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PROGRAMME STRUCTURE

**School of Pharmacy
B.Pharm**

**Programme Code:
SOP0101**

Batch: 2024-2028



School of Pharmacy
Programme Structure

S. No	Course Code	Course Name	Category	L	T	P	Credits
Semester I							
1	BP101T	Human Anatomy and Physiology I– Theory	Core	3	1	-	4
2	BP102T	Pharmaceutical Analysis I–Theory	Core	3	1	-	4
3	BP103T	Pharmaceutics I– Theory	Core	3	1	-	4
4	BP104T	Pharmaceutical Inorganic Chemistry– Theory	Core	3	1	-	4
5	BP105T	Communication skills– Theory*	Skill Enhance ment course	2	-	-	2
6	BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics–Theory*	Core	2	-	-	2
7	BP107P	Human Anatomy and Physiology– Practical	Practical	-	-	4	2
8	BP108P	Pharmaceutical Analysis I–Practical	Practical	-	-	4	2
9	BP109P	Pharmaceutics I– Practical	Practical	-	-	4	2
10	BP110P	Pharmaceutical Inorganic Chemistry– Practical	Practical	-	-	4	2
11	BP111P	Communication skills–Practical*	Practical	-	-	2	1
12	BP112RBP	Remedial Biology– Practical*	Practical	-	-	2	1
Total Credits: 27							



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Semester II							
1	BP201T	Human Anatomy and Physiology II – Theory	Core	3	1	-	4
2	BP202T	Pharmaceutical Organic Chemistry I –Theory	Core	3	1	-	4
3	BP203T	Biochemistry– Theory	Core	3	1	-	4
4	BP204T	Pathophysiology– Theory	Core	3	1	-	4
5	BP205T	Computer Applications in Pharmacy–Theory*	Core	3	-	-	3
6	BP206T	Environmental sciences –Theory*	Skill Enhance ment course	3	-	-	3
7	BP207P	Human Anatomy and Physiology II – Practical	Core	-	-	4	2
8	BP208P	Pharmaceutical Organic Chemistry I–Practical	Core	-	-	4	2
9	BP209P	Biochemistry– Practical	Core	-	-	4	2
10	BP210P	Computer Applications in Pharmacy–Practical*	Ability Enhance ment course	-	-	2	1
Total Credits: 29							



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Semester-III							
1	BP301T	Pharmaceutical Organic Chemistry II – Theory	Core	3	1	-	4
2	BP302T	Physical Pharmaceutics I– Theory	Core	3	1	-	4
3	BP303T	Pharmaceutical Microbiology– Theory	Core	3	1	-	4
4	BP304T	Pharmaceutical Engineering–Theory	Core	3	1	-	4
5.	KVE301	Universal Human value & Professional Ethics	Ability enhancem ent course	3	0	0	3
5	BP305P	Pharmaceutical Organic Chemistry II– Practical	Practical	-	-	4	2
6	BP306P	Physical Pharmaceutics I– Practical	Practical	-	-	4	2
7	BP307P	Pharmaceutical Microbiology– Practical	Practical	-	-	4	2
8	BP308P	Pharmaceutical Engineering– Practical	Core	-	-	4	2
Total Credits: 27							



Semester IV							
1	BP401T	Pharmaceutical Organic Chemistry III– Theory	Core	3	1	-	4
2	BP402T	Medicinal Chemistry I–Theory	Core	3	1	-	4
3	BP403T	Physical Pharmaceutics II– Theory	Core	3	1	-	4
4	BP404T	Pharmacology I– Theory	Core	3	1	-	4
5	BP405T	Pharmacognosy and PhytochemistryI –Theory	Core	3	1	-	4
6	BP406P	Medicinal Chemistry I– Practical	Practical	-	-	4	2
7	BP407P	Physical Pharmaceutics II– Practical	Practical	-	-	4	2
8	BP408P	Pharmacology I– Practical	Practical	-	-	4	2
9	BP409P	Pharmacognosy and Phytochemistry I –Practical	Practical	-	-	4	2
Total Credits: 28							



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Semester-V							
1	BP501T	Medicinal Chemistry II–Theory	Core	3	1	-	4
2	BP502T	Industrial Pharmacy I–Theory	Core	3	1	-	4
3	BP503T	Pharmacology II–Theory	Core	3	1	-	4
4	BP504T	Pharmacognosy and Phytochemistry II–Theory	Core	3	1	-	4
5	BP505T	Pharmaceutical Jurisprudence–Theory	Core	3	1	-	4
6	BP506P	Industrial Pharmacy I– Practical	Practical	-	-	4	2
7	BP507P	Pharmacology II– Practical	Practical	-	-	4	2
8	BP508P	Pharmacognosy and Phytochemistry II– Practical	Practical	-	-	4	2
9	PCC301	Community connect	Practical	-	-	4	2
Total Credits: 28							



