none"> Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement 	
Unit III:	Alkyl Halides & Alcohols Hours: 10
<ul style="list-style-type: none"> Alkylhalides- SN₁ and SN₂ reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations, SN₁ versus SN₂ reactions, Factors affecting SN₁ and SN₂ reactions, Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. Alcohols- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol 	
Unit IV:	Carbonyl compounds* (Aldehydes and ketones) Hours: 10
<ul style="list-style-type: none"> Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde 	
Unit V:	Carboxylic acids & Aliphatic amines Hours: 08
<ul style="list-style-type: none"> Carboxylic acids - Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester, Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid. Aliphatic amines - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine 	
Reference material:	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none"> Organic Chemistry by Morrison and Boyd Organic Chemistry by I.L. Finar, Volume-I Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl. Organic Chemistry by P.L.Soni Practical Organic Chemistry by Mann and Saunders. Vogel's text book of Practical Organic Chemistry Advanced Practical organic chemistry by N.K.Vishnoi. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz. Reaction and reaction mechanism by Ahluwaliah/Chatwal.

Course: Biochemistry (Revised 2019)					
Course Code: BP203T	First Year B. Pharm				Semester: II
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Max. Marks:	15	4	3	3	75
Pre-requisites:	Basics concepts and terminologies used in biology and chemistry				
Course Objectives:	<ol style="list-style-type: none"> To learn chemistry of biomolecules and enzymes along with bioenergetics To make student understand basic reactions happening inside body like metabolism and biosynthesis of biomolecules To learn central paradigm of biochemistry which will form base for understanding advanced application subjects like biotechnology 				
Course Outcomes: Upon completion of course learner will be able to					PO Mapped
CO1	Understand classification, structure, functions, digestion and metabolism of basic biomolecules like Carbohydrates, proteins and lipids				1
CO2	Learn thermodynamic and bioenergetic aspects of biochemical reactions				1
CO3	Reproduce names, structures, products and enzymes involved in all metabolic processes				1, 11
CO4	Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes				1, 11
CO5	Explain three cornered central paradigms of biochemistry i.e. replication, transcription and translation				1,11
Topics covered:					
Unit I:					8 Hours:
1.1 Biomolecules Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.					
1.2 Bioenergetics Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.					
1.3 Energy rich compounds; classification; biological significances of ATP and cyclic AMP					
Unit II:					10 Hours:
2.1 Carbohydrate metabolism Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance Hormonal regulation of blood glucose level and Diabetes mellitus					
2.2 Biological oxidation Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers					
Unit III:					9 Hours:
3.1 Lipid metabolism					

<p>β-Oxidation of saturated fatty acid (Palmitic acid) Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid) Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.</p> <p>3.3 Amino acid metabolism General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alpeptonuria, tyrosinemia) Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline Catabolism of heme; hyperbilirubinemia and jaundice</p>		
Unit IV:	Nucleic acid metabolism and genetic information transfer	10 Hours:
<p>Biosynthesis of purine and pyrimidine nucleotides Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis Genetic code, Translation or Protein synthesis and inhibitors</p>		
Unit V:	Enzymes	7 Hours:
<p>Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) Enzyme inhibitors with examples Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions</p>		
Reference Material	<p>Recommended Books (Latest Editions) 1. Principles of Biochemistry by Lehninger. 2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell. 3. Biochemistry by Stryer. 4. Biochemistry by D. Satyanarayan and U.Chakrapani 5. Textbook of Biochemistry by Rama Rao. 6. Textbook of Biochemistry by Deb. 7. Outlines of Biochemistry by Conn and Stumpf 8. Practical Biochemistry by R.C. Gupta and S. Bhargavan. 9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition) 10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna. 11. Practical Biochemistry by Harold Varley.</p>	

Course: Pathophysiology (Revised 2019)		
Course Code: BP204T	First Year B. Pharm	Semester: II

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Students must be aware about the following: <ul style="list-style-type: none"> • Anatomy and physiology of the different systems in the body • Basic knowledge of cell growth 				
Course Objectives:	This Course aims to : <ul style="list-style-type: none"> • To familiarize the learner with the Principles related to cell injury, adaptation, repair, growth, inflammation and pathogenesis of cancer. • To educate on etiology and pathophysiology of diseases related to cardiovascular, respiratory, urinary, endocrine, nervous, skeletal, gastrointestinal and infectious diseases. 				
Course Outcomes: After completion of this course the learner will be able to					PO Mapped
CO1	Explain of Principles related to cell injury, adaptation, repair, growth, inflammation and pathogenesis of cancer.				1,6,7,8,9,11
CO2	Describe the etiology and pathophysiology of diseases related to cardiovascular, Skeletal, Respiratory, Gastrointestinal, Urinary, Endocrine and Nervous system.				1, 6,7,8,9,11
CO3	Describe the etiology and pathophysiology of diseases related to infectious diseases.				1, 6,7,8,9,11
CO4	Apply the knowledge of related to diseases and symptoms to identify the disease.				1, 6,7,8,9,11
Topics covered:					
Unit I:					Hours 10
<p>1.1 Basic principles of Cell injury and Adaptation: Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance</p> <p>1.2 Basic mechanism involved in the process of inflammation and repair: Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis</p>					
Unit II:					Hours 10

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

5.2 Cardiovascular system: Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)		
5.3 Respiratory system: Asthma, Chronic obstructive airways diseases		
5.4 Renal system: Acute and chronic renal failure		
Unit III:		Hours 10
3.1 Haematological Diseases: Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia		
3.2 Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones		
3.3 Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.		
3.4 Gastrointestinal system: Peptic Ulcer		
Unit IV:		Hours 08
4.1 Inflammatory diseases: Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F), alcoholic liver disease.		
4.2 Disease of bones and joints: Rheumatoid arthritis, osteoporosis and gout		
4.3 Principles of cancer: Classification, etiology and pathogenesis of cancer		
Unit V:		Hours 07
5.1 Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections		
5.2 Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea		
Reference material:	<p>Recommended books (Latest edition)</p> <ol style="list-style-type: none"> 1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014. 2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010. 3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011. 4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states; 5. William and Wilkins, Baltimore; 1991 [1990 printing]. 6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010. 7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010. 8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014. 9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997. <p>Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.</p>	

Course: Computer Applications in Pharmacy – Theory (CBCS Revised 2019)		
Course Code: BP205T	First Year B. Pharm	Semester: II

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Type of course: Theory	Contact Hours: 3 Hours/week (3L)				Total Contact Hours: 30
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	50
Pre-requisites:	Knowledge of computer hardware, MS Office and excel				
Course Objectives:	1. To educate on the various types of application of computers in pharmacy 2. To elaborate on the various types of databases 3. To explain the various applications of databases in pharmacy				
Course Outcomes After completion of this course the learner will be able to					PO Mapped
CO1	Understand the basics of computers				3,4,10
CO2	Differentiate among different web technologies and databased				1,4,7,10
CO3	Delate various application of computers in Pharmacy				1,4,6,10
Topics covered:					
Unit I:	Number and Information systems				Hours: 6
1.1 Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc., binary addition, binary subtraction – One’s complement ,Two’s complement method, binary multiplication, binary division 1.2 Concept of Information Systems and Software: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.					
Unit II:	Web Technologies an databases				Hours: 6
2.1 Web technologies: Introduction to HTML, XML,CSS and Programming languages, introduction to web servers and Server Products 2.2 Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database					
Unit III:	Application of computers in Pharmacy				Hours: 6
3.1 Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, 3.2 Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring 3.3 Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System					
Unit IV:	Bioinformatics				Hours: 6

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery		
Unit V:	Computers as data analysis in Preclinical development	Hours: 6
Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)		
Reference material:	Recommended Books: (Latest Editions)	
	1. Computer Application in Pharmacy – William E. Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.	
	2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA	
	3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)	
	4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002	

Course: Environmental Science (Revised 2019)					
Course Code: BP206T	First Year B. Pharm				Semester: II
Type of course: Theory	Contact Hours: 3 Hours/week (3L)			Total Contact Hours: 30	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	50
Pre-requisites:	Understanding of agents and factors that contribute to environmental changes. Knowledge of structure and functioning of major physical and ecological components of the earth's systems				
Course Objectives:	Upon completion of the course the student shall be able to: 1. Create the awareness about environmental problems among learners. 2. Impart basic knowledge about the environment and its allied problems. 3. Develop an attitude of concern for the environment. 4. Motivate learner to participate in environment protection and environment improvement. 5. Acquire skills to help the concerned individuals in identifying and solving environmental problems. 6. Strive to attain harmony with Nature 7. Acquire skills to help the concerned individuals in identifying and solving environmental problems.				
Course Outcomes After completion of this course the learner will be able to					PO Mapped

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

CO1	Describe the basics of Environmental sciences like need and purpose of study the subject, Ecology, food chain and ecological pyramids, sustainable development	1,3,4,10,11
CO2	Classify and compare different sources of energies	1,3,4,10,11
CO3	, Relate technology to control pollution and economic benefits thereof, infer, the concept of green building, carbon credit and disaster management Realize the environment related moral responsibilities and identify Legal (environmental) aspects for becoming entrepreneur in future	1,3,4,10,11
Topics covered:		
Unit I:		Hours:10
	<ul style="list-style-type: none"> ▪ The Multidisciplinary nature of environmental studies ▪ Natural Resources ▪ Renewable and non-renewable resources: ▪ Natural resources and associated problems ▪ a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources. 	
Unit II:		Hours: 10
	<ul style="list-style-type: none"> ▪ Ecosystems ▪ Concept of an ecosystem. ▪ Structure and function of an ecosystem. ▪ Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) 	
Unit III:		Hours: 10
	Environmental Pollution: Air pollution; Water pollution; Soil pollution	
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore 2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner. 3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, 4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p 5. Clark R.S., Marine Pollution, Clarendon Press Oxford 6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p 7. De A.K., Environmental Chemistry, Wiley Eastern Ltd. Down of Earth, Centre for Science and Environment 	

Course: Human Anatomy and Physiology II (Revised 2019)		
Course Code: BP207P	First Year B. Pharm	Semester: II
Type of course: Practical	Contact Hours: 4 Hours/week	Total Contact Hours: 60

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Course assessment Methods:		Continuous mode of assessment			Semester-end assessment
Assessment Tool*:		Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:		10	2	3	35
Pre-requisites:		The learner must have basic knowledge about the following <ul style="list-style-type: none"> • Different systems in the body namely digestive, cardiovascular, reproductive, respiratory, integumentary and nervous system • Basic idea about the physiology of the body 			
Course Objectives:		This Course aims to teach the learner the following: <ul style="list-style-type: none"> e) Clinical methods for determination of body temperature, basal mass index, tidal volume, vital capacity, functioning and parts of different systems in the body f) Methods of contraception used commonly g) Histology, structure of different organs and tissues in the human body and response of the human body to difference reflexes. 			
Course Outcomes:					PO Mapped
After completion of this course the learner will be able to					
CO1	Determine body temperature, Basal mass index , vital capacity and tidal volume and explain how total blood count is determined using cell counter and which basal characteristics are commonly assessed during physical examination for clinical diagnosis				1,2,3,4,7,9,10,11
CO2	Understand and explain the anatomy and physiology of the different systems in the body and study effect of drugs acting locally and on the gastrointestinal tract				1,2,4,6,7, 8,9,10,11
CO3	Identify and explain the histology, structure of different organs and tissues in the human body and understand methods of contraception used commonly				1,6,7,9,10,11
CO4	Explain the response of the human body to difference reflexes, visual acuity, different types of taste, neurological evaluation, function of olfactory nerve and apply the principles in evaluation of body functions				1,2,4,6,7,8,9,10,11
C05	Plan, execute and conclude the experiment using various methodologies				1,3,4,6,7,8,9,10,11
Topics covered:					
Unit I:	UNIT I – Basic physiology and methods for assessment of wellbeing				Hours 08
<ul style="list-style-type: none"> • Recording of body temperature • Determination of tidal volume and vital capacity. • To demonstrate positive and negative feedback mechanism. • Recording of basal mass index 					
Unit II:	UNIT II – Study of special senses				Hours 08
<ul style="list-style-type: none"> • To demonstrate the function of olfactory nerve • To examine the different types of taste. • To demonstrate the visual acuity 					
Unit III:	UNIT III –Diagnostic techniques				Hours 08
<ul style="list-style-type: none"> • To demonstrate the general neurological examination • Study of family planning devices and pregnancy diagnosis test. • Demonstration of total blood count by cell analyser • To demonstrate the reflex activity 					

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Unit IV:	UNIT IV – Study of tissues and organ histology, function and anatomy of different systems in the body	Hours 12
	<ul style="list-style-type: none"> • To study the integumentary and special senses using specimen, models, etc., • To study the nervous system using specimen, models, etc., • To study the endocrine system using specimen, models, etc • Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens. • Permanent slides of vital organs and gonads. 	
Reference material:	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none"> 1) Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi. 2) Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York 3) Physiological basis of Medical Practice-Best and Taylor. Williams & Wilkins Co,Riverview,MI USA 4) Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A. 5) Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A. 6) Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers,New Delhi. 7) Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi. 8) Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi. 9) Physiological basis of Medical Practice-Best and Taylor. Williams & Wilkins Co, Riverview, MI USA 10) Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A. 11) Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata 	

Course: Pharmaceutical Organic Chemistry - I (Revised 2019)				
Course Code: BP208P	First Year B. Pharm			Semester: II
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	<ul style="list-style-type: none"> • Handling different sets of laboratory apparatus and basics of safety aspects while working in a chemistry lab. 			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Course Objectives:	<ol style="list-style-type: none"> 1. To discuss the aspects of occupational safety & hazards of working in a chemistry laboratory. 2. To teach the method for determination of some physical properties of organic compounds. 3. To teach the methods of determination of some common functional groups present in organic compounds. 4. To teach the methods of preparation of solid derivatives of organic compounds.
COURSE OUTCOMES:	
After completion of this course the learner will be able to	
CO1	Practice and follow safety rules & precautionary measures in a laboratory.
CO2	Explain theoretical aspects of physical constant determination, detection of functional groups.
CO3	Characterize/ Identify monofunctional or bifunctional organic compounds by physical constant, elemental analysis and functional group analysis.
CO4	Prepare solid derivatives from organic compounds & molecular model construction of basic organic compounds.
CO5	Plan, execute and conclude the experiment using various methodologies (defined protocol or qualitative or quantitative techniques).
PO Mapped	
	8,9
	1,2,3,8
	1,2,3,8
	1,2,3,8
	2
TOPICS	
Unit I:	Systematic qualitative analysis of unknown organic compounds like
	<ul style="list-style-type: none"> • Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc. • Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test • Solubility test • Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides. • Melting point/Boiling point of organic compounds • Identification of the unknown compound from the literature using melting point/ boiling point. • Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point. • Minimum 5 unknown organic compounds to be analysed systematically.
Unit II:	Preparation of suitable solid derivatives from organic compounds
Unit III:	Construction of molecular models

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Reference material:	<ol style="list-style-type: none"> 1. Organic Chemistry by Morrison and Boyd 2. Organic Chemistry by I.L. Finar , Volume-I 3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl. 4. Organic Chemistry by P.L.Soni 5. Practical Organic Chemistry by Mann and Saunders. 6. Vogel's text book of Practical Organic Chemistry 7. Advanced Practical organic chemistry by N.K.Vishnoi. 8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz. 9. Reaction and reaction mechanism by Ahluwalia/Chatwal.
----------------------------	--

Course: Biochemistry (Revised 2019)				
Course Code: BP209P	First Year B. Pharm			Semester: II
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course Assessment Methods	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Basics chemical properties of all biomolecules, enzyme kinetics as well as factors affecting enzyme activity			
Course Objectives:	<ol style="list-style-type: none"> 1. To develop skills of qualitative and quantitative analysis of biomolecules 2. Learn to apply knowledge acquired in theory to interpret results 			
Course Outcomes:				PO Mapped
After completion of this course the learner will be able to				
CO1	Able to perform Qualitative and quantitative analysis of various samples of carbohydrate, protein, lipids and enzymes			1,2
CO2	Estimate enzyme activity with respect to various factors Temp, substrate concentration and correlate with enzyme substrate interaction.			1,2
CO3	understand clinical applications of biochemical methods through experiments			1
CO4	Correlate findings with theoretical concepts and conclude the results based on confirmatory tests and calculations			1,3
CO5	Demonstrate oral and written communication and ability to plan experiment with proper time management.			2,3,8
TOPICS				
Unit I:	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)			
Unit II:	Identification tests for Proteins (albumin and Casein)			
Unit III:	Quantitative analysis of reducing sugars (DNSA method) and Proteins			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

	(Biuret method)
Unit IV:	Qualitative analysis of urine for abnormal constituents
Unit V:	Determination of blood creatinine
Unit VI	Determination of blood sugar
Unit VII	Determination of serum total cholesterol
Unit VIII	Preparation of buffer solution and measurement of Ph
Unit IX	Study of enzymatic hydrolysis of starch
Unit X	Determination of Salivary amylase activity
Unit XI	Study the effect of Temperature on Salivary amylase activity
Unit XII	Study the effect of substrate concentration on salivary amylase activity
Reference Material	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none"> 1. Principles of Biochemistry by Lehninger. 2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell. 3. Biochemistry by Stryer. 4. Biochemistry by D. Satyanarayan and U.Chakrapani 5. Textbook of Biochemistry by Rama Rao. 6. Textbook of Biochemistry by Deb. 7. Outlines of Biochemistry by Conn and Stumpf 8. Practical Biochemistry by R.C. Gupta and S. Bhargavan. 9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition) 10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna. 11. Practical Biochemistry by Harold Varley.