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Semester-VI							
1	BP601T	Medicinal Chemistry III–Theory	Core	3	1	-	4
2	BP602T	Pharmacology III– Theory	Core	3	1	-	4
3	BP603T	Herbal Drug Technology–Theory	Core	3	1	-	4
4	BP604T	Biopharmaceutics and Pharmacokinetics– Theory	Core	3	1	-	4
5	BP605T	Pharmaceutical Biotechnology– Theory	Core	3	1	-	4
6	BP606T	Quality Assurance– Theory	Core	3	1	-	4
7	BP607P	Medicinal chemistry III–Practical	Practical	-	-	4	2
8	BP608P	Pharmacology III– Practical	Practical	-	-	4	2
9	BP609P	Herbal Drug Technology– Practical	Practical	-	-	4	2
Total Credits: 30							



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Semester-VII							
1	BP701T	Instrumental Methods of Analysis–Theory	Core	3	1	-	4
2	BP702T	Industrial Pharmacy II–Theory	Core	3	1	-	4
3	BP703T	Pharmacy Practice–Theory	Core	3	1	-	4
4	BP704T	Novel Drug Delivery System–Theory	Core	3	1	-	4
5	BP705P	Instrumental Methods of Analysis–Practical	Practical	-	-	4	2
6	BP706PS	Practice School*	Project	-	-	12	6
Total Credits: 24							



Semester-VIII								
1	BP801T	Biostatistics and Research Methodology	Core	3	1	--	4	
2	BP802T	Social and Preventive Pharmacy	Core	3	1	-	4	
3	BP803ET	Pharma Marketing Management	Discipline specific Elective	3+ 3= 6	1+1 =2		4+4=8	
4	BP804ET	Pharmaceutical Regulatory Science	Elective					
5	BP805ET	Pharmacovigilance	Discipline specific Elective					
6	BP806ET	Quality Control and Standardization Of Herbals	Elective					
7	BP807ET	Computer Aided Drug Design	Elective					
8	BP808ET	Cell and Molecular Biology	Discipline specific Elective					
9	BP809ET	Cosmetic Science	Elective					
10	BP810ET	Experimental Pharmacology	Elective					
11	BP811ET	Advanced Instrumentation Techniques	Elective					
12	BP812ET	Dietary Supplements and Nutraceuticals	Elective					
13	BP813PW	Project Work	Project	-	-	12		6
Total Credits: 22								
Programme Credits: 215								



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Course Module



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 1
1	Course Code	BP101 T
2	Course Title	Human Anatomy & Physiology I – Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of this course the student should be able to</p> <ol style="list-style-type: none"> 1. Understand the mechanism of drug action and its relevance in the treatment of different diseases 2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments 3. Demonstrate the various receptor actions using isolated tissue preparation 4. Appreciate correlation of pharmacology with related medical sciences
6	Course Outcomes	<p>CO1: The students will be able to understand the structure and functions of various tissues and organs of the body.</p> <p>CO2: The student will be able to summarize the functioning of various body systems and their homeostasis.</p> <p>CO3: The student will be able to apply the knowledge of the anatomy and physiology of different body parts in explaining the working patterns of different body systems.</p> <p>CO4: The students will analyze the structures of various tissues and their origin to evaluate their damage and repair process.</p> <p>CO5: The students will evaluate the mechanisms of various processes on which the functioning of the various body organs depend and will observe the anatomical differentiation of different body parts.</p> <p>CO6: The students will be able to conclude about the mechanisms of various functioning of the body organs.</p>
7	Course Description	<p>This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.</p>
8	Outline syllabus	
	1	



	<p>UNIT-I</p> <p>A. 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>B. 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>C. Tissue level of organization Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.</p>
2	<p>UNIT-II</p> <p>A. Integumentary system Structure and functions of skin</p> <p>B. 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>C. Joints Structural and functional classification, types of joints movements and its Articulation</p>
3	<p>UNIT-III</p> <p>A. 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>B. Lymphatic system Lymphatic organs and tissues, lymphatic vessels, lymph circulation and</p> <p>C. Functions of lymphatic system</p>



4	<p>UNIT-IV A. Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. B. Origin and functions of spinal and cranial nerves. C .Special senses Structure and functions of eye, ear, nose and tongue and their disorders.</p>		
5	<p>UNIT-V A. 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 heart beat, its B. Regulation by autonomic nervous system, cardiac output, cardiac cycle. C. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<ol style="list-style-type: none"> 1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brother's 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. 		
Other References			