Course: Computer Applications in Pharmacy (Revised 2019)				
Course Code: BP210P	First Year B. Pharm			Semester: II
Type of course: Practical	Contact Hours: 2 Hours/week			Total Contact Hours: 30
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	5	2	3	15
Pre-requisites:	Knowledge of computer hardware, MS Office and excel			
Course Objectives:	To give basic training of usage of computers and software in pharmacy			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

COURSE OUTCOMES		PO Mapped
CO1	Designing and creating, questioners, HTML forms and MS access databases	2,4,5,11
CO2	Apply learning to the problems of pharmaceutical origin	1,2,3,4,5,11
TOPICS		
Unit I:		
	<ol style="list-style-type: none"> 1. Design a questionnaire using a word processing package to gather information about a particular disease. 2. Create a HTML web page to show personal information. 3. Retrieve the information of a drug and its adverse effects using online tools 4. Creating mailing labels Using Label Wizard , generating label in MS WORD 5. Create a database in MS Access to store the patient information with the required fields Using access 6. Design a form in MS Access to view, add, delete and modify the patient record in the database 7. Generating report and printing the report from patient database 8. Creating invoice table using – MS Access 9. Drug information storage and retrieval using MS Access 10. Creating and working with queries in MS Access 11. Exporting Tables, Queries, Forms and Reports to web pages 12. Exporting Tables, Queries, Forms and Reports to XML pages 	
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1) Computer Application in Pharmacy – William E. Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330. 2) Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA 3) Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA) 4) Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002 	

SEM III

Course: Pharmaceutical Organic Chemistry II (Revised 2019)					
Course Code: BP301T	Second Year B. Pharm				Semester: III
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic structures and properties of benzene, fats & oils.				
Course Objectives:	<ul style="list-style-type: none"> To introduce the concepts of aromaticity & resonance in benzene & its substituted compounds. To describe the reactivity/stability & the reactions of various compounds like hydrocarbons, fats, oils. 				
Course Outcomes: After completion of this course the learner will be able to					PO Mapped
CO1	Explain different reactions of benzene and predict aromatic character, resonance, orientation, effect of substituents in benzene and its derivatives				1,3,8
CO2	Describe and explain the method of preparation, reactions, chemical properties, uses, structures & the qualitative identification tests for compounds of different functional groups like phenols, aromatic amines, aromatic acids and hydrocarbons.				1,3,8,11
CO3	Explain reactions shown by fats & oils along with determining their analytical constants like Acid value, Saponification value, RM value.				1,3,8
CO4	Describe different conformational stabilities of cycloalkanes & reactions of cyclopropane & cyclobutane.				1,3,8
Topics covered:					
Unit I:	Benzene and its derivatives				Hours: 10
1.1 Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule					
1.2 Reactions of benzene - nitration, sulphonation, halogenation-reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.					
1.3 Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction					

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Unit II:	Phenols, Aromatic amines & Aromatic acids	Hours: 10
2.1 Phenols - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols 2.2 Aromatic Amines - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts 2.3 Aromatic Acids –Acidity, effect of substituents on acidity and important reactions of benzoic acid.		
Unit III:	Fats and Oils	Hours: 10
3.1 Fatty acids – reactions. 3.2 Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils 3.3 Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.		
Unit IV:	Polynuclear hydrocarbons	Hours: 08
Synthesis, reaction Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives.		
Unit V:	Cycloalkanes	Hours: 07
<ul style="list-style-type: none"> Stabilities – Baeyer’s strain theory, limitation of Baeyer’s strain theory, Coulson and Moffitt’s modification, Sachse Mohr’s theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only. 		
Reference material:	Books <ol style="list-style-type: none"> Organic Chemistry by R.T. Morrison and R.N.Boyd, 6th edition,Prentice Hall Publications Organic Chemistry by Pine, Stanley H.; Hendrickson, James B.; Cram, Donald J.; Hammond, George S., 4th edition. The Macgraw hill publications Organic Chemistry by I.L. Finar, Vol 1& 2, 6th edition, Pearson education Advanced Organic Chemistry: Reactions, Mechanisms, Structures by Jerry March, John Wiley and sons Organic Chemistry, Part A: Structures and Mechanism, Part B: Reactions and Synthesis, Francis and Carry, Richard J Sundberg. Springer publications A Guidebook to Mechanism in Organic Chemistry, 6th edition, Peter Sykes, Pearson Education Peter Sykes, Essentials of Organic chemistry by Paul M Dewick, Wiley, Pine Essentials of Organic chemistry by Paul M Dewick, Wiley Eliel, Kalsi, Organic Chemistry by L.G.Wade, Jr., Maya Shankar Singh, Pearson Education, 6th Ed, Organic Chemistry, 2nd Ed., Thomas Sorrell, University Science Books Stereochemistry: Conformation and Mechanism, b) Organic Reactions And Their Mechanisms. By P. S. Kalsi. New age International Organic Chemistry through Solved Problems, Goutam Brahmachari. Edition, Morgan & Claypool Organic Name Reactions: A Unified Approach. Goutam Brahmachari. Alpha Science publications 	

Course: Physical Pharmaceutics I (Revised 2019)		
Course Code: BP302T	First Year B. Pharm	Semester: III

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	1. The learner should have the basic knowledge of solutions, mixtures, free energy, pH and states of matter				
Course Objectives:	<p>The course aims to impart the learner the understanding of:</p> <ol style="list-style-type: none"> 1. physical and physicochemical properties, and principles involved in dosage forms/formulations. 2. To get a better insight into various areas of formulation research and development and stability studies of pharmaceutical dosage forms. 				
Course Outcomes: Upon completion of the current course the learner would be able to:					PO Mapped
CO1	Understand various physicochemical properties of drug molecules in the designing the dosage forms				1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
CO2	Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations				1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
CO3	Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.				1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Topics covered:					
Unit I:	Solubility of drugs				Hours: 10
1.1 Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs 1.2 Dissolution & drug release, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) 1.3 Raoult's law, real solutions, azeotropic mixtures, fractional distillation. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications					
Unit II:	States and properties of matter and Physicochemical properties of drug molecules				Hours: 10
2.1 States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism. 2.2 Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications					
Unit III:	Surface and interfacial phenomenon				Hours: 10

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.					
Unit IV:	Complexation and protein binding				Hours: 8
Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.					
Unit V:	pH, buffers and Isotonic solutions:				Hours: 7
Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.					
Reference material:	Books				
	1. Physical pharmacy by Alfred Martin				
	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, MarcelDekkar 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.					
Course: Pharmaceutical Microbiology (Revised 2019)					
Course Code: BP 303 T	Second Year B. Pharm				Semester: III
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic idea of Cell biology				
Course Objectives:	<ul style="list-style-type: none"> • To discuss the scope, history of microbiology and applications in pharma industry, classification of microorganisms and Learn different microscopy techniques and principles of different staining techniques • To study methods to control the microorganisms, sterilization techniques and preservation of pharmaceuticals • To get familiarized with general procedures of cell culture and applications of cell culture in pharmaceutical industry 				
Course Outcomes: After completion of this course the learner will be able to					PO Mapped
CO1	Understand classification and methods of identification, isolation, cultivation and preservation of various classes of microorganisms				1,6,8,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

CO2	Understand the use of various microscopic techniques, staining techniques and biochemical tests for identification of microorganisms	1,4,6,8,10,11
CO3	Describe various methods for control of microorganisms, their evaluation and factors affecting their efficiency	1,3,6,8,9,10,11
CO4	Demonstrate various methods used for sterilization of pharmaceutical products and evaluation of efficiency of methods of sterilization	1,3,4,6,8,9,10,11
CO5	Describe the cell culture technology and its application in pharmaceutical industry and research	1,4,6,8,9,10,11
Topics covered:		
Sr. no.	Content	Hours
1.	Unit I	10
<p>1.1 Introduction, history of microbiology, its branches, scope and its importance. 1.2 Introduction to Prokaryotes and Eukaryotes 1.3 Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). 1.4 Study of different types of phase contrast microscopy, dark field microscopy and electron microscope</p>		
2.	Unit II	10
<p>2.1 Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). 2.2 Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization. 2.3 Evaluation of the efficiency of sterilization methods. 2.4 Equipments employed in large scale sterilization. 2.5 Sterility indicators.</p>		
3.	Unit III	10
<p>3.1 Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. 3.2 Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation for bacteriostatic and bactericidal actions. 3.3 Evaluation of bactericidal & Bacteriostatic. 3.4 Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.</p>		
4.	Unit IV	08
<p>4.1 Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. 4.2 Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. 4.3 Assessment of a new antibiotic and testing of antimicrobial activity of a new substance.</p>		
5.	Unit V	07

- 5.1** Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.
- 5.2** Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.
- 5.3** Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.
- 5.4** Application of cell cultures in pharmaceutical industry and research.

Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London. 2. Prescott and Dunn., Industrial Microbiology, 4 th edition, CBS Publishers & Distributors, Delhi. 3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn. 4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology. 5. Rose: Industrial Microbiology. 6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan 7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution. 8. Pepler: Microbial Technology. 9. I.P., B.P., U.S.P.- latest editions. 10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai 11. Edward: Fundamentals of Microbiology. 12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi 13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
----------------------------	--

Course: Pharmaceutical Engineering (Revised 2019)					
Course Code: BP304T	Second Year B. Pharm				Semester: III
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester- end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.				

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Course Objectives:	<p>Upon completion of the course student shall be able:</p> <ol style="list-style-type: none"> 1. To know various unit operations used in Pharmaceutical industries. 2. To understand the material handling techniques. 3. To perform various processes involved in pharmaceutical manufacturing process. 4. To carry out various test to prevent environmental pollution. 5. To appreciate and comprehend significance of plant lay out design for optimum use of resources. 6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries 	
Course Outcomes: After completion of course learner will be able to		PO Mapped
CO1	Understand mechanics of fluid, fluid flow, and its measurements	1,2,3,8
CO2	Classify and describe heat measuring devices, mixers and dryers with respect to their applications in pharmacy	1,2,3,8
CO3	Understand basic principles involved in unit operations such as crystallization, evaporation, distillation, size reduction, filtration, centrifugation and refrigeration and will able to describe the equipment and accessories involved therein.	1,2,3,8,10
CO4	Summarize construction material, discuss corrosion of equipment from pharmaceutical industry point	1,3,8,10
Topics covered:		
Unit I:		Hours: 10
<p>1.1 Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturi meter, Pitot tube and Rotometer.</p> <p>1.2 Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.</p> <p>1.3 Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank</p>		
Unit II:		Hours: 10
<p>2.1 Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.</p> <p>2.2 Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.</p> <p>2.3 Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional</p>		

distillation, distillation under reduced pressure, steam distillation & molecular distillation		
Unit III:		Hours: 10
<p>3.1 Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer</p> <p>3.2 Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier</p>		
Unit IV:		Hours: 08
<p>4.1 Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.</p> <p>4.2 Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge</p>		
Unit V:		Hours: 07
<p>4.3 Materials of pharmaceutical plant construction, Corrosion And its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non-metals, basic of material handling system</p>		
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Introduction to chemical engineering – Walter L Badger & Julius Banchemo, Latest edition. 2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition. 3. Unit operation of chemical engineering – McCabe Smith, Latest edition. 4. Pharmaceutical engineering principles and practices–C.V.S Subrahmanyam et al., Latest edition. 5. Remington practice of pharmacy- Martin, Latest edition. 6. Theory and practice of industrial pharmacy by Lachmann., Latest edition. 7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition. 8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition. 	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Course: Pharmaceutical Organic Chemistry - II (Revised 2019)				
Course Code: BP305P	Second Year B. Pharm			Semester: III
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	<ul style="list-style-type: none"> • Safety rules & precautionary measures in the laboratory. • Some basic knowledge on conventional methods of synthesis of organic compounds. 			
Course Objectives:	<ol style="list-style-type: none"> 3. To teach the method for determination of some analytical constants in fats & oils. 4. To design and perform different organic synthetic reactions. 			
COURSE OUTCOMES				PO Mapped
CO1	Perform experiments involving laboratory techniques like recrystallization, distillation.			1,2,4
CO2	Determine analytical constants like Acid value, Iodine value in Fats & Oils.			1,2,3,8
CO3	Describe the theoretical aspects of organic synthesis & perform various unit operations of organic synthetic reactions.			1,2,4,5,6
CO4	Plan, execute and conclude the experiment using various methodologies (defined protocol or qualitative or quantitative techniques).			2
TOPICS				
Unit I:	Experiments involving laboratory techniques			
<ul style="list-style-type: none"> • Recrystallization • Steam distillation 				
Unit II:	Determination of following oil values (including standardization of reagents)			
<ul style="list-style-type: none"> • Acid value • Saponification value • Iodine value 				
Unit III:	Preparation of compounds			
<ul style="list-style-type: none"> • Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction. • 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ • Acetanilide by halogenation (Bromination) reaction. • 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction. 				

<ul style="list-style-type: none"> • Benzoic acid from Benzyl chloride by oxidation reaction. • Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction. • 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions. • Benzil from Benzoin by oxidation reaction. • Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction • Cinnamic acid from Benzaldehyde by Perkin reaction • P-Iodo benzoic acid from P-amino benzoic acid 	
Reference material:	<ol style="list-style-type: none"> 1. Organic Chemistry by Morrison and Boyd 2. Organic Chemistry by I.L. Finar , Volume-I 3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl. 4. Organic Chemistry by P.L.Soni 5. Practical Organic Chemistry by Mann and Saunders. 6. Vogel's text book of Practical Organic Chemistry 7. Advanced Practical organic chemistry by N.K.Vishnoi. 8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

Course: Physical Pharmaceutics – I (Revised 2019)				
Course Code: BP306P	Second Year B. Pharm			Semester: III
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	<ul style="list-style-type: none"> • Basic knowledge about the drug and different types of dosage forms 			
Course Objectives:	The objective of the course is to teach the learner the methods for the determination of different physical parameters underlying preformulation testing, formulation development, and finished product testing of drug delivery systems.			
Course Outcomes: After completion of the course learner will be able to				PO Mapped
CO1	Understand the principles and methods for the determination of various physical parameters of drugs and formulations.			1,2,3,4,5,6,8,10,11
CO2	Carry out various physical tests involved in the characterization of drugs.			1,2,3,4,5,6,8,10,11
CO3	Demonstrate testing of various physical parameters involved in pre-formulation and formulation evaluation.			1,2,3,4,5,6,8,10,11
CO4	Plan, execute the experiment using various methodologies (defined protocol or qualitative or quantitative techniques) and summarize the findings in systematic way verbally and			1,2,3,4,5,6,8,10,11

	in written communication.	
TOPICS		
	<ol style="list-style-type: none"> 1. Determination the solubility of drug at room temperature 2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation. 3. Determination of Partition coefficient of benzoic acid in benzene and water 4. Determination of Partition coefficient of Iodine in CCl₄ and water 5. Determination of % composition of NaCl in a solution using phenol-water system by CST method 6. Determination of surface tension of given liquids by drop count and drop weight method 7. Determination of HLB number of a surfactant by saponification method 8. Determination of Freundlich and Langmuir constants using activated charcoal 9. Determination of critical micellar concentration of surfactants 10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method 11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method 	
Reference material:	<ol style="list-style-type: none"> 1. Physical pharmacy by Alfred Martin 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, MarcelDekkar 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 ManavalanR. 8. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee 	

Course: Pharmaceutical Microbiology (Revised 2019)		
Course Code: BP 307P	Second Year B. Pharm	Semester: III
Type of course: Practical	Contact Hours: 4 Hours/week	Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment	Semester-end assessment

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	<ul style="list-style-type: none"> Basic knowledge of biotechnology, biochemistry and microbiology 			
Course Objectives:	1.To introduce the learner to some of the common techniques used in microbiological work and biotechnology experiment 2.To impart the knowledge of methods of subculturing, microbiological assays and tests for sterility			
Course Outcomes: After completion of the course learner will be able to				PO Mapped
CO1	Demonstrate methods of subculturing, characterization and identification of bacteria using various techniques (morphological, serological and biochemical)			1,2,3,5,6,7,8,10,11
CO2	Practice methods of sterilization for various products, perform test for sterility on pharmaceuticals and bioassay of antibiotics			1,2,3,5,6,7,8,9,10,11
CO3	Demonstrate the use of different equipments used in experimental microbiology			1,2,3,4,5,6,7,8,10,11
CO4	Plan, execute and conclude the experiment using various methodologies			1,2,3,4,5,6,7,8,10,11
TOPICS				
List of experiments:				
1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology. 2. Sterilization of glassware, preparation and sterilization of media. 3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations. 4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical). 5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques. 6. Microbiological assay of antibiotics by cup plate method and other methods 7. Motility determination by Hanging drop method. 8. Sterility testing of pharmaceuticals. 9. Bacteriological analysis of water 10. Biochemical test				
Reference material:	1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London. 2. Prescott and Dunn., Industrial Microbiology, 4 th edition, CBS Publishers & Distributors, Delhi. 3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn. 4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology. 5. Rose: Industrial Microbiology. 6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan 7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution. 8. Pepler: Microbial Technology. 9. I.P., B.P., U.S.P.- latest editions. 10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

	11. Edward: Fundamentals of Microbiology. 12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi 13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
--	--

Course: Pharmaceutical Engineering (Revised 2019)				
Course Code: BP308P	Second Year B. Pharm			Semester: III
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	<ul style="list-style-type: none"> Basics understanding of unit processes covered under the subject of pharmaceutical engineering. 			
Course Objectives:	To train the students in the fundamental of unit operations with respect to basics of engineering and their application which are required in pharmaceutical industries			
COURSE OUTCOMES: After the completion of course learner will be able to				PO Mapped
CO1	Impart knowledge of different unit operations			1,2,3,4,11
CO2	Understand process controls with respect to unit operations that are employed in the pharmaceutical industry			1,2,3,4,8
CO3	Perform experiments as per GLP and record in the journals			1,2,3,8
TOPICS				
Unit I:	Determination of radiation constant of brass, iron, unpainted and painted glass			
Unit II:	Steam distillation – To calculate the efficiency of steam distillation			
Unit III:	To determine the overall heat transfer coefficient by heat exchanger.			
Unit IV:	Construction of drying curves (for calcium carbonate and starch).			
Unit V:	Determination of moisture content and loss on drying			
Unit VI:	Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.			
Unit VII:	Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier			
Unit VIII:	Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.			
Unit IX:	Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK – Revised 2019

Unit X:	Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
Unit XI:	Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity)
Unit XII:	To study the effect of time on the Rate of Crystallization.
Unit XIII:	To calculate the uniformity Index for given sample by using Double Cone Blender.
Reference material:	<ol style="list-style-type: none">1. Introduction to chemical engineering – Walter L Badger & Julius Banchemo, Latest edition.2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.3. Unit operation of chemical engineering – McCabe Smith, Latest edition.4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.5. Remington practice of pharmacy- Martin, Latest edition.6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.

SEM IV

Course: Pharmaceutical Organic Chemistry –III (Revised 2019)					
Course Code: BP401T	Second year B.Pharm				Semester: IV
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	For understanding of stereochemistry of organic compounds, students should be known basic concepts of isomerism. Students should have basic introduction of heterocyclic compounds and in addition students should be aware of aromaticity concepts and various reactions of benzene and its analogues, for better understanding of characteristic and reactions of heterocyclic ring. Students should recollect basic reactions of organic chemistry and should have understanding of how to write reaction mechanism stepwise.				
Course Objectives:	To make students aware about significance of stereochemistry and concepts involved To provide information of medicinally useful heterocyclic compounds. To make them understand various named reaction involve in organic synthesis				
Course Outcomes: After completion of the course learner will be able to					PO Mapped
CO1	Understand basic concepts and various terminologies involved in stereochemistry.				1,11
CO2	Understand the methods of preparation and properties of heterocyclic organic compounds.				1,11
CO3	Predict and explain the reaction products considering the mechanisms and their stereochemical aspects.				1,3,11
Topics covered:					
Unit I:	Stereo isomerism				Hours: 10
Optical isomerism – i. Optical activity, enantiomerism, diastereoisomerism, meso compounds ii. Elements of symmetry, chiral and achiral molecules iii. DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers iv. Reactions of chiral molecules v. Racemic modification and resolution of racemic mixture.					

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

vi. Asymmetric synthesis: partial and absolute		
Unit II:	Geometrical isomerism	Hours: 10
i. Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) ii. Methods of determination of configuration of geometrical isomers. iii. Conformational isomerism in Ethane, n-Butane and Cyclohexane. iv. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. v. Stereospecific and stereoselective reactions		
Unit III:	Heterocyclic compounds:	Hours: 10
Nomenclature and classification Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene		
Unit IV:		Hours: 08
Synthesis, reactions and medicinal uses of following compounds/derivatives 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:	Reactions of synthetic importance	Hours: 07
i. Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction ii. Oppenauer-oxidation and Dakin reaction. iii. Beckmanns rearrangement and Schmidt rearrangement iv. Claisen-Schmidt condensation		
Reference Books (Latest Editions to be adopted)		
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		

Course: Medicinal Chemistry I (Revised 2019)					
Course Code: BP402T	Second Year B. Pharm				Semester: IV
Type of course: Theory	Contact Hours: 3 L + 1T / Week			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Max. Marks:	15	4	3	3	75
Pre-requisites:	Concepts learnt in General Chemistry Organic chemistry, biochemistry, Physical Chemistry (Pharmacy) , anatomy & physiology and microbiology				
Course Objectives:	1. Learn how physicochemical properties / QSAR play role to design and optimize the structure of leads 2. Learn about the Drug Metabolism, types of Phase I and Phase II Reactions by taking suitable drug examples 3. Learn structure including stereochemistry, chemical name, SAR, metabolism, mechanism of action and selected synthesis of Drugs acting on Autonomic Nervous System, Cholinergic neurotransmitters, Drugs acting on Central Nervous System.				
Course Outcomes: After completion of the course learner will be able to					PO Mapped
CO1	Identify and study the suitable drug targets for treatment of disorders				1,3
CO2	Identify the relationship between the physicochemical properties of the chemical entity and biological response				1,3,6
CO3	Draw a schematic metabolic pathway for any given drug				1,3,6
CO4	Identify the SAR of all the classes of Drugs acting on Autonomic Nervous System, Cholinergic neurotransmitters, Drugs acting on Central Nervous System.				1,3,6
Topics covered:					
Unit I:	Introduction to Medicinal Chemistry				Hours:10
<ul style="list-style-type: none"> ▪ 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 ▪ Drug metabolism ▪ Drug metabolism principles- Phase I and Phase II. ▪ Factors affecting drug metabolism including stereo chemical aspects 					
Unit II:	Drugs acting on Autonomic Nervous System				Hours: 10
<ul style="list-style-type: none"> ▪ Adrenergic Neurotransmitters: ▪ Biosynthesis and catabolism of catecholamine. ▪ Adrenergic receptors (Alpha & Beta) and their distribution. ▪ Sympathomimetic agents: SAR of Sympathomimetic agents ▪ Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine ▪ Methyl dopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline ▪ Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine. ▪ Agents with mixed mechanism: Ephedrine, Metaraminol. ▪ Adrenergic Antagonists: ▪ Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide. ▪ Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol. 					
Unit III:	Cholinergic neurotransmitters				Hours: 10

<ul style="list-style-type: none"> ▪ Biosynthesis and catabolism of acetylcholine. ▪ Cholinergic receptors (Muscarinic & Nicotinic) and their distribution ▪ 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. 		
Unit IV:	Drugs acting on Central Nervous System	Hours: 08
<ul style="list-style-type: none"> ▪ Sedatives and Hypnotics: ▪ Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem ▪ Barbiturates: SAR of barbiturates, Barbitol*, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital, Secobarbital ▪ Miscellaneous: ▪ Amides and imides: Glutethimide. ▪ Alcohol & their carbamate derivatives: Meprobamate, Ethchlorvynol. ▪ Aldehyde & their derivatives: Triclofos sodium, Paraldehyde. ▪ 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 buterophenones: Haloperidol, Droperidol, Risperidone. ▪ Beta amino ketones: Molindone hydrochloride. ▪ Benzamides: Sulpieride. ▪ Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action ▪ Barbiturates: Phenobarbitone, Methobarbital. ▪ Hydantoin: Phenytoin*, Mephentoin, Ethotoin ▪ Oxazolidinone diones: Trimethadione, Paramethadione ▪ Succinimides: Phensuximide, Methsuximide, Ethosuximide* ▪ Urea and monoacylureas: Phenacemide, Carbamazepine* ▪ Benzodiazepines: Clonazepam ▪ Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate 		
Unit V:	Drugs acting on Central Nervous System	Hours:07
<ul style="list-style-type: none"> ▪ General anesthetics: ▪ Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane. ▪ Ultra short acting barbiturates: Methohexital sodium*, Thiethylal sodium, Thiopental sodium. ▪ Dissociative anesthetics: Ketamine hydrochloride.* ▪ Narcotic and non-narcotic analgesics ▪ Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anileridine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate. 		

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

<ul style="list-style-type: none"> ▪ Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride ▪ Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepirac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone 	
Reference material:	<p>Books</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.

Course: Physical Pharmaceutics II (Revised 2019)					
Course Code: BP403T	Second Year B. Pharm			Semester: IV	
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic understanding of the various physical phenomena involved in designing of various formulations.				
Course Objectives:	On completion of the theory lectures, the learner should be familiar with the basic concepts of coarse & colloidal dispersions, rheology, micromeritics and drug stability, which in turn, will help the learner in design, development and evaluation of dosage forms.				
Course Outcomes: After completion of the course learner will be able to					PO Mapped
CO1	Understand the concept of coarse and colloidal dispersions, rheology, powder technology and drug stability				1,6,9,10,11
CO2	Identify the different types of dispersion, rheological properties of the different dosage form				1,6,9,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

CO3	Identify different order of reactions and pathways of drug degradation	1,6,9,10,11
CO4	Apply basic principles of drug characterization to achieve stable and reproducible drug delivery	1,4,6,9,10,11
Topics covered:		
1	UNIT I	7 hours
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.		
2	UNIT II	10 hours
<p>2.1 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>2.2 Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus</p>		
3	UNIT III - Coarse dispersion	10 hours
<p>3.1 Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of suspensions.</p> <p>3.2 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>		
4	UNIT IV	8 hours
Micromeritics: 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.		
5	UNIT V	10 hours
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		

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Physical Pharmacy by Alfred Martin, Sixth edition 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.
----------------------------	--

Course: Pharmacology I (Revised 2019)					
Course Code: BP404T	Second Year B. Pharm				Semester: IV
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	<p>Students must be aware about the following:</p> <ol style="list-style-type: none"> 1) Anatomy and physiology of the different systems in the body 2) Pathophysiology of diseases associated with the different systems of the body 				
Course Objectives:	<p>This Course aims to:</p> <ol style="list-style-type: none"> 1) Teach the pharmacological actions of different categories of drugs 2) Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels. 3) Teach to apply the basic pharmacological knowledge in the prevention and treatment of various diseases. 4) Discuss the correlation of pharmacology with other bio medical sciences 				
Course Outcomes:					PO Mapped
After completion of this course the learner will be able to					
CO1	Understand and explain the basic pharmacological principles related to drugs like concepts of agonists, antagonists and receptor pharmacology				1, 6, 8, 9,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

CO2	Understand and explain the basic principles of Pharmacokinetics, Pharmacodynamics and adverse reaction of drugs	1,6, 8, 9,10,11
CO3	Understand and explain the pharmacology and drugs used for peripheral nervous system	1,6, 8, 9,10,11
CO4	Understand and explain the Pharmacology and drugs used for central nervous system	1,6, 8, 9,10,11
CO5	Analyze and apply the knowledge of basic principles of pharmacology in predicting adverse drug reactions, drug interactions and drug development process	1,2,3,5,6,7,8,9,10,11
Topics covered:		
Unit I:	UNIT I - General Pharmacology	08 Hours
1.1 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 1.2 Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination		
Unit II:	UNIT II - General Pharmacology	12 Hours
2.1 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, trans membrane enzyme linked receptors, trans membrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. 2.2 Adverse drug reactions. 2.3 Drug interactions (pharmacokinetic and pharmacodynamic), 2.4 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:	UNIT III –Pharmacology of peripheral nervous system	10 Hours
3.1 Organization and function of ANS, Neurohumoral transmission,co- transmission and classification of neurotransmitters 3.2 Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics 3.3 Neuromuscular blocking agents and skeletal muscle relaxants (peripheral). 3.4 Local anaesthetic agents, 3.5 Drugs used in myasthenia gravis and glaucoma		
Unit IV:	UNIT IV - Pharmacology of central nervous system	08 Hours
4.1 Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine. 4.2 General anesthetics and pre-anesthetics. Sedatives, hypnotics and centrally acting muscle relaxants 4.3 Anti-epileptics 4.4 Alcohols and disulfiram		
Unit V:	UNIT V - Pharmacology of central nervous system	07 Hours
5.1 Psychopharmacological agents: Antipsychotics, antidepressants, anti- anxiety agents, anti-manics and hallucinogens 5.2 Drugs used in Parkinsons disease and Alzheimer’s disease. 5.3 CNS stimulants and nootropics 5.4 Opioid analgesics and antagonists 5.5 Drug addiction, drug abuse, tolerance and dependence.		
Reference material:	Reference Books (Latest Editions to be adopted)	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	<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 Elsevier 2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill 3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 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 5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 6. 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 publisher 8. 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. Vallabh Prakashan
--	---

Course: Pharmacognosy and Phytochemistry I (Revised 2019)					
Course Code: BP405T	Second Year B. Pharm			Semester: IV	
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic knowledge of biology, plant cell and tissues				
Course Objectives:	<p>Objectives: Upon completion of the course, the student shall be able:</p> <ul style="list-style-type: none"> • To know the techniques in the cultivation and production of crude drugs • To know the crude drugs, their uses and chemical nature • To know the evaluation techniques for the herbal drugs • To carry out the microscopic and morphological evaluation of crude drugs 				
Course Outcomes: After completion of the course learner will be able to					PO Mapped
CO1	Outline the Alternative and complementary systems of medicine, classify drugs of natural origin				1,3,6,7,9,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

CO2	Describe primary and secondary plant metabolites their biosynthesis, evaluation and therapeutic application	1,3,6,7,9,10,11
CO3	Describe the applications of plant tissue culture techniques with respect to production of secondary metabolites and edible vaccines	1,3,6,7,9,10,11
CO4	Elaborate commercial production, collection, preparation, storage and factors affecting cultivation of medicinal plants and its conservation	1,3,6,7,9,10,11
	Evaluate and analyse crude drugs by morphological and microscopic and other evaluation techniques of Drugs of Natural Origin	1,3,6,7,9,10,11
	Describe the source, composition, preparation and applications of crude drugs containing carbohydrates, lipids, fibers, important protein and enzymes of natural origin and marine drugs	1,3,6,7,9,10,11
Topics covered:		
1	UNIT I	10 hours
<p>1.1 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 mucilages, oleoresins and oleo- gum -resins).</p> <p>1.2 Classification of drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs</p> <p>1.3 Quality control of Drugs of Natural Origin: Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.</p>		
2	UNIT II	10 hours
<p>2.1 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>2.2 Conservation of medicinal plants</p>		
3	UNIT III	7 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>		

4	UNIT IV	10 hours
<p>4.1 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>4.2 Introduction to secondary metabolites: Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins</p>		
5	UNIT V- Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs	08 hours
<p>(a) Plant Products: Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens</p> <p>(b) Primary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:</p> <p>(c) Carbohydrates: Acacia, Agar, Tragacanth, Honey</p> <p>(d) Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).</p> <p>(e) Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax</p> <p>Marine Drugs: Novel medicinal agents from marine sources</p>		
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009. 1. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988. 2. Text Book of Pharmacognosy by T.E. Wallis 3. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi. 4. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi. 5. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi. 6. Essentials of Pharmacognosy, Dr.SH.Ansari, 2nd edition, Birla publications, New Delhi, 2007 7. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae <p>Anatomy of Crude Drugs by M.A. Iyengar</p>	

Course: Medicinal Chemistry I (Revised 2019)		
Course Code: BP406P	Second Year B. Pharm	Semester:IV
Type of course: Practical	Contact Hours: 4 Hours/week	Total Contact Hours: 60

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course assessment Methods:		Continuous mode of assessment			Semester-end assessment
Assessment Tool*:		Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:		10	2	3	35
Pre-requisites:		Handling different sets of laboratory apparatus required for synthesis and analysis Basics of safety aspects while working in chemistry lab.			
Course Objectives:		<ul style="list-style-type: none"> • To Make the learners aware about different techniques used in synthesis of organic compounds. • To make the learners learn about isolation of synthesized compounds. • To demonstrate how quantitatively evaluate purity of compounds. • To understand significance of partition coefficient for organic molecules 			
COURSE OUTCOMES					PO Mapped
CO1	Demonstrate skills of handling synthetic procedures and quantitative evaluation techniques.				1,11
CO2	Understand and apply various isolation techniques, purification techniques in synthetic chemistry and different types of assay methods for quantitative evaluation.				1,3,11
CO3	Design or predict experimental requirements for determining partition coefficient of organic molecule and interpret results obtained.				1,3,11
CO4	Recognize the reaction from experimental conditions, deduce the mechanism and transform one functional group to other.				1,3,11
	Demonstrate oral & written communication skills & ability to plan the experimentation with proper time management				1,8
TOPICS					
Unit I:	Preparation of drugs/ intermediates				
1,3-pyrazole					
1,3-oxazole					
Benzimidazole					
Benzotriazole					
2,3- diphenyl quinoxaline					
Benzocaine					
Phenytoin					

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Phenothiazine	
Barbiturate	
Unit II:	Assay of drugs
Chlorpromazine	
Phenobarbitone	
Atropine	
Ibuprofen	
Aspirin	
Furosemide	
Unit III:	Determination of Partition coefficient for any two drugs
Reference material:	<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.

Course: Physical Pharmaceutics- II (Revised 2019)				
Course Code: BP407P	Second Year B. Pharm			Semester: IV
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	<ul style="list-style-type: none"> • Basic knowledge of physics • Basic knowledge about the drug and powder and liquid dosage forms 			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course Objectives:	To train the learner in performing the quality control tests of typical monophasic liquid and powder formulations. To familiarize the learner with methods to evaluate shelf life and physical stability of products and teach the learner characterization methods and protocols for determination of physical parameters.	
COURSE OUTCOMES		PO Mapped
CO1	Demonstrate the properties of the powder and liquid dosage forms and comment on the quality.	1,2,3,4,5,6,8,10,11
CO2	Determine reaction rate constant, order of a reaction for different reactions	1,2,3,4,5,6,8,10,11
CO3	Predict shelf life by carrying out accelerated stability studies	1,2,3,4,5,6,8,10,11
CO4	Demonstrate testing of various physical parameters involved in pre-formulation and formulation evaluation.	1,2,3,4,5,6,8,10,11
CO5	Plan, execute the experiment using various methodologies (defined protocol or qualitative or quantitative techniques) and summarize the findings in systematic way verbally and in written communication.	1,2,3,4,5,6,8,10,11
TOPICS		
	<ol style="list-style-type: none"> 1. Determination of particle size, particle size distribution using sieving method 2. Determination of particle size, particle size distribution using Microscopic method 3. Determination of bulk density, true density and porosity 4. Determine the angle of repose and influence of lubricant on angle of repose 5. Determination of viscosity of liquid using Ostwald's viscometer 6. Determination sedimentation volume with effect of different suspending agent 7. Determination sedimentation volume with effect of different concentration of single suspending agent 8. Determination of viscosity of semisolid by using Brookfield viscometer 9. Determination of reaction rate constant first order. 10. Determination of reaction rate constant second order 11. Accelerated stability studies 	
Reference material:	<ol style="list-style-type: none"> 1) Physical Pharmacy by Alfred Martin, Sixth edition 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. 	

Course: Pharmacology I (Revised 2019)				
Course Code: BP408P	Second Year BPharm			Semester: IV
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Students must be aware about the following: <ol style="list-style-type: none"> 1) General Pharmacology including principles of agonist, antagonists and receptor pharmacology 2) Basic concepts related to drugs acting on central and peripheral nervous system 			
Course Objectives:	This Course aims to: <ol style="list-style-type: none"> 1) Teach different instruments and animals used in experimental Pharmacology 2) Teach common laboratory techniques in experimental Pharmacology 3) Introduce the guidelines for animal storage for experimental purpose and the effects of the drugs of different therapeutic classes in animals. 			
COURSE OUTCOMES: On completion of the course the learner will be able to				PO Mapped
CO1	Understand, explain, evaluate and apply basic techniques related to the instruments and animal handling for experimental purpose including routes of the administration.			1,2,3,4,6,7,9,10,11
CO2	Explain the guidelines recommended for ethical handling of animals and perform the animal experiments in ethical manner			1,2,3,4,6,7,9,10,11
CO3	Learn, analyze and perform common laboratory techniques and observe the effect of hepatic microsomal enzymes on drug induced sleeping time in mice			1,2,3,4,6,7,9,10,11
CO4	Perform, explain and apply the principle for experiments that study the effect of drugs acting on the central nervous system			1,2,3,4,6,7,9,10,11
CO5	Plan, execute and conclude the experiment using various methodologies			1,3,4,6,7,8,9,10,11
TOPICS				
Unit I:	General Concepts of Experimental Pharmacology and animal handling			
<ul style="list-style-type: none"> • Introduction to experimental pharmacology. • Commonly used instruments in experimental pharmacology. • Study of common laboratory animals. • Maintenance of laboratory animals as per CPCSEA guidelines. • Study of different routes of drugs administration in mice/rats. 				

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Unit II:	Study of the efficacy of drugs acting on central nervous system
	<ul style="list-style-type: none"> • Effects of skeletal muscle relaxants using rota-rod apparatus. • Effect of drugs on locomotor activity using actophotometer. • Anticonvulsant effect of drugs by MES and PTZ method. • Study of stereotype and anti-catatonic activity of drugs on rats/mice. • Study of anxiolytic activity of drugs using rats/mice.
Unit III:	Study of the efficacy of drugs acting on gastrointestinal tract and locally acting drugs
	<ul style="list-style-type: none"> • Effect of drugs on ciliary motility of frog oesophagus • Effect of drugs on rabbit eye. • Study of local anesthetics by different methods
Reference material:	<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 2) Pharmacology, Churchill Livingstone Elsevier 3) Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill 4) Goodman and Gilman's, The Pharmacological Basis of Therapeutics 5) 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 6) Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 7) K. D. Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi. 8) Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher 9) Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert, 10) Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata. 11) Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

Course: Pharmacognosy and Phytochemistry I (Revised 2019)				
Course Code: BP409P	Second Year B. Pharm			Semester: IV
Type of course: Practical	Contact Hours: 4 Hours/Week			Total Contact Hours: 60 Hours
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Basic knowledge of biology, plant parts, cell and tissues			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course Objectives:	This course highlights the morphological, microscopic and physicochemical evaluation of natural drugs used in Allopathic as well as complementary systems of medicine	
Course Outcomes: Upon completion of the current course the learner would be able to:		PO Mapped
CO1	Carry out quantitative microscopy for leaf constants	1,3,6,7,9,10,11
CO2	Determine different extractive values, ash values, moisture content, swelling index and foaming index as per Official Compendia	1,3,6,7,9,10,11
CO3	Determine the histological features of plants of diagnostic significance such as calcium oxalate crystals, starch grains, length and width of fibres	1,3,6,7,9,10,11
CO4	Demonstrate oral and written communication skills and ability to plan the experimentation with proper time management	1,3,7,8
CO5	Identify crude drugs containing carbohydrates, lipids and protein by chemical tests	1,3,6,7,9,10,11
EXPERIMENTS:		
Unit I:	Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil	
Unit II:	Determination of stomatal number and index	
Unit III:	Determination of vein islet number, vein islet termination and palisade ratio.	
Unit IV:	Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer	
Unit V:	Determination of Fiber length and width	
Unit VI:	Determination of number of starch grains by Lycopodium spore method	
Unit VII:	Determination of Ash value	
Unit VIII:	Determination of Extractive values of crude drugs	
Unit IX:	Determination of moisture content of crude drugs	
Unit X:	Determination of swelling index and foaming index	
Reference material:	Books 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.	

- | | |
|--|--|
| | <ol style="list-style-type: none">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), Ist 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, Gokhlae9. Anatomy of Crude Drugs by M.A. Iyengar |
|--|--|

SEM V

Course: Medicinal Chemistry II (Revised 2019)					
Course Code: BP501T	Third Year B. Pharm				Semester: V
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Knowledge of biochemistry, Anatomy and physiology				
Course Objectives:	1. To explain the chemistry of drugs with respect to their pharmacological activity 2. To describe the drug metabolic pathways, adverse effect and therapeutic value of drugs 3. To elaborate the Structural Activity Relationship of different class of drugs 4. to illustrate the chemical synthesis of selected drugs				
Course Outcomes: Upon completion of the course learner will be able to					PO Mapped
CO1	1. Understand the chemistry of drugs with respect to their pharmacological activity				1,6
CO2	2. Explain the drug metabolic pathways, adverse effect and therapeutic value of drugs				1,2,6
CO3	3. Distinguish Structural Activity Relationship of different class of drugs				1,6
CO4	4. Illustrate the chemical synthesis of selected drugs				1,6
Topics covered:					
Unit I:					Hours: 10
1.1 Antihistaminic agents: Histamine, receptors and their distribution in the human body H₁-antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines succinate, Clemastine fumarate, Diphenylpyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium H₂-antagonists: Cimetidine*, Famotidine, Ranitidin.					