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School:	SOP	
Programme:	B.Pharm	
Branch:	Semester: 1	
1	Course Code	BP102T
2	Course Title	Pharmaceutical Analysis I- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of this course the student should be able to 1. Understand the mechanism of drug action and its relevance in the treatment of different diseases 2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments 3. Demonstrate the various receptor actions using isolated tissue preparation 4. Appreciate correlation of pharmacology with related medical sciences
6	Course Outcomes	CO1: Students will be able to understand about the Pharmaceutical analysis and its importance in Pharmacy. CO2: Students will able to evaluate about different types of analytical techniques. CO3: Students can apply their analytical knowledge regarding Gravimetry. CO4: Students will able to explain difference between volumetric, quantitative and qualitative analysis. CO5: Students will be able to conclude about Electrochemical methods of analysis CO6: Students will be able to generalize about Non aqueous titrations.
7	Course Description	This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drug
8	Outline syllabus	



1	<p>UNIT-I</p> <p>A. Pharmaceutical Analysis</p> <p>Definition and scope</p> <p>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.</p> <p>B. Errors: Sources of errors, types of errors,</p> <p>C. Methods of minimizing errors, accuracy, precision and significant figures.</p>
2	<p>UNIT-II</p> <p>A. Acid base titration & Non aqueous titration</p> <p>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 curves</p> <p>B. Non aqueous titration: Solvents,</p> <p>C. acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl</p>
3	<p>UNIT-III</p> <p>A. Precipitation titrations, Complexometric titration & Gravimetry, Diazotization</p> <p>Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride. Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.</p> <p>B. Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.</p> <p>C. Define the Diazotization with their principle, methodology and their uses</p>
4	<p>UNIT-IV</p> <p>A. Redox titrations</p> <p>Concepts of oxidation and reduction</p> <p>B. Types of redox titrations (Principles and applications) Cerimetry</p> <p>C. Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate.</p>



5	<p>UNIT-V</p> <p>A. Electrochemical methods of analysis Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications.</p> <p>B. 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.</p> <p>C. Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine electrode, applications</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<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. 		



School:		SOP
Programme:		B.Pharm
Branch:		Semester: 1
1	Course Code	BP103T
2	Course Title	Pharmaceutics – Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of this course the student should be able to:</p> <ul style="list-style-type: none"> ● Know the history of profession of pharmacy ● Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations ● Understand the professional way of handling the prescription ● Preparation of various conventional dosage forms
6	Course Outcomes	<p>Student will be able</p> <p>CO1: to understand about general formulation, classification of different dosage forms and various Pharmacopoeias-IP, BP, USP etc.</p> <p>CO2: to apply the professional way of handling the prescription, excipients used in different dosage forms, various factors affecting Posology and solubility enhancement techniques.</p> <p>CO3: to illustrate different methods of preparation of various semisolid dosage forms and how to calculate the dose of pediatric patients, different calculations based on the Imperial & Metric system.</p> <p>CO4: to distinguish between various Monophasic and biphasic liquids.</p> <p>CO5: to explain about different types of semisolid dosage forms like suspension, emulsion, ointments, pastes, creams etc.</p> <p>CO6: to predict stability problems in different dosage forms.</p>
7	Course Description	<p>This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.</p>



8	Outline syllabus
1	<p>UNIT-I</p> <p>A. 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.</p> <p>B. Dosage forms: Introduction to dosage forms, classification and definitions</p> <p>C. Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription. Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.</p>
2	<p>UNIT-II</p> <p>A. Pharmaceutical Calculations, Powders, Liquid dosage forms Weight & Measures, Calculation involving Percentage solution etc.</p> <p>B. Definition of Powders, Eutectic Mixtures, Geometric Dilutions.</p> <p>C. Solubility enhancement techniques Advantages & disadvantage of liquid dosage forms.</p>
3	<p>UNIT-III</p> <p>A. Monophasic and Biphasic liquids</p> <p>Introduction of various monophasic liquids such as gargles, syrups, liniments, Eardrops etc.</p> <p>B. Suspensions, different types of suspension & stability problems & methods to overcome</p> <p>C. Emulsions, classification & different methods of preparation, stability problems & methods to overcome</p>
4	<p>UNIT-IV</p> <p>A. Pharmaceutical Incompatibilities & Suppositories</p> <p>B. Definition and classification of different pharmaceutical incompatibilities</p> <p>C. Suppositories: types, methods of preparation, types of base, Evaluation and Displacement value.</p>



5	UNIT-V A. Semisolid Dosage Forms Definition, classification, B.Mechanism Preparation of ointments, paste, creams, gels. C.Excipients used and Evaluation of semi solid dosage forms.		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<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. Francoise Nieloud and Gilberte 		
Other References			