<p>1.2 Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole</p> <p>1.3 Anti-neoplastic agents: Alkylating agents: Meclorothamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepe Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate Miscellaneous: Cisplatin, Mitotane.</p>	
Unit II:	Hours: 10
<p>2.1 Anti-anginal: Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbidedinitrite*, Dipyridamole. Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. Diuretics: Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid. Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol</p> <p>2.2 Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.</p>	
Unit III:	Hours: 10
<p>3.1 Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcaïnide hydrochloride, Amiodarone, Sotalol.</p> <p>3.2 Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol</p> <p>3.3 Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel</p> <p>3.4 Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan</p>	
Unit IV:	Hours: 8
<p>4.1 Drugs acting on Endocrine system Nomenclature, Stereochemistry and metabolism of steroids</p> <p>4.2 Sex hormones: Testosterone, Nandralone, Progesterones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.</p> <p>4.3 Drugs for erectile dysfunction: Sildenafil, Tadalafil 1</p> <p>4.4 Oral contraceptives: Mifepristone, Norgestrel, Levonorgestrol 1</p> <p>4.5 Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone</p> <p>4.6 Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.</p>	
Unit V:	Hours: 7
<p>5.1 Antidiabetic agents: Insulin and its preparations</p>	

<p>Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acarbose, Voglibose.</p> <p>5.2 Local Anesthetics: SAR of Local anesthetics Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine. Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate. Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine. Miscellaneous: Phenacaine, Diperon, Dibucaine.*</p>	
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Wilson and Griswold'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 to 5. 9. Indian Pharmacopoeia. 10. Text book of practical organic chemistry- A.I. Vogel.

Course: Industrial Pharmacy I (Revised 2019)					
Course Code: BP502T	Third Year B. Pharm				Semester: V
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Have basic understanding of pharmaceutics I, physical pharmaceutics, pharmaceutical calculations and unit processes covered under pharmaceutical engineering.				
Course Objectives:	The course aims to impart a higher level of technical knowledge for formulation development, manufacturing and quality control of sterile products, liquid dosage forms, solid dosage forms, aerosols, cosmetic products and packaging material science so as to train the students to be industry ready.				
Course Outcomes					PO Mapped
After completion of the current course the learner would be able to:					

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

CO1	To understand dosage forms and their manufacturing techniques	1,3,4,6,7,11
CO2	To understand all the related and practical aspect of solid, liquid and semisolid dosage form development and evaluation	1,2,3,4,7,8,10,11
CO3	To correlate the theoretical knowledge with professional and practical need of pharmaceutical industry.	1,2,3,4,5,6,7,8,9,10,11
Topics covered:		
Unit I:	Preformulation Studies	Hours: 7
<p>1.1 Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances</p> <p>1.2 Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism</p> <p>1.3 Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization, BCS classification of drugs</p> <p>1.4 Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.</p>		
Unit II:	Tablets and liquid orals	Hours: 10
<p>2.1 Tablets</p> <p>a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.</p> <p>b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.</p> <p>c. Quality control tests: In process and finished product tests</p> <p>2.2 Liquid orals: Formulation and manufacturing consideration of solutions, suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia</p>		
Unit III:	Capsules and pellets	Hours: 8
<p>3.1 Hard gelatin capsules: Introduction, Extraction of gelatin and production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules. In process and final product quality control tests for capsules.</p> <p>3.2 Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minimum/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules.</p> <p>3.3 Pellets: Introduction, formulation requirements, pelletization process, equipment for manufacture of pellets.</p>		
Unit IV:	Sterile dosage forms	Hours: 10

<p>4.1 Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity.</p> <p>4.2 Production procedure, production facilities and controls</p> <p>4.3 Formulation of injections, sterile powders, emulsions, suspensions, large volume parenteral and lyophilized products, Sterilization.</p> <p>4.4 Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests</p> <p>4.5 Ophthalmic Preparations: Introduction, formulation considerations; formulation of eyedrops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations</p>		
Unit V:	Cosmetics, Pharmaceutical aerosols, Packaging material science	Hours: 10
<p>5.1 Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.</p> <p>5.2 Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosolsystems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.</p> <p>5.3 Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.</p>		
Reference Maerial:	<p>Latest edition to be adopted</p> <ol style="list-style-type: none"> 1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B. Schwartz. 2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman. 3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman. 4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition 5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS). 6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman 7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone. 8. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea & Febiger, Philadelphia, 5th edition, 2005 9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107. 	

Course: Pharmacology II (Revised 2019)		
Course Code: BP503T	Third Year B. Pharm	Semester: V
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)	Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment	Semester-end assessment

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Students must be aware about the following: <ul style="list-style-type: none"> • Anatomy and physiology of the different systems in the body. • Pathophysiology of diseases associated with the different systems of the body • Information on endogenous receptors in the human body • Concept of Inflammation 				
Course Objectives:	This Course aims to: <ul style="list-style-type: none"> • Educate on different drugs acting on cardiovascular system, urinary system and endocrine system. • Provide understanding about autacoids and drugs affecting autacoids' actions and educate on pharmacology of anti-inflammatory drugs. • Impart knowledge on pharmacology of drugs used in inflammatory disorders like rheumatic and gout • Provide understanding about bioassay, their types and application with examples. 				
Course Outcomes After completion of this course the learner will be able to					PO Mapped
CO1	Classify the drugs used for cardiovascular system, urinary system and endocrine system and explain their Pharmacology.				1,8,9,10,11
CO2	Classify and explain autacoids and related drugs and their role in inflammatory disorders like rheumatic and gout.				1,8,9,10,11
CO3	Explain the concept of bioassay, their types, methods and application with different examples of drugs.				1,8,9,10,11
Topics covered:					
Unit I:	Pharmacology of drugs acting on cardio vascular system				Hours 10
<ul style="list-style-type: none"> • Introduction to hemodynamic and electrophysiology of heart. • Drugs used in congestive heart failure • Anti-hypertensive drugs. • Anti-anginal drugs. • Anti-arrhythmic drugs. • Anti-hyperlipidemic drugs. 					
Unit II:	Pharmacology of drugs acting on cardio vascular system and urinary system				Hours 10
2.1 Pharmacology of drugs acting on cardio vascular system <ul style="list-style-type: none"> • Drug used in the therapy of shock, • Hematinics, coagulants and anticoagulants, • Fibrinolytics and anti-platelet drugs, • Plasma volume expanders 2.2 Pharmacology of drugs acting on urinary system <ul style="list-style-type: none"> • Diuretics • Anti-diuretics 					
Unit III:	Autocoids and related drugs				Hours 10

<ul style="list-style-type: none"> • Introduction to autacoids and classification • Histamine, 5-HT and their antagonists. • Prostaglandins, Thromboxanes and Leukotrienes. • Angiotensin, Bradykinin and Substance P. • Non-steroidal anti-inflammatory agents • Anti-gout drugs • Antirheumatic drugs 		
Unit IV:	Pharmacology of drugs acting on endocrine system	Hours 08
<ul style="list-style-type: none"> • Basic concepts in endocrine pharmacology. • Anterior Pituitary hormones- analogues and their inhibitors. • Thyroid hormones- analogues and their inhibitors. • Hormones regulating plasma calcium level-Parathormone, calcitonin and Vitamin-D. • Insulin, Oral Hypoglycemic agents and glucagon. • ACTH and corticosteroids. 		
Unit V:	Pharmacology of drugs acting on endocrine system & Bioassay	Hours 07
<p>5.1 Pharmacology of drugs acting on endocrine system</p> <ul style="list-style-type: none"> • Androgens and Anabolic steroids. • Estrogens, progesterone and oral contraceptives. • Drugs acting on the uterus. <p>5.2 Bioassays</p> <ul style="list-style-type: none"> • Principles and applications of bioassay. • Types of bioassay • Bioassay of insulin, oxytocin, vasopressin, ACTH, d- tubocurarine, digitalis, histamine and 5-HT 		
Reference material:	<p>Reference Books (Latest Editions to be adopted)</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 Elsevier 2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill. 3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 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. 5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology. 6. 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 publisher 8. 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. Vallabh Prakashan 	

Course: Pharmacognosy and Phytochemistry II (Revised 2019)		
Course Code: BP504T	Third Year B. Pharm	Semester: V

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Type of course: Theory	Contact Hours: 3 Hours/week (3 Lectures + 1 Tutorial)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic knowledge of medicinal botany and plant metabolites				
Course Objectives:	Objectives: Upon completion of the course, the student shall be able: <ol style="list-style-type: none"> 1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents 2. To understand the preparation and development of herbal formulation. 3. To understand the herbal drug interactions 4. To carryout isolation and identification of phytoconstituents 				
Course Outcomes: After completion of the current course the learner would be able to:					PO Mapped
CO1	Describe the modern extraction process by using different methods and principles, in the isolation, purification, identification and analysis of various phyto-constituents				1,3,6,7,9,10,11
CO2	To develop the skills of general methods of extraction, evaluation, chemical tests of crude drugs containing various secondary metabolites.				1,3,6,7,9,10,11
CO3	Describe basic metabolic pathways and biosynthesis of various secondary metabolites through these pathways				1,3,6,7,9,10,11
CO4	To understand utilization of radioactive isotopes in the investigation of biogenetic studies.				1,3,6,7,9,10,11
CO5	To understand the industrial production, estimation and utilization of different classes of phytoconstituents				1,3,6,7,9,10,11
Topics covered:					
Unit I:	Metabolic pathways in higher plants and their determination				Hours 07
1.1 Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. 1.2 Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.					
Unit II:	General introduction, composition, chemistry & chemical classes, general methods of extraction & analysis, biosources, therapeutic uses and commercial applications of following secondary metabolites:				Hours 14

<p>2.1 Alkaloids: Vinca, Rauwolfia, Belladonna, Opium, 2.2 Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta 2.3 Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis 2.4 Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander, 2.5 Tannins: Catechu, Pterocarpus 2.6 Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony 2.7 Glycosides: Senna, Aloes, Bitter Almond 2.8 Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids</p>		
Unit III:		Hours 06
<p>Isolation, identification and analysis of phytoconstituents</p> <ul style="list-style-type: none"> • Terpenoids: Menthol, Citral, Artemisin • Glycosides: Glycyrrhetic Acid and Rutin • Alkaloids: Atropine, Quinine, reserpine, Caffeine • Resins: Phodophyllatoxin, curcumin 		
Unit IV:		Hours 06
<p>Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine</p>		
Unit V:		Hours 10
<p>Basics of Phytochemistry: Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs</p>		
Reference material:	<p>Reference Books (Latest Editions to be adopted)</p> <ol style="list-style-type: none"> 1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009. 2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi. 3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi. 4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi. 5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007 6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi. 7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005. 8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994. 9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor. 10. The formulation and preparation of cosmetic, fragrances and flavours. 11. Remington's Pharmaceutical sciences. 12. Text Book of Biotechnology by Vyas and Dixit. 13. Text Book of Biotechnology by R.C. Dubey. 	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course: Pharmaceutical Jurisprudence (Revised 2019)					
Course Code: BP505T	Third Year B. Pharm				Semester: V
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Have basic understanding of pharmaceutical formulations, manufacturing and pharmacy education				
Course Objectives:	1. Learner will have an understanding of the laws regulating the manufacturing and sale of Pharmaceuticals. 2. Learner will have an understanding about the rules and regulations governing the Pharmacy education in India.				
Course Outcomes					PO Mapped
Upon completion of the current course the learner would be able to:					
CO1	The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals				1,2,3,4,5,6,7,8,9,10,11
CO2	Various Indian pharmaceutical Acts and Laws.				1,2,3,4,5,6,7,8,9,10,11
CO3	The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.				1,2,3,4,5,6,7,8,9,10,11
CO4	The code of ethics during the pharmaceutical practice				1,2,5,6,7,8,9,10,11
Topics covered:					
Unit I:	Drugs and Cosmetics Act, 1940 and its rules 1945				Hours: 10
1.1 Objectives, Definitions, Legal definitions of schedules to the act and rules 1.2 Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties. 1.3 Manufacture of drugs – Prohibition of manufacture and sale of certain drugs 1.4 Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license					
Unit II:	Drugs and Cosmetics Act, 1940 and its rules 1945.				Hours: 10

<p>2.1 Detailed study of Schedule G, H, M, N, P, T,U, V, X, Y, Part XII B, Sch F & DMR (OA) 2.2 Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties 2.3 Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties. 2.4 Administration of the act and rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors</p>		
Unit III:	Pharmacy Act –1948, Medicinal and Toilet Preparation Act – 1955, Narcotic Drugs and Psychotropic substances Act-1985 and Rules	Hours: 10
<p>3.1 Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties 3.2 Medicinal and Toilet Preparation Act –1955: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties 3.3 Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties</p>		
Unit IV:		Hours: 8
<p>4.1 Study of Salient Features of Drugs and magic remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties 4.2 Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties 4.3 National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)</p>		
Unit V:		Hours: 07
<p>5.1 Pharmaceutical Legislations – A brief review, Introduction, Study of drugs Enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee 5.2 Code of Pharmaceutical ethics Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath 5.3 Medical Termination of pregnancy act 5.4 Right to information Act 5.5 Introduction to Intellectual Property Rights (IPR)</p>		
Reference Books	Reference Books (Latest Editions to be adopted)	
	<p>1. Forensic Pharmacy by B. Suresh 2. Text book of Forensic Pharmacy by B.M. Mithal 3. Hand book of drug law-by M.L. Mehra 4. A text book of Forensic Pharmacy by N.K. Jain 5. Drugs and Cosmetics Act/Rules by Govt. of India publications.</p>	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	6. Medicinal and Toilet preparations act 1955 by Govt. of India publications. 7. Narcotic drugs and psychotropic substances act by Govt. of India publications 8. Drugs and Magic Remedies act by Govt. of India publication 9. Bare Acts of the said laws published by Government. Reference books (Theory)
--	---

Course: Industrial Pharmacy I (Revised 2019)				
Course Code: BP506P	Third Year B. Pharm			Semester: V
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Have basic understanding of pharmaceutical calculations, formulation aspects, unit processes covered under the subjects of physical pharmaceutics, pharmaceutics, industrial pharmacy theory and pharmaceutical engineering.			
Course Objectives:	The course aims to impart a higher level of technical skills for formulation and quality control of tablets, capsules, injectables and creams so as to train the students to be industry ready.			
COURSE OUTCOMES				PO Mapped
Upon completion of the current course the learner would be able to:				
CO1	To understand all the theoretical and practical aspect of dosage form development.			1,3,4,6,7,11
CO2	To formulate and evaluate solid, liquid and semisolid dosage forms.			1,2,3,4,7,8,10,11
CO3	To correlate the theoretical knowledge with professional and practical need of pharmaceutical industry.			1,2,3,4,5,6,7,8,9,10,11
CO4	Plan, execute the experiment using various methodologies (defined protocol or qualitative or quantitative techniques) and summarize the findings in systematic way verbally and in written communication.			2,3,4,5,6,8,11
TOPICS				
1.	Preformulation studies on paracetamol/aspirin/or any other drug			
2.	Preparation and evaluation of Paracetamol tablets			
3.	Preparation and evaluation of Aspirin tablets			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

4.	Coating of tablets- film coating of tables/granules
5.	Preparation and evaluation of Tetracycline capsules
6.	Preparation of Calcium Gluconate injection
7.	Preparation of Ascorbic Acid injection
8.	Quality control test of (as per IP) marketed tablets and capsules
9.	Preparation of Eye drops/ and Eye ointments
10.	Preparation of Creams (cold / vanishing cream)
11.	Evaluation of Glass containers (as per IP)
Reference material:	<p>Recommended Books: (Latest Editions)</p> <ol style="list-style-type: none"> 1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B. Schwartz 2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman 3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman 4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition 5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS) 6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman 7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition 8. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea & Febiger, Philadelphia, 5th edition, 2005 9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

Course: Course: Pharmacology II (Revised 2019)		
Course Code: BP507P	Third Year B Pharm	Semester: V
Type of course: Practical	Contact Hours: 4 Hours/week	Total Contact Hours: 60

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Students must be aware about the following: <ul style="list-style-type: none"> • Pharmacology of various drugs and physiological receptors in body. • Basic knowledge about experimental animal pharmacology. • Basic knowledge about drug receptor pharmacology. 			
Course Objectives:	This Course aims to : <ul style="list-style-type: none"> • Demonstration of various bioassay on different isolated tissue preparations and behavioral experiments using interactive CDs. • Introduce about in vitro animal experiments and various physiological solutions. • With interactive CDs demonstrating effect of different drugs, their interpretation on various isolated animal tissue preparation. 			
COURSE OUTCOMES: On completion of the course the learner will be able to				PO Mapped
CO1	Demonstrate the understanding of guidelines for animal experimentations, various routes of drug administration, and methods for blood collection from experimental animals.			1,3,4,6,7,9,10,11
CO2	Describe the composition of physiological salt solutions and basic instruments used in experimental pharmacology.			1,3,4,6,7,9,10,11
CO3	Perform experiments using various isolated preparation and describe the effect of different drugs on the concentration response curves, interpret the action of various drugs using preclinical models/computer simulations.			1,3,4,6,7,9,10,11
CO4	Plan, execute and conclude the experiment using various methodologies.			1,3,4,6,7,8,9,10,11
TOPICS				
1	Introduction to in-vitro pharmacology and physiological salt solutions.			
2	Effect of drugs on isolated frog heart.			
3	Effect of drugs on blood pressure and heart rate of dog.			
4	Study of diuretic activity of drugs using rats/mice.			
5	DRC of acetylcholine using frog rectus abdominis muscle.			
6	Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.			
7	Bioassay of histamine using guinea pig ileum by matching method.			
8	Bioassay of oxytocin using rat uterine horn by interpolation method.			
9	Bioassay of serotonin using rat fundus strip by three point bioassay.			
10	Bioassay of acetylcholine using rat ileum/colon by four point bioassay.			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

11	Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12	Determination of PD2 value using guinea pig ileum.
13	Effect of spasmogens and spasmolytics using rabbit jejunum.
14	Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15	Analgesic activity of drug using central and peripheral methods.
Reference material:	<p style="text-align: center;">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 Elsevier 2) Churchil Livingstone Elsevier 3) Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill. 4) Goodman and Gilman's, The Pharmacological Basis of Therapeutics 5) 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. 6) Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology. 7) K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi. 8) Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher 9) Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert. 10) Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata. 11) Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

Course: Pharmacognosy and Phytochemistry II (Revised 2019)				
Course Code: BP508P	Third Year B. Pharm			Semester: V
Type of course: Practical	Contact Hours: 4 Hours/Week 60			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	<ul style="list-style-type: none"> ▪ Basic knowledge of plant cell and Tissue ▪ Basic knowledge of extraction of secondary metabolites and various methods of extraction 			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course Objectives:	<ol style="list-style-type: none"> 1) To study crude drugs representative to major parts of plants for their morphological features and microscopic characters including histology, powder characteristics. 2) To apply the knowledge of microscopic characters of the crude drugs in ascertaining genuinely of powdered formulations. 3) To learn the principle in carrying out distillation of volatile oils and detection of active constituents by chromatography. 4) To comprehend principle in extraction, isolation and detection of phytoconstituents. 	
Course Outcomes: Upon completion of the current course the learner would be able to:		PO Mapped
CO1	Identify crude drugs based on morphological characters, microscopic characters and give biological source with the chemical constituents and therapeutic uses	1,3,6,7,9,10,11
CO2	Apply the knowledge of microscopic characters in ascertaining the genuinely of powdered formulations.	1,3,6,7,9,10,11
CO3	Understand the principle involved for carrying out extraction, isolation and detection of active constituents by chromatography	1,3,6,7,9,10,11
CO4	Demonstrate oral and written communication skills and ability to plan the experimentation with proper time management	1,3,7,8
CO5	Identify unorganized drugs by qualitative chemical tests	1,3,6,7,9,10,11
CO6	Understand principle involved in distillation of volatile oils and detection of phytoconstituents by chromatography.	1,3,6,7,9,10,11
TOPICS		
Unit I:	Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander	
Unit II:	Exercise involving isolation & detection of active principles a. Caffeine - from tea dust. b. Diosgenin from Dioscorea c. Atropine from Belladonna d. Sennosides from Senna	
Unit III:	Separation of sugars by Paper chromatography	
Unit IV:	TLC of herbal extract	
Unit V:	Distillation of volatile oils and detection of phytoconstituents by TLC	
Unit VI:	Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh	

Reference material:	Recommended Books: (Latest Editions) <ol style="list-style-type: none">1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 20076. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.10. The formulation and preparation of cosmetic, fragrances and flavours.11. Remington's Pharmaceutical sciences.12. Text Book of Biotechnology by Vyas and Dixit.13. Text Book of Biotechnology by R.C. Dubey.

SEM VI

Course: Medicinal Chemistry III (Revised 2019)					
Course Code: BP601T	Third Year B. Pharm				Semester: VI
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Students should know pharmacology of drugs listed to help them understand chemistry aspects.				
Course Objectives:	To impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. To emphasize on development of therapeutic class of medicinal drugs and correlation of various substituent/functional groups of drug to its biological activity. To make students understand modern techniques				
Course Outcomes: After completion of the course learner will be able to					PO Mapped
CO1	Understand structure, chemistry, therapeutic value, metabolism, and adverse reactions of medicinally important drugs.				1,11
CO2	Understand the importance of drug design and different modern techniques of drug design.				1,3,4,11
CO3	Express Development for particular class of the drug and interpret effect of substitution on therapeutic effect of drug.				1,3,8,11
Topics covered:					
Unit I:	Antibiotics				Hours: 10
Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. (a) β-Lactam antibiotics: Penicillin, Cephalosporins, β Lactamase inhibitors, Monobactams (b) Aminoglycosides: Streptomycin, Neomycin, Kanamycin (c) Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline					
Unit II:	Antibiotics				Hours: 10
Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. (a) Macrolide: Erythromycin Clarithromycin, Azithromycin. (b) Miscellaneous: Chloramphenicol*, Clindamycin. (c) Prodrugs: Basic concepts and application of prodrugs design.					

<p>(d) Antimalarials: Etiology of malaria. (e) Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine. (f) Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil. (g) Miscellaneous: Pyrimethamine, Artesunate, Artemether, Atovaquone.</p>	
Unit III:	Hours: 10
<p>3.1 Anti-tubercular Agents : Synthetic anti tubercular agents: Isoniazid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.* Anti-tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine, Streptomycin, Capreomycin sulphate. 3.2 Urinary tract anti-infective agents : (a) Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin (b) Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine. 3.3 Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.</p>	
Unit IV:	Hours: 08
<p>4.1 Antifungal agents: (a) Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin. (b) Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole, Tioconazole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.</p>	
<p>4.2 Anti-Protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.</p>	
<p>4.3 Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquinol, Ivermectin</p>	
<p>4.4 Sulphonamides and Sulfones: Historical development, chemistry, classification and SAR of Sulphonamides: Sulphamethizole, Sulfoxazole, Sulphamethazine, Sulfacetamide*, Sulphapyridine, Sulfamethoxazole*, Sulphadiazine, Mefenide acetate, Sulfasalazine. Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole Sulfones: Dapsone*.</p>	
Unit V:	Hours: 07
<p>5.1 Introduction to Drug Design Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammett's electronic parameter, Taft's steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques 5.2 Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.</p>	
Reference material:	<p>Reference Books (Latest Editions to be adopted)</p> <ol style="list-style-type: none"> 1. Wilson and Gisvold'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.

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	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.				
Course: Pharmacology III (Revised 2019)					
Course Code: BP602T	Third Year B. Pharm	Semester: VI			
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)	Total Contact Hours: 60			
Course assessment Methods:	Continuous mode of assessment	Semester-end assessment			
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	<ul style="list-style-type: none"> • Understanding of general principles of pharmacology • Basic knowledge of pathogenic microorganisms and common infections and cancer pathophysiology • Anatomy and physiology of respiratory and gastrointestinal system and their related diseases. • Basic knowledge of immune system and signaling involved in immune responses • Basic knowledge of circadian rhythm. 				
Course Objectives:	<ul style="list-style-type: none"> • To impart knowledge about the drugs used in treatment of Bacterial, fungal, viral and microbial infections, cancer, HIV, gastrointestinal and respiratory disorders. • To impart knowledge about immunology, chronopharmacology and toxicology 				
Course Outcomes					PO Mapped
CO1	Classify the drugs acting on respiratory and gastrointestinal system into correct therapeutic categories; correlate the pathophysiology of few common disorders of respiratory and gastrointestinal system to their pharmacotherapy; explain the principal pharmacological actions, including the mode of action, side effects and uses of related drugs				1, 3, 6, 8, 9, 10
CO2	Classify chemotherapeutic agents; explain the principal pharmacological actions, including the mode of action, side effects and uses of related drugs; and justify the need for rational use of antimicrobials.				1, 3, 6, 8, 9, 10
CO3	Explain the principles of immunology and chronopharmacology and discuss their pharmacotherapeutic applications.				1, 3, 6, 8, 9, 10
CO4	Comprehend the principles of toxicology and treatment of various poisonings.				1, 3, 6, 8, 9, 10
Topics covered:					
Unit I:	Drugs acting on Respiratory system and Gastrointestinal Tract				Hours: 10
1.1 Pharmacology of drugs acting on Respiratory system					

<ul style="list-style-type: none"> a. Anti -asthmatic drugs b. Drugs used in the management of COPD c. Expectorants and antitussives d. Nasal decongestants e. Respiratory stimulants 		
<p>1.2 Pharmacology of drugs acting on the Gastrointestinal Tract</p> <ul style="list-style-type: none"> a. Antiulcer agents. b. Drugs for constipation and diarrhoea. c. Appetite stimulants and suppressants. d. Digestants and carminatives. e. Emetics and anti-emetics. 		
Unit II:	Chemotherapy Part I	Hours: 10
<ul style="list-style-type: none"> a. General principles of chemotherapy. b. Sulfonamides and cotrimoxazole. c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides 		
Unit III:	Chemotherapy Part II	Hours: 10
<ul style="list-style-type: none"> a. Antitubercular agents b. Antileprotic agents c. Antifungal agents d. Antiviral drugs e. Anthelmintics f. Antimalarial drugs g. Antiamoebic agents 		
Unit IV:	Chemotherapy Part III and Immunopharmacology	Hours: 08
<p>4.1 Chemotherapy</p> <ul style="list-style-type: none"> a. Urinary tract infections and sexually transmitted diseases. b. Chemotherapy of malignancy <p>4.2 Immunopharmacology</p> <ul style="list-style-type: none"> a. Immunostimulants b. Immunosuppressant c. Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars 		
Unit V:	Toxicology and Chronopharmacology	Hours: 07
<p>5.1 Principles of toxicology</p> <ul style="list-style-type: none"> a. Definition and basic knowledge of acute, subacute and chronic toxicity. b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity c. General principles of treatment of poisoning d. Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning <p>5.2 Chronopharmacology</p> <ul style="list-style-type: none"> a. Definition of rhythm and cycles. b. Biological clock and their significance leading to chronotherapy 		
Reference material:	<p>Reference Books (Latest Editions to be adopted)</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 Elsevier 	

	<ol style="list-style-type: none"> 2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill 3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics 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 5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 6. 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 publisher Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert, 8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata 9. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan, 10. N. Udupa and P.D. Gupta, Concepts in Chronopharmacology.
--	--

Course: Herbal Drug Technology (Revised 2019)					
Course Code: BP603T	Third Year B. Pharm				Semester : VI
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic principles of Pharmacognosy				
Course Objectives:	Objectives: Upon completion of this course the student should be able to: <ol style="list-style-type: none"> 1. understand raw material as source of herbal drugs from cultivation to herbal drug product 2. know the WHO and ICH guidelines for evaluation of herbal drugs 3. know the herbal cosmetics, natural sweeteners, nutraceuticals 4. appreciate patenting of herbal drugs, GMP . 				
Course Outcomes: Upon completion of the current course the learner would be able to:					PO Mapped
CO1	To understand herbs as raw materials and its processing to produce herbal drug product.				1,3,6,7,9,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

CO2	Outline the fundamental principles involved in different traditional systems of medicine including ayurveda and standardization of various ayurvedic formulations	1,3,6,7,9,10,11
CO3	Understand and apply the significance of excipients of natural origin, used in pharmaceutical formulations and describe various classes of excipients .	1,3,6,7,9,10,11
CO4	Apply the knowledge of pharmacology to understand pharmacodynamic and pharmacokinetic herb-drug and herb-food interactions	1,3,6,7,9,10,11
CO5	Attain the knowledge of health benefits of nutraceuticals, herbal cosmetics, conventional and novel herbal formulations.	1,3,6,7,9,10,11
CO6	To understand and demonstrate patenting, regulatory requirements and evaluation of natural products.	1,3,6,7,9,10,11
Topics covered:		
1	UNIT I	Hours: 11
<p>1.1 Herbs as raw materials Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs Selection, identification and authentication of herbal materials Processing of herbal raw material</p> <p>1.2 Biodynamic Agriculture Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides</p> <p>1.3 Indian Systems of Medicine Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Gjutika, Churna, Lehya and Bhasma</p>		
2	UNIT II	Hours: 07
<p>2.1 Nutraceuticals General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.</p> <p>2.2 Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina</p> <p>2.3 Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra</p>		
3	UNIT III	10
<p>3.1 Herbal Cosmetics Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.</p> <p>3.2 Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.</p> <p>3.3 Herbal formulations : Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes</p>		
4	UNIT IV	Hours: 10

<p>4.1 Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.</p> <p>4.2 Patenting and Regulatory requirements of natural products:</p> <p>a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.</p> <p>4.3 Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs</p>		
5	UNIT V	Hours:07
<p>5.1 General Introduction to Herbal Industry Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.</p> <p>5.2 Schedule T–Good Manufacturing Practice of Indian systems of medicine Components of GMP (Schedule – T) and its objectives</p> <p>5.3 Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.</p>		
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Textbook of Pharmacognosy by Trease & Evans. 2. Textbook of Pharmacognosy by Tyler, Brady & Robber. 3. Pharmacognosy by Kokate, Purohit and Gokhale 4. Essential of Pharmacognosy by Dr.S.H.Ansari 5. Pharmacognosy & Phytochemistry by V.D.Rangari 6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy) 7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002. 	

Course: Biopharmaceutics and Pharmacokinetics (Revised 2019)					
Course Code: BP604T	Third Year B. Pharm				Semester: VI
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic knowledge of human anatomy and physiology and basic principles of physical pharmacy.				

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course Objectives:	On completion of following theory topics, learner should be able to understand basics of ADME and understand the concepts of bioavailability and bioequivalence concept and their application in pharmaceutical industry.	
Course Outcomes		PO Mapped
CO1	Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.	1,2,3,4,5,6,7,8,9,10 11
CO2	Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.	1,2,3,4,5,6,7,8,9,10 11
CO3	To understand the concepts of bioavailability and bioequivalence of drug products and their significance.	1,2,3,4,5,6,7,8,9,10 11
CO4	Understand various pharmacokinetic parameters, their significance & applications	1,2,3,4,5,6,7,8,9,10 11
Topics covered:		
1	UNIT I	Hours: 10
1.1 Introduction to Biopharmaceutics 1.2 Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption through GIT, absorption of drug from Non per oral extra-vascular routes 1.3 Distribution of Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs		
2	UNIT II	Hours: 10
2.1 Drug Elimination renal excretion of drugs, factors affecting renal excretion of drugs,renal clearance, Non-renal routes of drug excretion of drugs. 2.2 Bioavailability and Bioequivalence: Definition and Objectives of bioavailability studies, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro, in-vivo correlations, bioequivalence studies, methods to enhance the bioavailability of poorly soluble drugs.		
3.	UNIT III	Hours: 10
Pharmakokinetics: Definition and introduction of pharmacokinetics, compartment models, Non-compartment models, physiological models, One compartment open model. a. Intravenous Injection (Bolus) b. Intravenous infusion, extra vascular administrations, calculations of K_a , KE , $t_{1/2}$, V_d , AUC K_a , Cl_t and CL_r - definition methods of elimination, understanding of their significance and application.		
4.	UNIT IV	Hours: 08
Multicompartment models: Two compartment open model. IV bolus kinetics of Multiple dosing, steady state drug level, calculation of loading and maintainedose and their significance in clinical setting		

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

5.	UNIT V	Hours: 07
Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity.c. Michaelis-menton method of estimating parameters, Biotransformation of drugs		
Reference Books	<p>Latest Editions to be adopted</p> <ol style="list-style-type: none"> 1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi. 2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari 3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall International edition.USA 4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmanekar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi 5. Pharmacokinetics: By Milo Gibaldi Donald, R. Merceel Dekker Inc. 6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press. 7. Biopharmaceutics; By Swarbrick 8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995. 10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989. 11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebert F Notari Marcel Dekker Inn, New York and Basel, 1987. 12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania 	

Course: Pharmaceutical Biotechnology (Revised 2019)					
Course Code: BP605T	Third Year B. Pharm				Semester: VI
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic knowledge of cell biology, biochemistry and microbiology				
Course Objectives:	On completion of following theory topics, learner should be able to understand basic of modern biotechnology, fermentation technology, enzyme technology and immunology, working of tools used in molecular biotechnology, applications of conventional, modern biotechnology in pharmaceutical industries.				
Course Outcomes					PO Mapped

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

CO1	Understand the tools, techniques, ethics and environmental safety involved in gene cloning, and the applications of Recombinant DNA technology	1,4,7,9,10,11
CO2	Discuss basics of immunology and explain the antigen-antibody interactions and defense mechanism and explain technique of monoclonal antibodies production for treating the human diseases	1,4,7,10,11
CO3	Study fermentation technology and understanding the basic concepts for production of safer vaccines and antibiotics	1,9,10,11
CO4	Demonstrate different techniques and applications of enzyme immobilization and cell culture	1,4,9,10,11
Topics covered:		
1	UNIT I	Hours 10
1.1 Brief introduction to Biotechnology with reference to Pharmaceutical Sciences 1.2 Enzyme Biotechnology- Methods of enzyme immobilization and applications. 1.3 Biosensors- Working and applications of biosensors in Pharmaceutical Industries. 1.4 Brief introduction to Protein Engineering. 1.5 Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. 1.6 Basic principles of genetic engineering		
2	UNIT II	Hours: 10
2.1 Study of cloning vectors, restriction endonucleases and DNA ligase. 2.2 Recombinant DNA technology. Application of genetic engineering in medicine. 2.3 Application of r DNA technology and genetic engineering in the products: 2.4 Interferon b) Vaccines- hepatitis- B c) Hormones- Insulin. 2.5 Brief introduction to PCR		
3	UNIT III	Hours: 10
Types of immunity- humoral immunity, cellular immunity a. Structure of Immunoglobulins Structure and Function of MHC b. Hypersensitivity reactions, Immune stimulation and Immune suppressions c. General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity d. Storage conditions and stability of official vaccines e. Hybridoma technology- Production, Purification and Applications f. Blood products and Plasma Substitutes		
4	UNIT IV	Hours: 08

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

4.1 Immuno blotting techniques- ELISA, Western blotting, Southern blotting. 4.2 Genetic organization of Eukaryotes and Prokaryotes 4.3 Microbial genetics including transformation, transduction, conjugation, plasmids and transposons 4.4 Introduction to Microbial biotransformation and applications 4.5 Mutation.: Types of mutation/ mutants		
5	UNIT V	Hours: 07
5.1 Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. 5.2 Large scale production fermenter design and its various controls. 5.3 Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin 5.4 Blood product collection, Processing and storage of whole volume blood, dried human plasma, plasma substituents		
References	<p style="text-align: center;">Books (Latest edition to be adopted)</p> <ol style="list-style-type: none"> 1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C. 2. RA Goldshy et. al., : Kuby Immunology. 3. J.W. Goding: Monoclonal Antibodies. 4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry. 5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio. 6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication. 7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi 	

Course: Pharmaceutical Quality Assurance (Revised 2019)					
Course Code: BP606T	Third Year B. Pharm				Semester: VI
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic knowledge about pharmaceutical product development and quality control tests.				
Course Objectives:	At completion of this course it is expected that students will be able to- 1. understand the cGMP aspects in a pharmaceutical industry				

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	<p>2. appreciate the importance of documentation</p> <p>3. understand the scope of quality certifications applicable to pharmaceutical industries</p> <p>4. understand the responsibilities of QA & QC departments</p>	
Course Outcomes		PO Mapped
CO1	Understand the concepts of quality assurance, total quality management, ICH guidelines and quality by design	1,2,3,4,9
CO2	Understand the organization, planning of premises and resources for pharmaceutical industry.	2,3,5,6,9,10
CO3	Apply the principles of quality control and good laboratory practices during practical training.	2,3,4,11
CO4	Evaluate and apply document maintenance and complaint handling to practical situations.	1,3,5,7,8
CO5	Evaluate and support the calibration and validation principles as applicable to academic laboratories.	1,2,3,4,11
Topics covered:		
Unit I:		Hours: 10
<p>1.1 Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP</p> <p>1.2 Total Quality Management (TQM): Definition, elements, philosophies</p> <p>1.3 ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines</p> <p>1.4 QbD: Definition, overview, elements of QbD program, tools</p> <p style="padding-left: 40px;">ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration</p> <p>1.5 NABL accreditation : Principles and procedure</p>		
Unit II:		Hours: 10
<p>2.1 Organization and personnel: Personnel responsibilities, training, hygiene and personal records. Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.</p> <p>2.2 Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials</p>		
Unit III:		Hours: 10
<p>3.1 Quality Control: Quality control test for containers, rubber closures and secondary packing materials</p> <p>3.2 Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities</p>		
Unit IV:		Hours: 08
<p>4.1 Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.</p> <p>4.2 Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.</p>		

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Unit V:		Hours: 07
<p>5.1 Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.</p> <p>5.2 Warehousing: Good warehousing practice, materials management</p>		
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Quality Assurance Guide by organization of Pharmaceutical Products of India. 2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69. 3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications. 4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh 5. How to Practice GMP's – P P Sharma. 6. ISO 9000 and Total Quality Management – Sadhank G Ghosh 7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms 8. Good laboratory Practices – Marcel Deckker Series 9. ICH guidelines, ISO 9000 and 14000 guidelines 	

Course: Medicinal chemistry III (Revised 2019)				
Course Code: BP607P	Third Year B. Pharm			Semester: VI
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Organic Chemistry, Organic Chemistry lab safety and general procedures, heating, filtration, adjusting pH and MP determination			
Course Objectives:	<ol style="list-style-type: none"> 8. To give students a hand on experience on setting organic chemistry reaction 9. To train students performing quantitative organic analysis 10. To train students to handle microwave organic chemistry reaction 11. To train students for computer aided tools and software 			
COURSE OUTCOMES: Upon completion of the course learner will be able to				PO Mapped
CO1	Perform Synthesis of Some drugs and intermediates			1,2,3,5,11
CO2	Perform Assay of drugs			1,2,3,5,11
CO3	Apply principles of Green Chemistry to synthesis			1,2,3,5,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

CO4	Experimenting on computers for studies in pharmaceutical chemistry	1,2,3,5, 11
TOPICS		
Unit I:	Preparation of drugs and intermediates	
	<ol style="list-style-type: none"> 1. Sulphanilamide 2. 7-Hydroxy, 4-methyl coumarin 3. Chlorobutanol 4. Triphenyl imidazole 5. Tolbutamide 6. Hexamine 	
Unit II:	Assay of drugs	
	<ol style="list-style-type: none"> 1. Isonicotinic acid hydrazide 2. Chloroquine 3. Metronidazole 4. Dapsone 5. Chlorpheniramine maleate 6. Benzyl penicillin 	
Unit III:	Preparation of medicinally important compounds or intermediates by Microwave irradiation technique	
Unit IV:	Drawing structures and reactions using chem draw®	
Unit V:	Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinski's RO5)	
Reference material:	Books <ol style="list-style-type: none"> 1. Wilson and Griswold's Organic medicinal and Pharmaceutical Chemistry. 2. Faye'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. 	