School:	SOP	
Programme:	B.Pharm	
Branch:	Semester: 1	
1	Course Code	BP104T
2	Course Title	Pharmaceutical Inorganic Chemistry -Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of this course the student should be able to</p> <ol style="list-style-type: none"> 1. Understand the mechanism of drug action and its relevance in the treatment of different diseases 2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments 3. Demonstrate the various receptor actions using isolated tissue preparation 4. Appreciate correlation of pharmacology with related medical sciences
6	Course Outcomes	<p>CO1 Students shall be able to illustrate various sources of impurities and their control in inorganic drugs and pharmaceuticals.</p> <p>CO2 Students shall be able to explain concept of acids, bases and buffers and methods of calculating and adjusting isotonicity.</p> <p>CO3 Students shall be able to discuss major intra and extracellular ions, replacement therapy and physiological acid-base balance.</p> <p>CO4 Students shall be able to evaluate various inorganic compounds, like gastrointestinal agents, dental products and antimicrobials.</p> <p>CO5 Students will be able to apply knowledge about radiopharmaceuticals, their handling, hazards and uses.</p> <p>CO6 Students shall be able to understand importance of inorganic compounds which can be used as useful medicinal compounds.</p>
7	Course Description	This subject deals with the monographs of inorganic drugs and pharmaceuticals.
8	Outline syllabus	
	1	<p>UNIT-I</p> <p>A. Impurities in pharmaceutical substances</p> <p>History of Pharmacopoeia,</p> <p>B. Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead C. Heavy metals, modified limit test for Chloride and Sulphate</p>



2	<p>UNIT-II</p> <p>A. Acids, Bases and Buffers Major extra and intracellular electrolytes, Dental products</p> <p>B. Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting tonicity.</p> <p>C. Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.</p>		
3	<p>UNIT-III</p> <p>A. Gastrointestinal agents Acidifiers: Ammonium chloride* and Dil. HCl Antacid: Ideal properties of antacids, combinations of antacids, Sodium 40 Bicarbonate*, Aluminum hydroxide gel, B. Magnesium hydroxide mixture Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite Antimicrobials: C. Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparation</p>		
4	<p>UNIT-IV</p> <p>A. Miscellaneous compounds Expectorants: Potassium iodide, Ammonium chloride*. Emetics: Copper sulphate*, B. Sodium potassium tartarate Haematinics: Ferrous sulphate*, C. Ferrous gluconate Poison and Antidote: Sodium thiosulphate*, Activated charcoal Sodium nitrite Astringents: Zinc Sulphate, Potash Alum</p>		
5	<p>UNIT-V</p> <p>A. Radiopharmaceuticals Radio activity, Measurement of radioactivity, B. Properties of α, β, γ radiations, Half life, radio isotopes and C. study of radio isotopes - Sodium iodide I131 , Storage conditions, precautions & pharmaceutical application of radioactive substances.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



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Text book/s*	<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, 4th edition.2. A.I. Vogel, Text Book of Quantitative Inorganic analysis3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition4. M.L Schroff, Inorganic Pharmaceutical Chemistry5. Bentley and Driver's Textbook of Pharmaceutical Chemistry6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
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School:		SOP
Programme:		B.Pharm
Branch:		Semester: 1
1	Course Code	BP105T
2	Course Title	Communications Theory Theory
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course the student shall be able to</p> <p>Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation</p> <p>Communicate effectively (Verbal and Non Verbal)</p> <p>Effectively manage the team as a team player</p> <p>Develop interview skills</p> <p>Develop Leadership qualities and essentials</p>
6	Course Outcomes	<p>CO1: students will be able to Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation</p> <p>CO2: students will be able to plan how to Communicate effectively (Verbal and Non Verbal)</p> <p>CO3: students will be able to apply Effectively to manage the team as a team player</p> <p>CO4: students will be able to Develop interview skills</p> <p>CO5: students will be able to generalize about Leadership qualities and essentials</p> <p>CO6: students will be able to plan about Group discussion</p>
7	Course Description	<p>This course will 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.</p>
8	Outline syllabus	



1		<p>UNIT-I</p> <p>A. Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context</p> <p>B. Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers</p> <p>C. Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment</p>
2		<p>UNIT-II</p> <p>A. Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication</p> <p>B. Communication Styles: Introduction, The Communication Styles Matrix with example for each –</p> <p>C. Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style</p>
3		<p>UNIT-III</p> <p>A. Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming anActive Listener, Listening in Difficult Situations</p> <p>B. 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</p> <p>C. Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message</p>