Course: Pharmacology III (Revised 2019)				
Course Code: BP608P	Third Year B. Pharm			Semester: VI
Type of course: Practical	Contact Hours: 4 Hours/week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Pre-requisites:	<ul style="list-style-type: none"> Basic mathematical skills, Concepts of agonist and antagonist, Concepts of sterilization of pharmaceuticals, Basic knowledge of preclinical toxicity studies 	
Course Objectives:	<p>To impart the mathematical and statistical skills required to for pharmacological calculations.</p> <p>To impart the understanding of principles and methodology related to various in vitro and in vivo preclinical studies including acute toxicity studies.</p>	
COURSE OUTCOMES		
Upon completion of this course the learner should be able to:		PO Mapped
CO1	Solve the problems based on dose calculation in pharmacological experiments, calculation of pharmacokinetic parameters, student's t test, ANOVA test, Chi square test, Wilcoxin Signed Rank test.	1,2,3,5, 6,8,9
CO2	Explain the principal and methodology of some in vitro and in vivo models and discuss the data analysis of the same.	1,2,3,5, 6,7,8,9
CO3	Explain the principle and methodology of acute oral toxicity, skin irritation and eye irritation testing along with data interpretation.	1,2,3,6,7,8,9
CO4	Plan, execute and conclude the experiment using various methodologies (defined protocol or qualitative or quantitative techniques).	1,3,4,6,7,8,9,10,11
TOPICS		
<ol style="list-style-type: none"> Dose calculation in pharmacological experiments. Antiallergic activity by mast cell stabilization assay. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model. Study of effect of drugs on gastrointestinal motility. Effect of agonist and antagonists on guinea pig ileum. Estimation of serum biochemical parameters by using semi autoanalyser. Effect of saline purgative on frog intestine. Insulin hypoglycaemic effect in rabbit. Test for pyrogens (rabbit method). Determination of acute oral toxicity (LD50) of a drug from a given data. Determination of acute skin irritation / corrosion of a test substance. Determination of acute eye irritation / corrosion of a test substance. Calculation of pharmacokinetic parameters from a given data. Biostatistics methods in experimental pharmacology (student's t test, ANOVA). Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test). <p><i>*Experiments are demonstrated by simulated experiments/videos</i></p>		
Reference material:	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none"> Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill Goodman and Gilman's, The Pharmacological Basis of Therapeutics 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 Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology 	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	6. 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 publisher Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert, 8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata 9. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan, 10.N. Udupa and P.D. Gupta, Concepts in Chronopharmacology.
--	---

Course: Herbal Drug Technology (Revised 2019)				
Course Code: BP609P	Third Year B. Pharm			Semester: VI
Type of course: Practical	Contact Hours: 4 Hours/Week			Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional Exam*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Basic knowledge of ayurvedic and herbal formulations			
Course Objectives:	1) To extract and perform qualitative chemical tests belonging to various classes of phytoconstituents 2) To apply knowledge of analytical procedures in quantitative determination of total aldehyde content, phenol content, total alkaloids from crude drugs 3) To learn evaluation of excipients of natural origin 4) To study monograph analysis of herbal drugs from recent official compendia 5) To assess ayurvedic dosage form, herbal formulations and herbal cosmetics as per official compendia.			
Course Outcomes: Upon completion of the current course the learner would be able to:				PO Mapped
CO1	Extract and perform qualitative chemical tests on the crude drugs containing various phytoconstituents.			1,3,6,7,9,10,11
CO2	Apply analytical procedures and principles for quantitative determination of total aldehyde content, phenol content and total alkaloids from crude drugs			1,3,6,7,9,10,11
CO3	Carry out evaluation of ayurvedic dosage form, herbal drugs, herbal formulations, herbal excipients and herbal cosmetics as per Pharmacopoeia			1,3,6,7,9,10,11
CO4	Demonstrate oral and written communication skills and ability to plan the experimentation with proper time management			1,3,7,8
EXPERIMENTS:				
Unit I:	To perform preliminary phytochemical screening of crude drugs.			
Unit II:	Determination of the alcohol content of Asava and Arista			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Unit III:	Evaluation of excipients of natural origin
Unit IV:	Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
Unit V:	Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
Unit VI:	Monograph analysis of herbal drugs from recent Pharmacopoeias
Unit VII:	Determination of Aldehyde content
Unit VIII:	Determination of Phenol content
Unit IX:	Determination of total alkaloids
Books	
Reference material:	<ol style="list-style-type: none"> 1. Textbook of Pharmacognosy by Trease & Evans. 2. Textbook of Pharmacognosy by Tyler, Brady & Robber. 3. Pharmacognosy by Kokate, Purohit and Gokhale 4. Essential of Pharmacognosy by Dr.S.H.Ansari 5. Pharmacognosy & Phytochemistry by V.D.Rangari 6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy) 7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

SEM VII

Course: Instrumental Methods of Analysis (Revised 2019)					
Course Code: BP701T	Final Year B. Pharm				Semester: VII
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Before undertaking the course, students should have knowledge of the following: <ol style="list-style-type: none"> 1. Liquid-liquid extraction- Partition coefficient, molecular diffusion, mass transfer 2. Adsorption, adsorption isotherms, quantum theory, difference between protons, neutrons and electrons 				
Course Objectives:	Upon completion of the course the student shall be able to: <ol style="list-style-type: none"> 1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis 2. Understand the chromatographic separation and analysis of drugs. 3. Perform quantitative & qualitative analysis of drugs using various analytical instruments. 				
Course Outcomes					PO Mapped
Upon completion of the current course the learner would be able to:					
CO1	Recall with examples the terminologies associated with spectroscopy and chromatography				1, 2, 3, 8, 11
CO2	Explain and illustrate the theory and applications of UV visible spectroscopy, fluorimetry, IR spectroscopy, HPLC, GC, paper chromatography, TLC, ion chromatography, gel chromatography and affinity chromatography				1, 2, 3, 4, 6, 8, 11
CO 3	Apply the knowledge gained and perform mathematical calculations to obtain quantitative results from UV spectroscopy and chromatographic parameters				2, 3, 4, 8, 11
CO 4	Predict the spectroscopic behavior of molecules				2, 3, 4, 8, 11
Topics covered:					
Unit I:	UV Visible spectroscopy				Hours: 10

<p>1.1 Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert 's law, Derivation and deviations. 1.2 Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors-Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode. 1.3 Applications - Spectrophotometric titrations, Single component and multicomponent analysis 1.4 Fluorimetry: Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications</p>		
Unit II:	IR spectroscopy	Hours: 10
<p>2.1 Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations 2.2 Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications 2.3 Flame Photometry-Principle, interferences, instrumentation and applications 2.4 Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications Nepheloturbidometry- Principle, instrumentation and applications</p>		
Unit III:	Introduction to chromatography	Hours: 10
<p>3.1 Adsorption and partition column chromatography- Methodology, advantages, disadvantages and applications. 3.2 Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications. 3.3 Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications 3.4 Electrophoresis–Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications</p>		
Unit IV:		Hours: 8
<p>4.1 Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications 4.2 High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.</p>		
Unit V:		Hours: 7
<p>5.1 Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications 5.2 Gel chromatography- Introduction, theory, instrumentation and applications Affinity chromatography- Introduction, theory, instrumentation and applications</p>		
Reference material:	<p>Recommended books (Latest edition): 1. Instrumental Methods of Chemical Analysis by B.K Sharma 2. Organic spectroscopy by Y.R Sharma 3. Text book of Pharmaceutical Analysis by Kenneth A. Connors 4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel 5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 6. Organic Chemistry by I. L. Finar 7. Organic spectroscopy by William Kemp 8. Quantitative Analysis of Drugs by D. C. Garrett 9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi 10. Spectrophotometric identification of Organic Compounds by Silverstein</p>	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course: Industrial Pharmacy II (Revised 2019)					
Course Code: BP702T	Final Year B. Pharm				Semester: VII
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	The student should have basic knowledge of Pharmaceutics and formulation science				
Course Objectives:	This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market				
Course Outcomes					PO Mapped
Upon completion of the current course the learner would be able to:					
CO1	Know the process of pilot plant and scale up of pharmaceutical dosage forms				1,2,3,4,6,7,10,11
CO2	Understand the process of technology transfer from lab scale to commercial batch				1,2,3,4,6,7,10,11
CO 3	Know different Laws and Acts that regulate pharmaceutical industry				1,2,3,4,5,6,7,8,9,10,11
CO 4	Understand the approval process and regulatory requirements for drug products				1,2,3,4,6,5,7,8,9,10,11
Topics covered:					
Unit I:					Hours: 10
<p>Pilot plant scale up techniques General considerations - including significance of personnel requirements, space requirements, raw materials Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation SUPAC guidelines Introduction to Platform technology</p>					
Unit II:					Hours: 10
<p>Technology development and transfer Terminologies, Technology transfer protocol, Quality risk management Transfer from R & D to production (Process, packaging and cleaning) Granularity of TT Process (API, excipients, finished products, packing materials)</p>					

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Documentation, Premises and equipment, qualification and validation, quality control, analytical method transfer Approved regulatory bodies and agencies Commercialization - practical aspects and problems (case studies) TOT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI Technology of Transfer (TOT) related documentation - confidentiality agreements, licensing, MoUs, legal issues		
Unit III:		Hours: 10
3.1 Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals 3.2 Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New 8 137 Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies		
Unit IV:		Hours: 08
Quality Management System Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by design, Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP		
Unit V:		Hours: 07
Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Common Technical Document (CTD), Certificate of Pharmaceutical Product (COPP) Regulatory requirements and approval procedures for New Drugs		
Reference material:	Books 1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http://en.wikipedia.org/wiki/Regulatory_Affairs . 2. International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php 3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition. Regulatory Affairs brought by learning plus, inc. available at http://www.cgmp.com/ra.htm .	

Course: Pharmacy Practice (Revised 2019)		
Course Code: BP703T	Final Year B. Pharm	Semester: VII
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)	Total Contact Hours: 60

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic knowledge about drug dispensing, categories of drugs and labeling requirements.				
Course Objectives:	<p>Upon completion of the course, the student shall be able to</p> <ol style="list-style-type: none"> 1. know various drug distribution methods in a hospital 2. appreciate the pharmacy stores management and inventory control 3. monitor drug therapy of patient through medication chart review and clinical review 4. obtain medication history interview and counsel the patients 5. identify drug related problems 6. detect and assess adverse drug reactions 7. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states 8. know pharmaceutical care services 9. do patient counseling in community pharmacy; 10. appreciate the concept of Rational drug therapy. 				
Course Outcomes					PO Mapped
Upon completion of the current course the learner would be able to:					
CO1	Understand the management of hospital pharmacy, community pharmacy, clinical pharmacy and the functions of pharmacy and therapeutics committee.				1,2,5,6,9,10
CO2	Comprehend adverse drug reaction classification, therapeutic drug monitoring, drug store management and inventory control.				1,3,5,7,9
CO 3	Summarize the over the counter medications, investigational use of drugs, and interpretation of clinical laboratory tests.				1,2,4,11
CO 4	Apply drug distribution systems, prescribed medication order and communication skills during practical situations.				2,3,4,5,8
CO 5	Evaluate medication adherence, patient counselling and education programs in hospitals.				2,3,5,7,8,11
Topics covered:					
Unit I:					Hours: 10
<p>1.1 Hospital and it's organization Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.</p> <p>1.2 Hospital pharmacy and its organization Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.</p> <p>1.3 Adverse drug reaction</p>					

<p>Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.</p>		
<p>1.4 Community Pharmacy Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.</p>		
Unit II:		Hours: 10
<p>2.1 Drug distribution system in a hospital Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.</p> <p>2.2 Hospital formulary Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.</p> <p>2.3 Therapeutic drug monitoring Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.</p> <p>2.4 Medication adherence Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.</p> <p>2.5 Patient medication history interview Need for the patient medication history interview, medication interview forms.</p> <p>2.6 Community pharmacy management Financial, materials, staff, and infrastructure requirements.</p>		
Unit III:		Hours: 10
<p>3.1 Pharmacy and therapeutic committee Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.</p> <p>3.2 Drug information services Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.</p> <p>3.3 Patient counselling Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist.</p> <p>3.4 Education and training program in the hospital Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.</p> <p>3.5 Prescribed medication order and communication skills Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.</p>		
Unit IV:		Hours: 08

<p>4.1 Budget preparation and implementation Budget preparation and implementation</p> <p>4.2 Clinical Pharmacy Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care.</p> <p>4.3 Over the counter (OTC) sales Introduction and sale of over the counter, and Rational use of common over the counter medications.</p>					
Unit V:					Hours: 07
<p>5.1 Drug store management and inventory control Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure.</p> <p>5.2 Investigational use of drugs Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.</p> <p>5.3 Interpretation of Clinical Laboratory Tests Blood chemistry, hematology, and urinalysis</p>					
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Merchant S.H. and Dr. J.S.Quadry. <i>A textbook of hospital pharmacy</i>, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001. 2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. <i>A textbook of Clinical Pharmacy Practice- essential concepts and skills</i>, 1sted. Chennai: OrientLongman Private Limited; 2004. 3. William E. Hassan. <i>Hospital pharmacy</i>, 5th ed. Philadelphia: Lea & Febiger; 1986. 4. Tipnis Bajaj. <i>Hospital Pharmacy</i>, 1st ed. Maharashtra: Career Publications; 2008. 5. Scott LT. <i>Basic skills in interpreting laboratory data</i>, 4th ed. American Society of Health System Pharmacists Inc; 2009. 6. Parmar N.S. <i>Health Education and Community Pharmacy</i>, 18th ed. India: CBS Publishers & Distributers; 2008. <p>Journals:</p> <ol style="list-style-type: none"> 1. Therapeutic drug monitoring. ISSN: 0163-4356 2. Journal of pharmacy practice. ISSN : 0974-8326 3. American journal of health system pharmacy. ISSN: 1535-2900 (online) 4. Pharmacy times (Monthly magazine) 				

Course: Novel Drug Delivery Systems (Revised 2019)					
Course Code: BP704T	Final Year B. Pharm				Semester: VII
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Max. Marks:	15	4	3	3	75
Pre-requisites:	Have basic knowledge of pharmaceutical formulations and their development and strong basis of Physical Pharmacy and biopharmaceutics.				
Course Objectives:	The course aims to impart knowledge about developing novel drug delivery systems, need for the same and different routes explored.				
Course Outcomes				PO Mapped	
Upon completion of the current course the learner would be able to:					
CO1	To understand various approaches for development of novel drug delivery systems.			1,2,3,4,5,6,7,8,9,10,11	
CO2	To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation			1,2,3,4,5,6,7,8,9,10,11	
Topics covered:					
1	UNIT I				Hours: 10
<p>1.1 Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations</p> <p>1.2 Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems</p>					
2	UNIT II				Hours: 10
<p>2.1 Microencapsulation: Definition, advantages and disadvantages, microspheres/microcapsules, microparticles, methods of microencapsulation, applications</p> <p>2.2 Mucosal Drug Delivery system: Introduction, Principles of bioadhesion /mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems</p> <p>2.3 Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump</p>					
3	UNIT III				Hours: 10
<p>3.1 Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches</p> <p>3.2 Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications</p> <p>3.3 Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers</p>					
4	UNIT IV				Hours: 8

Nanotechnology and its Concepts: Concepts and approaches for targeted drug delivery systems, advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications	
UNIT V	Hours: 7
5.1 Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts	
5.2 Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices	
Reference material:	<p>Recommended Books: (Latest Editions)</p> <ol style="list-style-type: none"> 1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992. 2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992. 3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim 4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001). 5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002. <p>Journals</p> <ol style="list-style-type: none"> 1. Indian Journal of Pharmaceutical Sciences (IPA) 2. Indian Drugs (IDMA) 3. Journal of Controlled Release (Elsevier Sciences) 4. Drug Development and Industrial Pharmacy (Marcel & Decker) 5. International Journal of Pharmaceutics (Elsevier Sciences)

Course: Instrumental Methods of Analysis (Revised 2019)				
Course Code: BP705P	Final Year B. Pharm			Semester: VII
Type of course: Practical	Contact Hours: 4 Hours/week		Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Practical Sessional test*	Attendance	Based on Practical Records, Regular Viva	End semester Examination
Max. Marks:	10	2	3	35
Pre-requisites:	Before undertaking the course, students should have knowledge of the following: 1. Basic metric conversions 2. Concept of dilution factor			
Course Objectives:	Upon completion of the course the student shall be able to:			

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	<ol style="list-style-type: none"> 1. Perform qualitative and quantitative analysis of compounds 2. Interpret and compile a report of analysis performed 	
Course Outcomes: Upon completion of the course the student shall be able to:		PO Mapped
CO1	Apply the principles of uv-vis spectroscopy, fluorescence spectroscopy, flame photometry, colorimetry and turbidometry to perform, analyze, determine and report the content of drugs in formulation/sample solution	2, 3, 4, 6, 8, 10
CO2	Relate the principles of separation with chromatographic techniques to identify and separate two components in a mixture	2, 3, 4, 6, 8, 10
CO3	Recall the working principle, instrumentation and pharmaceutical applications of HPLC, GC and HPTLC	1, 2, 3, 4, 10, 11
CO4	Plan, execute and conclude the experiment using qualitative or quantitative techniques	1, 2, 3, 4
Experiments		
<ol style="list-style-type: none"> 1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds 2. Estimation of dextrose by colorimetry 3. Estimation of sulfanilamide by colorimetry 4. Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy 5. Assay of paracetamol by UV- Spectrophotometry 6. Estimation of quinine sulfate by fluorimetry 7. Study of quenching of fluorescence 8. Determination of sodium by flame photometry 9. Determination of potassium by flame photometry 10. Determination of chlorides and sulphates by nephelo turbidometry 11. Separation of amino acids by paper chromatography 12. Separation of sugars by thin layer chromatography 13. Separation of plant pigments by column chromatography 14. Demonstration experiment on HPLC 15. Demonstration experiment on Gas Chromatography 		
Reference material:	Books: <ol style="list-style-type: none"> 1. Instrumental Methods of Chemical Analysis by B.K Sharma 2. Organic spectroscopy by Y.R Sharma 3. Text book of Pharmaceutical Analysis by Kenneth A. Connors 4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel 5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 6. Organic Chemistry by I. L. Finar 7. Organic spectroscopy by William Kemp 8. Quantitative Analysis of Drugs by D. C. Garrett 9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi 10. Spectrophotometric identification of Organic Compounds by Silverstein 	

Course: Practice School (Revised 2019)

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course Code: BP706PS	Final Year B. Pharm		Semester: VII
Type of course: Theory	Contact Hours: 12 Hours/week		Total Contact Hours: 100 hrs
Course assessment Methods:	Continuous mode		End Semester Exam
Assessment Tool*:	Attendance	Teacher student interaction	Evaluation of Report (not more than 25 pages) by internal subject expert
Max. Marks:	10	15	125
Pre-requisites:	A basic understanding of all domains of Pharmacy		
Course Objectives:	Introduction to pharmacy practice will help in understanding of practical aspects of different domains of Pharmacy. It will guide students for future career selection		
Course Outcomes:			PO Mapped
CO1	Apply theoretical knowledge learned in classroom in practical setting		1,4,11
CO2	Understanding the importance and applications of various subjects and their correlation with practice of Pharmacy		1,4,11
CO3	Development of skills in the handling of modern tools		1,4,11
CO4	Acquire skills of documentation and record keeping		1,4,11
CO5	Plan academic, career and personal interests via research experience		1,4,11
Domains covered (Any one):			
I:	Phytomedicine and Nutraceuticals		Hours: 150
II:	Formulation Development		Hours: 150
III:	Quality Control and Quality Assurance		Hours: 150
IV:	Cosmeceuticals		Hours: 150
V:	Pharmacology		Hours: 150