4	<p>UNIT-IV</p> <p>A. Interview Skills: Purpose of an interview, Do's and Don'ts of an interview</p> <p>B. Giving Presentations: Dealing with Fears, Planning your Presentation,</p> <p>C. Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery</p>		
5	<p>UNIT-V</p> <p>A. Group Discussion:</p> <p>B. Introduction, Communication skills in group discussion,</p> <p>C. Do's and Don'ts of group discussion</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05 Marks	10	35



Text book/s*	<ol style="list-style-type: none">1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 20112. Communication skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 20113. Organizational Behaviour, Stephen .P. Robbins, 1st Edition, Pearson, 20134. Brilliant- Communication skills, Gill Hasson, 1st Edition, Pearson Life, 20115. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, GopalaSwamy Ramesh, 5th Edition, Pearson, 20136. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Greenhall, 1st Edition Universe of Learning LTD, 20107. Communication skills for professionals, Konar nira, 2nd Edition, New arrivals – PHI, 20118. Personality development and soft skills, Barun K Mitra, 1st Edition, Oxford Press, 20119. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 201110. Soft skills and professional communication, Francis Peters SJ, 1st Edition, Mc GrawHill Education, 201111. Effective communication, John Adair, 4th Edition, Pan Mac Millan, 200912. Bringing out the best in people, Aubrey Daniels, 2nd Edition, Mc Graw Hill, 1999
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School:		SOP
Programme:		B.Pharma
Branch:		Semester: 1
1	Course Code	BP106 RBT
2	Course Title	Remedial biology - Theory
3	Credits	4
4	Contact Hours (L-T-P)	2-0-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course, the student shall be able to</p> <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 -Know understand the basic components of anatomy & physiology animal with special reference to human
6	Course Outcomes	<p>CO1: Students will be able to generalize would acquire knowledge of five kingdoms of life, morphology and anatomy of flowering plants, anatomy and physiology of plants and humans and various plant growth regulators.</p> <p>CO2: Students would be able to understand the anatomy and physiology of plants and humans.</p> <p>CO3: Students will be able to apply the knowledge of the anatomy and physiology of different body parts in explaining the working patterns of different body systems.</p> <p>CO4: The students will analyze the structures of various tissues and their origin.</p> <p>CO5: The students would evaluate the mechanisms of various processes on which the functioning of the various body organs and plants depend. Moreover, will observe the anatomical differentiation of different body parts of human.</p> <p>CO6: The students will be able to predict about the mechanisms of various body organs and plants</p>
7	Course Description	To learn and understand the components of living world, structure and functional system of plant and animal kingdom. Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.
8	Outline syllabus	



1	<p>UNIT-I</p> <p>A.Living world: 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> <p>B.Morphology of Flowering plants Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed. C.General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledones</p>
2	<p>UNIT-II</p> <p>A.Body fluids and circulation 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</p> <p>B.Digestion and Absorption Human alimentary canal and digestive glands Role of digestive enzymes Digestion, absorption and assimilation of digested food</p> <p>C.Breathing and respiration Human respiratory system Mechanism of breathing and its regulation Exchange of gases, transport of gases and regulation of respiration Respiratory volumes</p>
3	<p>UNIT-III</p> <p>A.Excretory products and their elimination Modes of excretion Human excretory system- structure and function Urine formation Rennin angiotensin system</p> <p>B.Neural control and coordination 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</p> <p>C.Chemical coordination and regulation Endocrine glands and their secretions Functions of hormones secreted by endocrine glands</p> <p>Human reproduction Parts of female reproductive system Parts of male reproductive system Spermatogenesis and Oogenesis Menstrual cycle</p>



4	UNIT-IV A.Plants and mineral nutrition: Essential mineral, macro and micronutrients B. Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation C.Photosynthesis Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.		
5	UNIT-V A.Plant Respiration: Respiration, glycolysis, fermentation (anaerobic). B.Plant growth and development Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators C.Cell - The unit of life Structure and functions of cell and cell organelles. Cell division D.Tissues Definition, types of tissues, location and functions.		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05 Marks	10	35
Text book/s*	a. Text book of Biology by S. B. Gokhale A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.		
Other References	a. A Text book of Biology by B.V. Sreenivasa Naidu b. A Text book of Biology by Naidu and Murthy c. Botany for Degree students By A.C.Dutta. d. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthakrishnan. e. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate		