SEM VIII

Course: Research Methodology and Biostatistics (Revised 2019)					
Course Code: BP801T	Final Year B. Pharm				Semester: VIII
Type of course: Theory	Contact Hours: 4 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Students must be aware about the following: <ol style="list-style-type: none"> 1. Importance of research 2. Basic terminologies like hypothesis, aim, objectives, rationale in research, 3. Terminologies like mean, median, mode, standard deviation 				
Course Objectives:	This Course aims to: <ol style="list-style-type: none"> 1. Learn and understand the operation of M.S. Excel, SPSS, R and MINITAB® , DoE (Design of Experiment) 2. Understand various statistical techniques to solve statistical problems 3. Apply statistical techniques in solving the problems 				
Course Outcomes:					PO Mapped
After completion of this course the learner will be able to					
CO1	Understand descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non-Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies,				1,7,3,9,10,11
CO2	Perform analysis using SPSS, R and MINITAB statistical software's, analysing the statistical data using Excel.				1,2,3,4,7,9,10,11
CO3	Explain the basics of biostatistics and its role in Pharmacy				1,5,7,8,9,10,11
CO4	Evaluate and apply the principles of biostatistics during conduct of basic research				1,2,3,4,5,6,7,8,9,10,11
Topics covered:					
Unit I:	Basic statistics				Hours 10
1.1 Introduction: Statistics, Biostatistics, Frequency distribution 1.2 Measures of central tendency: Mean, Median, Mode- Pharmaceutical Examples 1.3 Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems 1.4 Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation -Pharmaceuticals examples					
Unit II:					Hours 10

2.1 Regression: Curve fitting by the method of least squares, fitting the lines $y = a + bx$ and $x = a + by$, Multiple regression, standard error of regression– Pharmaceutical Examples.	
2.2 Probability: Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties – problems	
2.3 Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference	
Unit III:	Hours 10
3.1 Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test	
3.2 Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism	
3.3 Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph	
3.4 Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.	
Unit IV:	Hours 8
4.1 Blocking and confounding system for Two-level factorials	
4.2 Regression modeling: Hypothesis testing in Simple and Multiple regression models	
4.3 Introduction to Practical components of Industrial and Clinical Trials problems: Statistical Analysis Using Excel, SPSS, MINITAB® , DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach	
Unit V:	Hours 07
5.1 Design and Analysis of experiment- Factorial Design: Definition, 2X2 , 2X3 design, advantage of factorial design	
5.2 Response Surface methodology: Central composite design, Historical design, Optimization Techniques	
Reference material:	Reference Books (Latest Editions to be adopted)
	1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.
	2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
	3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
	4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

Course: Social and Preventive Pharmacy (Revised 2019)					
Course Code: BP802T	Final Year B. Pharm				Semester: VIII
Type of course: Theory	Contact Hours: 03 hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Max. Marks:	15	4	3	3	75
Pre-requisites:	Students must be aware about the following: 1) Definition of Health 2) Different types of infectious disease and measures to prevent spread of diseases 3) Basic concepts of pathophysiology and Pharmacology				
Course Objectives:	This Course aims to: 1. Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide. 2. Have a critical way of thinking based on current healthcare development. 3. Evaluate alternative ways of solving problems related to health and pharmaceutical issues				
Course Outcomes:					PO Mapped
After completion of this course the learner will be able to					
CO1	Explain the basic concepts related to health, diseases and health education and apply the knowledge for promoting health and hygiene at the social level.				1,3,6,7,8,9,10,11
CO2	Explain the various measures to control and prevent spread of diseases and apply these principles to avoid spread of the disease				1,4,5,6,7,8,9,10,11
CO3	Understand the different types of national health programs and their objectives and apply this knowledge to create awareness among those socially connected with the learner.				1,3,4,5,6,7,8,9,10,11
CO4	Understand the importance of community services and render them for societal benefit through analysis of social health problems and contribute to public health objectives				1, 3,4,5,6,7,8,9,10,11
Topics covered:					
Unit I:	Concept of Health				Hours: 10
1.1 Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. 1.2 Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention. 1.3 Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health 1.4 Hygiene and health: personal hygiene and health care; avoidable habits					
Unit II:	Preventive Medicine				Hours: 10
Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse					
Unit III:	National Health Programs, Objectives and functioning				Hours: 10
National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme					
Unit IV:	National Health intervention programs				Hours: 08
National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program					

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Unit V:	Community services	Hours: 07
Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.		
Reference material:	Recommended Books (Latest edition):	
	<ol style="list-style-type: none"> 1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications 2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, Jaypee Publications 3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, Jaypee Publications 4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, Jaypee Publications 5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14:9788190128285, Banarsidas Bhanot Publishers. 6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad 	
	Recommended Journals:	
	1. Research in Social and Administrative Pharmacy, Elsevier, Ireland	

Course: Pharmaceutical Marketing Management (Revised 2019)					
Course Code: BP803ET	Final Year B. Pharm				Semester: VIII
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Knowledge of basic medical terminologies				
Course Objectives:	To introduce the learner to the concepts of marketing management.				
Course Outcomes: After the completion of course, learner will be able to:					PO Mapped
CO1	State the importance of marketing in the pharma industry. Develop an understanding of Indian Pharma industry as well as Global Pharma market.				1, 6, 8, 7
CO2	Formulate marketing strategies with respect to Pharmaceutical products. Able to formulate a pricing strategy.				1, 6, 8, 7
CO3	Take crucial product related decisions in the business world and create promotion and advertising strategies for Pharmaceutical products.				1, 6, 8, 7, 9
CO4	Gain a deeper understanding about pharmaceutical supply chain and logistics through different channels. Understand the role and responsibilities of Medical Representatives and Product Management team.				1, 6, 8, 7, 9
Topics covered:					

Unit I:	Marketing & Pharmaceutical Market	Hours: 10
<p>1.1 Marketing: Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.</p> <p>1.2 Pharmaceutical market: Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation & targeting. Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.</p>		
Unit II:	Product decision	Hours: 10
<p>Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labelling decisions, Product management in pharmaceutical industry.</p>		
Unit III:	Promotion	Hours: 10
<p>Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.</p>		
Unit IV:	Pharmaceutical marketing channels & Professional sales representative (PSR)	Hours: 10
<p>4.1 Pharmaceutical marketing channels: Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.</p> <p>4.2 Professional sales representative (PSR): Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR</p>		
Unit V:	Pricing and Emerging concepts in marketing	Hours: 10
<p>5.1 Pricing: Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).</p> <p>5.2 Emerging concepts in marketing: Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.</p>		
Reference material:	<p>Recommended Books: (Latest Editions)</p> <ol style="list-style-type: none"> 1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi 2. Walker, Boyd and Larreche: Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi. 3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill 4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India 5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition) 6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt: Global Perspective, Indian Context, Macmilan India, New Delhi 7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi 8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications 	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course: Pharmaceutical Regulatory Science (Revised 2019) - ELECTIVE					
Course Code: BP804ET	Final Year B. Pharm				Semester: VIII
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Have foundational knowledge in pharmaceutical science, pharmaceutical management and communication skills.				
Course Objectives:	The course aims to impart a higher level of theoretical up to date knowledge in international regulatory affairs and clinical trial studies related to pharmaceutical product development.				
Course Outcomes					PO Mapped
Upon completion of the current course the learner would be able to:					
CO1	Know about the process of drug discovery and development				1,6,7,10
CO2	Know the important regulatory concepts, documentation requirements, regulatory registration procedures, regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals globally.				1,4,6,7,9,11
CO3	Describe the clinical trials requirements for approvals for conducting clinical trials and discuss the role of pharmacovigilance and the process of monitoring in clinical trials.				1,2,3,4,5,6,7,8,9,10,11
CO4	To correlate the theoretical knowledge with professional and practical need of pharmaceutical industry.				1,2,3,4,5,6,7,8,10,11
Topics covered:					
Unit I:	New Drug Discovery and development				Hours: 10
<ul style="list-style-type: none"> • Stages of drug discovery, Drug development process • Pre-clinical studies, non-clinical activities, clinical studies • Innovator and generics, Concept of generics, Generic drug product development 					
Unit II:					Hours: 10

<p>2.1 Regulatory Approval Process Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA) in US. Changes to an approved NDA / ANDA.</p> <p>2.2 Regulatory authorities and agencies Overview of regulatory authorities of United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)</p>		
Unit III:	Registration of Indian drug product in overseas market	Hours: 10
<p>Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research</p>		
Unit IV:	Clinical trials	Hours: 8
<ul style="list-style-type: none"> • Developing clinical trial protocols, Institutional Review Board /Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, • Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials 		
Unit V:	Regulatory Concepts	Hours: 7
<ul style="list-style-type: none"> • Basic terminologies, guidance, guidelines, regulations, laws and acts. • Orange book, Federal Register, Code of Federal Regulatory, Purple book 		
Reference material:	<ol style="list-style-type: none"> 1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan. 2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185. Informa Health care Publishers. 3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190. 4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc. 5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus. 6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143. 7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance by Fay A. Rozovsky and Rodney K. Adams. 8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene. 9. Drugs: From Discovery to Approval, Second Edition By Rick Ng. 	

Course: Pharmacovigilance - Elective (Revised 2019)		
Course Code: BP805ET	Final Year B. Pharm	Semester: VIII

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Type of course: Theory - Elective	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	<ul style="list-style-type: none"> • Basic/core knowledge in Pharmacology • Prior knowledge of Adverse drug reactions (ADR) and types of ADR. • Prior knowledge of clinical trial design 				
Course Objectives:	<ol style="list-style-type: none"> 1. To provide an opportunity for the student to learn about developments of pharmacovigilance. 2. To teach the basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance. 3. To teach the various methods that can be used to assess adverse drug reactions generate safety data and signal detection. 4. To provide insights on Regulatory aspects of pharmacovigilance 				
Course Outcomes					PO Mapped
Upon completion of this course the learner should be able to:					
CO1	Remember the history and development of pharmacovigilance and discuss the importance of drug safety monitoring.				1,3,4,6,7,8,11
CO2	Discuss the various facets of ADRs in normal as well as special populations with their relation to pharmacovigilance methods.				1,3,4,6,7,8,11
CO3	Integrate knowledge of drug-disease classification, coding and information resources and outline the pharmacovigilance process.				1,3,4,6,7,8,11
CO4	Outline the regulatory processes in pharmacovigilance and summarize the components of pharmacovigilance program.				1,3,4,6,7,8,11
Topics covered:					
Unit I					Hours: 10
1.1 Introduction to Pharmacovigilance History and development of Pharmacovigilance Importance of safety monitoring of Medicine WHO international drug monitoring programme Pharmacovigilance Program of India (PvPI)					
1.2 Introduction to adverse drug reactions Definitions and classification of ADRs Detection and reporting Methods in Causality assessment Severity and seriousness assessment Predictability and preventability assessment Management of adverse drug reactions					
1.3 Basic terminologies used in pharmacovigilance Terminologies of adverse medication related events Regulatory terminologies					
Unit II					Hours: 10

<p>2.1 Drug and disease classification Anatomical, therapeutic and chemical classification of drugs International classification of diseases Daily defined doses International Non proprietary Names for drugs</p> <p>2.2 Drug dictionaries and coding in pharmacovigilance WHO adverse reaction terminologies MedDRA and Standardised MedDRA queries WHO drug dictionary Eudravigilance medicinal product dictionary</p> <p>2.3 Information resources in pharmacovigilance Basic drug information resources Specialised resources for ADRs</p> <p>2.4 Establishing pharmacovigilance programme Establishing in a hospital Establishment & operation of drug safety department in industry Contract Research Organisations (CROs) Establishing a national programme</p>		
Unit III	Hours: 10	
<p>3.1 Vaccine safety surveillance Vaccine Pharmacovigilance Vaccination failure Adverse events following immunization</p> <p>3.2 Pharmacovigilance methods Passive surveillance – Spontaneous reports and case series Stimulated reporting Active surveillance – Sentinel sites, drug event monitoring and registries Comparative observational studies – Cross sectional study, case control study and cohort study Targeted clinical investigations</p> <p>3.3 Communication in pharmacovigilance Effective communication in Pharmacovigilance Communication in Drug Safety Crisis management Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media</p>		
Unit IV	Hours: 08	
<p>4.1 Statistical methods for evaluating medication safety data Safety data generation Preclinical phase Clinical phase Post approval phase</p> <p>4.2 ICH Guidelines for Pharmacovigilance Organization and objectives of ICH Expedited reporting Individual case safety reports Periodic safety update reports Post approval expedited reporting Pharmacovigilance planning Good clinical practice in pharmacovigilance studies</p>		
Unit V	Hours: 07	
<p>5.1 Pharmacogenomics of adverse drug reactions Genetics related ADR with example focusing PK parameters</p> <p>5.2 Drug safety evaluation in special population Paediatrics Pregnancy and lactation</p>		

Geriatrics 5.3 CIOMS CIOMS Working Groups CIOMS Form 5.4 CDSCO (India) and Pharmacovigilance D&C Act and Schedule Y Differences in Indian and global pharmacovigilance requirements	
Reference material:	Recommended Books (Latest edition): 1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers. 2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers. 3. Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers. 4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers. 5. An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers. 6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones & Bartlett Publishers. 7. Textbook of Pharmacoepidemiology edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers. 8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills: G. Parthasarathi, Karin Nyfort Hansen, Milap C. Nahata 9. National Formulary of India 10. Text Book of Medicine by Yashpal Munjal 11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna 12. http://www.who.int/dynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297 13. http://www.ich.org/ 14. http://www.cioms.ch/ 15. http://cdsco.nic.in/ 16. http://www.who.int/vaccine_safety/en/ 17. http://www.ipc.gov.in/PvPI/pv_home.html

Course: Quality Control and Standardization of Herbals – Elective (Revised 2019)					
Course Code: BP806ET	Final Year B. Pharm				Semester: VIII
Type of course: Theory	Contact Hours: 3 Hours/week (3L+ 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Basic knowledge of regulatory requirements of natural products.				
Course Objectives:	Objectives: Upon completion of the subject student shall be able to;				

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	<ol style="list-style-type: none"> 1. know WHO guidelines for quality control of herbal drugs 2. know Quality assurance in herbal drug industry 3. know the regulatory approval process and their registration in Indian and international markets 4. appreciate EU and ICH guidelines for quality control of herbal drugs 	
Course Outcomes: Upon completion of the current course the learner would be able to:		PO Mapped
CO1	Describe WHO guidelines for quality control of herbal drugs.	1,3,6,7,9,10,11
CO2	Understand the significance of Quality Assurance in herbal drug industry by implementing cGMP, GAP, GMP and GLP	1,3,6,7,9,10,11
CO3	Describe EU and ICH guidelines for quality control of herbal drugs.	1,3,6,7,9,10,11
CO4	Understand the stability testing of herbal medicines and application of different chromatographic techniques in standardization of herbal products.	1,3,6,7,9,10,11
CO5	Understand regulatory requirements for herbal medicines.	1,3,6,7,9,10,11
Topics covered:		
1	UNIT I	Hours: 10
Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use		
2	UNIT –II	Hours: 10
2.1 Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine 2.2 WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines WHO Guidelines on GACP for Medicinal Plants.		
3	UNIT –III	Hours: 10
EU and ICH guidelines for quality control of herbal drugs. Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines		
4	UNIT –IV	Hours: 8
Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products. Preparation of documents for new drug application and export registration GMP requirements and Drugs & Cosmetics Act provisions.		
5	UNIT –V	Hours: 7
Regulatory requirements for herbal medicines. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias. Role of chemical and biological markers in standardization of herbal products		

Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Pharmacognosy by Trease and Evans 2. Pharmacognosy by Kokate, Purohit and Gokhale 3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , Carrier Pub., 2006. 4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002. 5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products, 6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002. 7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8. 8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998. 9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981. 10. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999. 11. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005. 12. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004
----------------------------	---

Course: Computer Aided Drug Design (Revised 2019)					
Course Code: BP807ET	Final Year B. Pharm				Semester: VIII
Type of course: Theory - Elective	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	<ul style="list-style-type: none"> • The learner should have basic knowledge of Biochemistry, Medicinal Chemistry, Organic Chemistry and Mathematics 				
Course Objectives:	Upon completion of the course, the student shall be able to understand <ol style="list-style-type: none"> 1. Design and discovery of lead molecules 2. The role of drug design in drug discovery process 				

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	<p>3. The concept of QSAR and docking</p> <p>4. Various strategies to develop new drug like molecules.</p> <p>5. The design of new drug molecules using molecular modeling software</p>	
Course Outcomes		PO Mapped
Upon completion of this course the learner should be able to:		
CO1	Recognize various stages and approaches of drug discovery and development	1,2,3,4,9,11
CO2	Interpret the QSAR equation and 3D contour plots	1,3,4,9,10,11
CO3	Experimenting with facts learned, for designing new molecules using molecular docking, de novo drug design, pharmacophore, virtual screening techniques	1,3,4,9,11
CO4	Debate on use of informatics and databases in drug design	1,2,3,4,10,11
CO5	Explain Molecular and Quantum Mechanics methods in drug design	1,3,4,11
Topics covered:		
Unit I:	Introduction to Drug Discovery and Development	Hours: 10
<p>1.1 Stages of drug discovery and development</p> <p>1.2 Lead discovery and Analog Based Drug Design: Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.</p> <p>1.3 Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies</p>		
Unit II:	Quantitative Structure Activity Relationship (QSAR)	Hours: 10
<ul style="list-style-type: none"> • SAR versus QSAR, History and development of QSAR, • Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammett's substituent constant and Taft's steric constant. • Hansch analysis, Free Wilson analysis • 3D-QSAR approaches like COMFA and COMSIA. 		
Unit III:	Molecular Modeling and virtual screening techniques	Hours: 10
<p>3.1 Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,</p> <p>3.2 Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. <i>De novo</i> drug design.</p>		
Unit IV:	Informatics & Methods in drug design	Hours: 08
Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.		
Unit V:	Molecular Modeling	Hours: 07
Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.		
Reference material:	<p>Recommended Books (Latest edition):</p> <ol style="list-style-type: none"> 1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore. 2. Martin YC. "Quantitative Drug Design" Dekker, New York. 3. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic 	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	<ol style="list-style-type: none"> 4. Medicinal & Pharmaceutical Chemistry” Lippincott, New York. 5. Foye WO “Principles of Medicinal chemistry ‘Lea & Febiger. 6. Koro Ikovas A, Burckhalter JH. “Essentials of Medicinal Chemistry” Wiley Interscience. 7. Wolf ME, ed “The Basis of Medicinal Chemistry, Burger’s Medicinal Chemistry” JohnWiley& Sons, New York. 8. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press. 9. Smith HJ, Williams H, eds, “Introduction to the principles of Drug Design” Wright Boston. 10. Silverman R.B. “The organic Chemistry of Drug Design and Drug Action”Academic Press New York. XYZ
--	--

Course: Cell and Molecular Biology- Elective (Revised 2019)					
Course Code: BP808ET	Final Year B. Pharm				Semester: VIII
Type of course: Theory- Elective	Contact Hours: 4 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Students must be aware about the following: <ol style="list-style-type: none"> 1) Definition, structure and function of cell. 2) Concept of nucleic acids and types of nucleic acids 3) Concept of protein synthesis 				
Course Objectives:	This Course aims to: <ol style="list-style-type: none"> 1) Summarize and impart knowledge of history of cell and molecular biology, cellular functioning and composition, cell membrane structure and function 2) Describe the chemical foundations of cell biology and cell cycle. 3) Summarize and impart knowledge of the DNA properties of cell biology, protein structure, synthesis and function. 4) Describe and impart knowledge of basic molecular genetic mechanisms. 5) Develop analytical thinking abilities in students by helping them understand important molecular targets for drugs through detailed understanding of the cell pathways. 				
Course Outcomes:					PO Mapped
After completion of this course the learner will be able to					
CO1	Understand the basic mechanisms related to cell function, composition and molecular biology				1,9,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

CO2	Learn and comprehend the basics of molecular genetics, structure and function of nucleic acids and protein synthesis	1,9,10,11
CO3	Understand about cell cycle and cell signaling pathways	1,9,10,11
CO4	Develop the ability to apply and analyze the knowledge of cell and molecular biology in identifying molecular targets for drugs	1,3,5,7,8,10,11
Topics covered:		
Unit I:	Basic Principles of Cell	Hours: 10
	a) Cell and Molecular Biology: Definitions theory and basics and applications. b) Cell and Molecular Biology: History and Summation. c) Theory of the Cell? Properties of cells and cell membrane. d) Prokaryotic versus Eukaryotic e) Cellular Reproduction f) Chemical Foundations – an Introduction and Reactions (Types)	
Unit II:	Nucleic Acids-DNA and RNA	Hours: 10
	a) DNA and the Flow of Molecular Structure b) DNA Functioning c) DNA and RNA d) Types of RNA e) Transcription and Translation	
Unit III:	Protein Synthesis and pathways	Hours: 10
	a) Proteins: Defined and Amino Acids b) Protein Structure c) Regularities in Protein Pathways d) Cellular Processes e) Positive Control and significance of Protein Synthesis	
Unit IV:	Genetics	Hours: 08
	a) Science of Genetics b) Transgenics and Genomic Analysis c) Cell Cycle analysis d) Mitosis and Meiosis e) Cellular Activities and Checkpoints	
Unit V:	Cell Signals and signalling Pathways	Hours: 07
	a) Cell Signals: Introduction b) Receptors for Cell Signals c) Signaling Pathways: Overview d) Misregulation of Signaling Pathways e) Protein-Kinases: Functioning	
Reference material:	Recommended Books (latest edition): 1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London. 2. Prescott and Dunn, Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi. 3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn. 4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology. 5. Rose: Industrial Microbiology. 6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	<p>7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.</p> <p>8. Pepler: Microbial Technology.</p> <p>9. Edward: Fundamentals of Microbiology.</p> <p>10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi</p> <p>11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company</p> <p>12. B.R. Glickand J.J. Pasternak: Molecular Biotechnology: Principles and</p> <p>13. Applications of RecombinantDNA: ASM Press Washington D.C.</p> <p>14. R. A Goldshy et. al.,: Kuby Immunology</p>
--	--

Course: Cosmetic Science- Elective (Revised 2019)					
Course Code: BP809ET	Final Year B. Pharm				Semester: VIII
Type of course: Theory- Elective	Contact Hours: 3 Hours/week (3L + T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Have foundational knowledge in pharmaceutical science and formulation aspects.				
Course Objectives:	To provide the learner with knowledge of cosmeticology with respect to the types of formulations, evaluation and regulatory aspects				
Course Outcomes					PO Mapped
Upon completion of the current course the learner would be able to:					
CO1	Discuss the various raw materials for cosmetics and structure and function of human skin				1,3,8,11
CO2	Understand the toxicological aspects and toxicity testing for cosmetics and cosmeceuticals				1,3,4, 7,8,11
CO3	Discuss the various cosmetics products w.r.t. raw materials, large scale manufacturing and functional and physicochemical evaluation including Herbal cosmetics.				1,2,3,8,11
CO4	Know the regulatory guidelines and sensorial assessment for cosmetics				1,3,4,5,7,8,9,10, 11

Topics covered:		
1	Unit I:	Hours: 10
<p>1.1 Classification of cosmetic and cosmeceutical products Defination of cosmetics as per Indian and EU regulations, Evolution of cosmoceuticals from cosmetics, cosmetics as quasi and OTC drugs</p> <p>1.2 Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application Skin: Basic structure and function of skin. Hair: Basic structure of hair. Hair growth cycle Oral Cavity: Common problem associated with teeth and gums.</p>		
2	Unit II	Hours: 10
<p>2.1 Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, Vanishing cream their relative skin sensory, advantages and disadvantages. Application of these products in formulation of cosmeceuticals.</p> <p>2.2 Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioners, antidandruff shampoo. Hair oils. Chemistry and formulation of Para-phenylene diamine based hair dye.</p> <p>2.3 Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash</p>		
3	Unit III	Hours: 10
<p>3.1 Sun protection, Classification of Sunscreens and SPF</p> <p>3.2 Role of herbs in cosmetics: Skin Care: Aloe and turmeric Hair care: Henna and amla. Oral care: Neem and clove</p> <p>3.3 Analytical cosmetics: BIS specification and analytical methods for shampoo, skin-cream and toothpaste</p>		
4	Unit IV:	Hours: 8
<p>Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps, and syndet bars. Evolution and skin benefits.</p>		
5	Unit V	Hours: 7
<p>Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action</p>		
Reference material:	<p>Recommended books (Latest edition): 1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.</p>	

	2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi. 3. Text book of cosmology by Sanju Nanda & Roop K. Khar, Tata Publishers.
--	---

Course: Experimental Pharmacology- Elective (Revised 2019)					
Course Code: BP810ET	Final Year B. Pharm				Semester: VIII
Type of course: Theory- Elective	Contact Hours: 3 Hours/week (3L + 1T)				Total Contact Hours: 60
Course assessment Methods:	Continuous mode of assessment				Semester- end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Students must be aware about the following: <ul style="list-style-type: none"> • The basic knowledge in the field of pharmacology pertaining to the drugs and its therapeutic applications. • The concepts of drug action and mechanisms involved. • The pathophysiology and pharmacotherapy of certain diseases • The underlying mechanism of drug actions at cellular and molecular level. • Basic knowledge of experimental handling, correlation of experimental data with human. 				
Course Objectives:	This Course aims to teach the learner the following : <ul style="list-style-type: none"> • The applications of various commonly used laboratory animals. • The various screening methods used in preclinical research. • The importance of biostatistics and research methodology. • 4. Design and execute a research hypothesis independently. 				
Course Outcomes: On completion of the course the learner will be able to					PO Mapped
CO1	Understand the regulations and ethical requirement for the usage of experimental animals, the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes.				1,6,7,9,10,11
CO2	Explain the knowledge gained on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development.				1,6,7,10,11
CO3	Learn about the various screening methods involved in the drug discovery process.				1,6,7,10,11
CO4	Understand and explain the rational used for selection of sex, gender, number, group of various animals used in the drug				1,6,7,9,10,11

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

	discovery process and good laboratory practices in maintenance and handling of experimental animals.	
CO5	They would appreciate to correlate the preclinical data to humans.	1,4,6,7,9,11
Topics covered:		
Unit I:	Laboratory Animals	08
<ul style="list-style-type: none"> • Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. • Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia 		
Unit II:		13
<p>2.1 Preclinical screening models</p> <ul style="list-style-type: none"> • Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study. • Study of screening animal models for Diuretics, nootropics, anti-Parkinson's, antiasthmatics, <p>2.2 Preclinical screening models for CNS activity</p> <p>Analgesic, antipyretic, anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease</p>		
Unit III:	Preclinical screening models for ANS activity	12
<ul style="list-style-type: none"> • Sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics 		
Unit IV:	Preclinical screening models:	12
<p>4.1 For CVS activity-</p> <ul style="list-style-type: none"> • Antihypertensives, diuretics, antiarrhythmic, antidyslipidemic, anti aggregatory, coagulants, and anticoagulants • Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics. <p>4.2 Research methodology and Bio-statistics</p> <ul style="list-style-type: none"> • Selection of research topic, review of literature, research hypothesis and study design • Pre-clinical data analysis and interpretation using Student's 't' test and One-way ANOVA. Graphical representation of data 		
Reference material:	<p>Recommended Books (latest edition):</p> <ol style="list-style-type: none"> 1. Fundamentals of experimental Pharmacology-by M.N.Ghosh 2. Hand book of Experimental Pharmacology-S.K.Kulakarni 3. CPCSEA guidelines for laboratory animal facility. 4. Drug discovery and Evaluation by Vogel H.G. 5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta 6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard 	

Course: Advanced Instrumentation Techniques (Revised 2019)

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course Code: BP8011ET	Final Year B. Pharm				Semester: VIII
Type of course: Theory-Elective	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	Before undertaking the course, students should have knowledge of the following: <ol style="list-style-type: none"> 1. Carbocation stability, fission and rearrangements. 2. Difference between protons, neutrons and electrons 3. Liquid-liquid extraction- Partition coefficient, molecular diffusion, mass transfer 				
Course Objectives:	Upon completion of the course the student shall be able to: <ol style="list-style-type: none"> 1. Understand the advanced instruments used and its applications in drug analysis 2. Understand the chromatographic separation and analysis of drugs. 3. Understand the calibration of various analytical instruments 4. Know analysis of drugs using various analytical instruments 				
Course Outcomes: Upon completion of the course the student shall be able to:					PO Mapped
CO1	Recall with examples the terminologies associated with spectroscopy, X-ray diffraction, extraction, immunoassays, calibration and validation				1, 2, 3, 8, 11
CO2	Explain and illustrate the theory, instrumentation and applications of Nuclear Magnetic Resonance spectroscopy, mass spectrometry, thermal methods of analysis, X ray diffraction methods, radioimmunoassay, extraction and hyphenated techniques and the methodology of calibration and validation of analytical instruments				1, 2, 3, 4, 6, 8, 11
CO3	Apply the knowledge gained and perform mathematical calculations to obtain: chemical shift values and relative intensities of peaks in ¹ H NMR; mass to charge ratio of fragments in MS				2, 3, 4, 8, 11
CO4	Predict the spectroscopic behavior of molecules				2, 3, 4, 8, 11
Topics covered:					
Unit I:					Hours: 10

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

<p>1.1 Nuclear Magnetic Resonance spectroscopy- Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications</p> <p>1.2 Mass Spectrometry- Principles, Fragmentation, Ionization techniques– Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications</p>					
Unit II:					Hours: 10
<p>2.1 Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)</p> <p>2.2 X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, Xray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications</p>					
Unit III:					Hours: 10
<p>3.1 Calibration and validation-as per ICH and USFDA guidelines</p> <p>3.2 Calibration of following Instruments- Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC</p>					
Unit IV:					Hours: 8
<p>4.1 Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay</p> <p>4.2 Extraction techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction</p>					
Unit V:					Hours: 7
Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS					
Reference materials:	Books:				
	<ol style="list-style-type: none"> 1. Instrumental Methods of Chemical Analysis by B.K Sharma 2. Organic spectroscopy by Y.R Sharma 3. Text book of Pharmaceutical Analysis by Kenneth A. Connors 4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel 5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 6. Organic Chemistry by I. L. Finar 7. Organic spectroscopy by William Kemp 8. Quantitative Analysis of Drugs by D. C. Garrett 9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi 10. Spectrophotometric identification of Organic Compounds by Silverstein 				
Course: Dietary Supplements and Nutraceuticals - Elective (Revised 2019)					
Course Code: BP812ET		Final Year B. Pharm			Semester: VIII
Type of course: Theory- Elective		Contact Hours: 3 Hours/week (3 Lectures + 1 Tutorial)			Total Contact Hours: 60
Course assessment Methods:		Continuous mode of assessment			Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Pre-requisites:	Basic principles of Pharmacognosy	
Course Objectives:	<p>Objective: This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to:</p> <ol style="list-style-type: none"> 1. Understand the need of supplements by the different group of people to maintain healthy life. 2. Understand the outcome of deficiencies in dietary supplements. 3. Appreciate the components in dietary supplements and the application. 4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims. 	
Course Outcomes: Upon completion of the current course the learner would be able to:		PO Mapped
CO1	Explain concept of nutraceuticals, dietary supplements, functional foods, classify these based on chemical nature, health benefits and mechanism of action	1,3,7,9,10
CO2	Acquire the knowledge of chemistry of phytochemicals as nutraceuticals, their health benefits, recommended doses along with the marketed formulations	1,3,7,9,10
CO3	To understand the effect of processing, storage and interactions of different environmental factors on the potential of nutraceuticals.	1,3,7,9,10
CO4	To understand the role of antioxidants as nutraceuticals for prevention of various chronic diseases	1,3,7,9,10
CO5	Describe the regulatory aspects for manufacture and sale of nutraceutical products and dietary supplements	1,3,7,9,10
Topics covered:		
1	UNIT I	Hours: 10
<p>a) Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.</p> <p>b) Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.</p> <p>c) Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds.</p>		
2	UNIT –II	Hours: 10
<p>Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following:</p> <ol style="list-style-type: none"> a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, leutin b) Sulfides: Diallyl sulfides, Allyl trisulfide. c) Polyphenolics: Resveratrol d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones 		

<p>e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans g) Tocopherols h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.</p>		
3	UNIT –III	Hours: 10
<p>a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids. b) Dietary fibres and complex carbohydrates as functional food ingredients..</p>		
4	UNIT –IV	Hours: 8
<p>a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney b) damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing. c) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α- Lipoic acid, melatonin Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole. d) Functional foods for chronic disease prevention</p>		
5	UNIT-V	Hours: 7
<p>a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals. b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety . Adulteration of foods. c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.</p>		
Reference material:	<p>Books:</p> <ol style="list-style-type: none"> 1. Dietetics by Sri Lakshmi 2. Role of dietary fibres and nutraceuticals in preventing diseases by K.T Agusti and P.Faizal: BSPublication. 3. Advanced Nutritional Therapies by Cooper. K.A., (1996). 4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988). 5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2 nd Edn., Avery Publishing Group, NY (1997). 6. G. Gibson and C.williams Editors 2000 Functional foods Woodhead Publ.Co.London. 7. Goldberg, I. Functional Foods. 1994. Chapman and Hall, New York. 8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good 9. Manufacturing Practice (GMPs) and Shelf Life Testing in Essentials of Functional 10. Foods M.K. Sachmidl and T.P. Labuza eds. Aspen Press. 11. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition) 12. Shils, ME, Olson, JA, Shike, M. 1994 Modern Nutrition in Health and Disease. 13. Eighth edition. Lea and Febiger 	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course Code: BP813ET	Fourth Year B. Pharm				Semester: VIII
Type of course: Theory	Contact Hours: 3 Hours/week (3L + 1T)			Total Contact Hours: 60	
Course assessment Methods:	Continuous mode of assessment				Semester-end assessment
Assessment Tool*:	Theory Sessional Exam	Attendance	Three Academic Activities	Teacher - Student interaction	End semester Examination
Max. Marks:	15	4	3	3	75
Pre-requisites:	The student should have basic knowledge of Pharmaceutics and formulation science				
Course Objectives:	This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market with respect to excipients, optimization techniques, quality control, testing of packaging materials and regulatory considerations.				
Course Outcomes: Upon completion of this course learner will be able to					PO Mapped
CO1	Understand the process product development, with respect to preformulation, formulation development and manufacturing aspects and stability studies.				1,2,3,4,6,7,10,11
CO2	Understand the about Pharmaceutical excipients with respect to product development.				1,2,3,4,6,7,10,11
CO3	Understand the concepts of Optimization and QbD and its application to pharmaceutical product development.				1,2,3,4,5,6,7,8,9,10,11
CO4	Understand the regulatory requirements and quality control testing of different types of dosage forms and packaging materials for drug products.				1,2,3,4,6,5,7,8,9,10,11
Topics covered					
1	Unit I:				Hours: 10
Introduction to pharmaceutical product development, objectives, regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms					
2	Unit II:				Hours: 10
An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories i. Solvents and solubilizers ii. Cyclodextrins and their applications iii. Non - ionic surfactants and their applications iv. Polyethylene glycols and sorbitols v. Suspending and emulsifying agents vi. Semi solid excipients					
3	Unit III:				Hours: 10

<p>An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories</p> <ul style="list-style-type: none"> i. Tablet and capsule excipients ii. Directly compressible vehicles iii. Coat materials iv. Excipients in parenteral and aerosols products v. Excipients for formulation of NDDS <p>Selection and application of excipients in pharmaceutical formulations with specific industrial applications</p>		
4	Unit IV:	Hours: 8
<p>Optimization techniques in pharmaceutical product development. A study of various optimization techniques for pharmaceutical product development with specific examples. Optimization by factorial designs and their applications. A study of QbD and its application in pharmaceutical product development.</p>		
5	Unit V:	Hours: 7
<p>Selection and quality control testing of packaging materials for pharmaceutical product development- regulatory considerations</p>		
Reference material:	<p>Books</p> <ol style="list-style-type: none"> 1. Pharmaceutical Statistics Practical and Clinical Applications by Stanford Bolton, Charles Bon; Marcel Dekker Inc. 2. Encyclopedia of Pharmaceutical Technology, edited by James Swarbrick, Third Edition, Informa Healthcare publishers. 3. Pharmaceutical Dosage Forms, Tablets, Volume II, edited by Herbert A. Lieberman and Leon Lachman; Marcel Dekker, Inc. 4. The Theory and Practice of Industrial Pharmacy, Fourth Edition, edited by Roop K. Khar, S. P. Vyas, Farhan J. Ahmad, Gaurav K. Jain; CBS Publishers and Distributors Pvt. Ltd. 2013. 5. Martin's Physical Pharmacy and Pharmaceutical Sciences, Fifth Edition, edited by Patrick J. Sinko, BI Publications Pvt. Ltd. 6. Targeted and Controlled Drug Delivery, Novel Carrier Systems by S. P. Vyas and R. K. Khar, CBS Publishers and Distributors Pvt. Ltd, First Edition 2012. 7. Pharmaceutical Dosage Forms and Drug Delivery Systems, Loyd V. Allen Jr., Nicholas B. Popovich, Howard C. Ansel, 9th Ed. 40 8. Aulton's Pharmaceutics – The Design and Manufacture of Medicines, Michael E. Aulton, 3rd Ed. 9. Remington – The Science and Practice of Pharmacy, 20th Ed. 10. Pharmaceutical Dosage Forms – Tablets Vol 1 to 3, A. Liberman, Leon Lachman and Joseph B. Schwartz 11. Pharmaceutical Dosage Forms – Disperse Systems Vol 1 to 3, H.A. Liberman, Martin, M.R and Gilbert S. Banker. 12. Pharmaceutical Dosage Forms – Parenteral Medication Vol 1 & 2, Kenneth E. Avis and H.A. Libermann. 13. Advanced Review Articles related to the topics 	

VIVEKANAND EDUCATION SOCIETY'S COLLEGE OF PHARMACY
CURRICULUM BOOK –Revised 2019

Course: Project Work (Revised 2009)							
Course Code: BP814PW	Final Year B. Pharm					Semester: VIII	
Type of course: Practical	Contact Hours: 12 Hours/week					Total Contact Hours: 12 Hours/week	
Course assessment Methods:	Mode of assessment (End Semester - By Internal and External Examiner)						
Assessment Tool*:	<i>Evaluation of Presentation (75)</i>			<i>Evaluation of Dissertation Book (75)</i>			
Max. Marks:	Presentation	Communi- cation	Q & A	Objective	Methodology	Result and discussion	Conclusion & Outcomes
	25	20	30	15	20	20	20
Pre-requisites:	Sound understanding of methods of literature search, Basic knowledge in the domain of Pharmaceutical sciences. Comfortable in working in the laboratories and passion for research Course						
Course Objectives:	<ul style="list-style-type: none"> • To inculcate research aptitude among the learners • To enhance learner's skills of applying theoretical concepts to solve a practical problem • To develop inquisitiveness among learner 						
COURSE OUTCOMES						PO Mapped	
CO1	Apply theoretical knowledge learned in classroom to a solve research problem					1, 3, 11	
CO2	Understanding the importance and applications of various subjects and their correlation in hypothesizing and solving research problem					1, 11	
CO3	Development of critical thinking, and analytical skills through hands-on learning					1, 3, 11	
CO4	Acquire various skills like Problem solving, data handling, presentation, documentation etc.					1, 2, 3, 8, 11	
CO5	Plan academic, career and personal interests via research experience					1, 2, 9	
CO6	Work collaboratively with other researchers/ fellow colleagues.					4,5,6	