School:	SOP	
Programme:	B.Pharm	
Branch:	Semester: 1	
1	Course Code	BP106 RMT
2	Course Title	Remedial Mathematics - Theory
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the student shall be able to -Know the classification and salient features of five kingdoms of life -Understand the basic components of anatomy & physiology of plant -Know understand the basic components of anatomy & physiology animal with special reference to human
6	Course Outcomes	CO1: Students would acquire knowledge of partial fraction and logarithms CO2: Students would be able to understand about matrices and determinants CO3: Students will be able to apply the knowledge of Differentiation. CO4: Students will be able to analyze the knowledge of Integration CO5: Students will be able to interpret differential equations. CO6: Students will be able to apply mathematical techniques.
7	Course Description	This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform
8	Outline syllabus	



1	<p>UNIT – I</p> <p>A.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>B.Logarithms Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.</p> <p>C.Function: Real Valued function, Classification of real valued functions,</p> <p>Limits and continuity : Introduction , Limit of a function, Definition of limit of a function</p>
2	<p>UNIT –II</p> <p>A.Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants ,</p> <p>B.Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix,</p> <p>C.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>
3	<p>UNIT – III</p> <p>A.Calculus</p> <p>Differentiation : Introductions, Derivative of a function, Derivative of a constant,</p> <p>B. 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),</p> <p>C. Derivative of the quotient of two functions (Quotient formula) – Without Proof,</p> <p>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>



4	<p>UNIT - IV</p> <p>A. Analytical Geometry</p> <p>Introduction: Signs of the Coordinates, Distance formula,</p> <p>B. 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</p> <p>C. Integration:</p> <p>Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application</p>		
5	<p>UNIT-V</p> <p>A. Differential Equations : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations</p> <p>B. Laplace Transform : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives,</p> <p>C. Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	5 Marks	10	35
Text book/s*	<ol style="list-style-type: none"> 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 		
Other References			



School:	SOP
Programme:	B.Pharm
Branch:	Semester: 1
1 Course Code	BP107P
2 Course Title	Human Anatomy and Physiology- Practical
3 Credits	2
4 Contact Hours (L-T-P)	0-0-4
Course Type	Compulsory
5 Course Objective	<ol style="list-style-type: none"> 1. To understand how to handle the microscope in Human Anatomy & Physiology lab 2. To calculate Hb content, WBC & RBC count and Erythrocyte 3. To identify axial and skeletal bones of Human skeleton 4. To learn and practice how to record Blood Pressure of given subject
6 Course Outcomes	<p>CO1: Student will be able to Understand how to handle the microscope in Human Anatomy & Physiology lab</p> <p>CO2: Student will be able to analyze Hb content, WBC & RBC count and Erythrocyte sedimentation rate</p> <p>CO3: Student will be able to Identify axial and skeletal bones of Human skeleton</p> <p>CO4: Student will be able to interpret Blood Pressure of given subject</p> <p>CO5: Student will be able to skeletal bones of Human skeleton</p> <p>CO6: Students shall be able to understand and know body parts</p>
7 Course Description	Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.
8 Outline syllabus	
1	UNIT-I a). Study of compound microscope b). Microscopic study of epithelial and connective tissue c). Microscopic study of muscular and nervous tissue
2	UNIT-II a). Identification of axial bones b). Identification of appendicular bones



3	UNIT-III a). Introduction to hemocytometry and enumeration of white blood cell (WBC) count b). Enumeration of total red blood corpuscles (RBC) count c). Determination of bleeding time 10. Determination of clotting time		
4	UNIT-IV a). Determination of blood group b). Estimation of hemoglobin content c). Determination of erythrocyte sedimentation rate (ESR)		
5	UNIT-V a). Determination of heart rate and pulse rate b). Recording of blood pressure		
Mode of examination	Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05	10	35
Text book/s*	1. Essentials of Medical Physiology K.Sembulingam and P.Sembulingam. Jaypee brothers medical publishers, NewDelhi. 2. Anatomy and Physiology in Health and Illness by Kathleen W.Wilson ,Churchill Livingstone, New York		
Other References	Physiological basis of Medical Practice Bestand Tailor. Williams & Wilkins Co, Riverview, MI USA		



School:		SOP
Programme:		B.Pharm
Branch:		Semester: 1
1	Course Code	BP108P
2	Course Title	Pharmaceutical Analysis – Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course, the student shall be able to</p> <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 -Know understand the basic components of anatomy & physiology animal with special reference to human
6	Course Outcomes	<p>CO1: Upon completion of course student shall be able to understand about limits of impurities in a particular drug and to perform limit test to identify and determine the impurities in pharmaceuticals.</p> <p>CO2: Students shall be able to perform standardization and analyze given sample strength of drug or pharmaceuticals.</p> <p>CO3: Students shall be able to know the purity testing of drugs and pharmaceuticals. They can apply these strength tests to analyze and evaluate the sample.</p> <p>CO4: Students shall be able to understand about electrochemical analysis for pharmaceutical sample.</p> <p>CO5: Students shall be able to perform standardization and analyze given sample strength of drug or pharmaceuticals.</p> <p>CO6: Students shall be able to apply purity testing of pharmaceuticals.</p>
7	Course Description	Deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs
8	Outline syllabus	
	1	<p>UNIT-I</p> <ul style="list-style-type: none"> a). Limit test for Chlorides and Sulphates b). Modified limit test for Chlorides and Sulphates c). Limit test for Iron d). Limit test for Heavy metals e). Limit test for Lead Limit test for Arsenic



2	UNIT-II a). Sodium hydroxide b). Sulphuric acid c). Sodium thiosulfate d). Potassium permanganate e). Ceric ammonium sulphate		
3	UNIT-III a). Ammonium chloride by acid base titration b). Sodium Chloride by precipitation titration		
4	UNIT-IV Conductometric titration of strong acid against strong base		
5	UNIT-V a). Sodium hydroxide b). Sulphuric acid c). Sodium thiosulfate		
Mode of examination	Theory/Jury/Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05	10	35
Text book/s*	Practical human anatomy and physiology by S.R.Kale and R.R.Kale. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava. Biology practical manual according to National core curriculum .Biology forum of Karnataka. ProfM.J.H.Shafi		



School:	SOP
Programme :	B.Pharm
Branch:	Semester: 1
1 Course Code	BP109P
2 Course Title	Pharmaceutics –I Practical
3 Credits	2
4 Contact Hours (L-T-P)	0-0-4
Course Type	Compulsory
5 Course Objective	This course will impart basic knowledge in the area of pharmaceutics and formulation of different pharmaceutical dosage forms. The students will get hands-on training in the preparation of such dosage forms in the laboratory.
6 Course Outcomes	<p>CO1: Upon completion of course student shall be able to understand about different methods of preparation of various monophasic and biphasic liquid dosage forms.</p> <p>CO2: Students shall be able to apply specific types of excipients used in preparation of semisolid dosage forms.</p> <p>CO3: Students shall be able to interpret different types of pharmaceutical dosage forms like syrups,elixirs,solutions,paints,gargles,mouthwashes,suspensions,emulsions,powders,ointments,pastes etc.</p> <p>CO4: Students shall be able to differentiate between different methods of preparation of pharmaceutical dosage forms.</p> <p>CO5: Students shall be able to interpret specific types of excipients used in preparation of semisolid dosage forms.</p> <p>CO6: Students shall be able to understand Different types of pharmaceutical formulations for the human use.</p>
7 Course Description	This course is designed to impart knowledge on preparatory pharmacy and professional way of preparing various dosage forms such as monophasic liquids, biphasic liquids, semisolid dosage forms etc.
8 Outline syllabus	



1	<p>UNIT-I</p> <p>A. Syrups Syrup IP'66 Compound syrup of Ferrous Phosphate BPC'68</p> <p>B. Elixirs Piperazine citrate elixir Paracetamol pediatric elixir</p>
2	<p>UNIT-II</p> <p>A. Linctus Terpin Hydrate Linctus IP'66 Iodine Throat Paint (Mandles Paint)</p> <p>B. Solutions Strong solution of ammonium acetate Cresol with soap solution Lugol's solution</p>
3	<p>UNIT-III</p> <p>A. Suspensions Calamine lotion Magnesium Hydroxide mixture Aluminium Hydroxide gel</p> <p>B. Emulsions Turpentine Liniment Liquid paraffin emulsion</p>
4	<p>UNIT-IV</p> <p>A. Powders and Granules ORS powder (WHO) Effervescent granules Dusting powder Divided powders</p> <p>B. Suppositories Glycero gelatin suppository Coca butter suppository Zinc Oxide suppository</p>



5	UNIT-V A. Semisolids Sulphur ointment Non staining-iodine ointment with methyl salicylate Carbopal gel B. Gargles and Mouthwashes Iodine gargle Chlorhexidine mouthwash		
Mode of examination	Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05Marks	10	35
Text book/s*	H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh. 1. Indian pharmacopoeia. 2. British pharmacopoeia.		
Other References			



School:		SOP
Programme:		B.Pharm
Branch:		Semester: I
1	Course Code	BP110P
2	Course Title	Pharmaceutical inorganic chemistry- Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	The students will know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
6	Course Outcomes	<p>CO1: Student shall be able to understand about the limits of impurities in a particular drug and to perform limit test to identify and determine the impurities in inorganic drugs and pharmaceuticals.</p> <p>CO2: Students shall be able to perform identification test and analyze given sample of drug or pharmaceuticals.</p> <p>CO3: Students shall be able to interpret the purity testing of inorganic drugs and pharmaceuticals. They can apply these purity tests to analyze and evaluate the sample.</p> <p>CO4: Students shall be able to apply methods of preparation of drugs and pharmaceuticals.</p> <p>CO5: Students shall be able to apply methods of preparation of various inorganic drugs.</p> <p>CO6: Students shall be able to evaluate the presence of inorganic compounds in biological fluids.</p>
7	Course Description	Limit test for non- toxic and toxic impurities, identification test for some Drugs, preparation of some drugs and purity test for some inorganic drugs and pharmaceuticals.
8	Outline syllabus	
	1	<p>UNIT-I</p> <p>a). Limit test for Chlorides and Sulphates</p> <p>b). Modified limit test for Chlorides and Sulphates</p> <p>c). Limit test for Iron</p> <p>d). Limit test for Heavy metals</p> <p>e). Limit test for Lead Limit test for Arsenic</p>



2	UNIT-II a). Magnesium hydroxide b). Ferrous sulphate c). Sodium bicarbonate d). Calcium gluconate e). Copper sulphate		
3	UNIT-III a). Swelling power of Bentonite b). Neutralizing capacity of aluminum hydroxide gel c). Determination of potassium iodate and iodine in potassium Iodide		
4	UNIT-IV a). Boric acid b). Potash alum c). Ferrous sulphate		
5	UNIT-V a). Ferrous sulphate b). Sodium bicarbonate		
Mode of examination	Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05 Marks	10	35
Text book/s*	Practical human anatomy and physiology. by S.R.Kale and R.R.Kale. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava. Biology practical manual according to National core curriculum .Biology forum of Karnataka. ProfM.J.H.Shafi		
Other References			



School:		SOP
Programme:		B.Pharm
Branch:		Semester: 1
1	Course Code	BP112 RBP
2	Course Title	Remedial biology Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-2
	Course Type	Compulsory
5	Course Objective	<ol style="list-style-type: none"> 1. To understand how to handle the microscope in lab. 2. To identify axial and skeletal bones of Human skeleton 3. To learn and practice how to record Blood Pressure of given subject. 4. To Study morphology and microscopy of Stem, Root, Leaf, seed, fruit, flower and their modifications. 5. Identification of blood group.
6	Course Outcomes	<p>CO1: Student will be able to understand how to handle the microscope in lab.</p> <p>CO2: Student will be able to Identify axial and skeletal bones of Human skeleton</p> <p>CO3: Student will be able to Record Blood Pressure of given subject.</p> <p>CO4: Student will be able to understand study Morphological and histological characteristics of root, Stem, Leaf, Seed, Fruit and Flower.</p> <p>CO5: Student will be able to interpret the blood group of subject.</p> <p>CO6: Students will be able to apply practical knowledge of identification of Bones.</p>
7	Course Description	Practical is complimentary to the theoretical discussions remedial biology and allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings and plants. This is helpful for developing an insight on the subject.
8	Outline syllabus	
	1	<p>UNIT-I</p> <ol style="list-style-type: none"> a). Study of compound microscope b). Microscopic study of leaves and flowers c). Microscopic study of roots and stem



	2	UNIT-II a). Identification of axial bones b). Identification of appendicular bones		
	3	UNIT-III a). Determination of blood group b). Estimation of hemoglobin content		
	4	UNIT-IV Determination of heart rate and pulse rate		
	5	UNIT-V Recording of blood pressure		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05 Marks	05	15
	Text book/s*	Practical human anatomy and physiology. by S.R.Kale and R.R.Kale. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava. Biology practical manual according to National core curriculum . Biology forum of Karnataka. Prof .M.J.H.Shafi		
	Other References			



School:		SOP
Programme:		B.Pharm
Branch:		Semester: 2
1	Course Code	BP 201T
2	Course Title	Human Anatomy & Physiology-II
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<ol style="list-style-type: none"> 1. Explain the gross morphology, structure and functions of various organs of the human body. 2. Describe the various homeostatic mechanisms and their imbalances. 3. Identify the various tissues and organs of different systems of human body. 4. Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume. 5. Appreciate coordinated working pattern of different organs of each system 6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.
6	Course Outcomes	<p>CO1: The students will understand the structure and functions of various systems and organs of the body. Also about increase the understanding about genes and genetics.</p> <p>CO2: The student will be able to summarize the functioning of various body systems and their homeostasis.</p> <p>CO3: The student will be able to apply the knowledge of the functioning of various body systems and the structures of the organs involved in it.</p> <p>CO4: The students will analyze the correlation of various body systems and how they result in particular kind of functions.</p> <p>CO5: The students would evaluate the processes like respiration, Excretion, digestion hormone release and reproduction by understand their mechanisms.</p> <p>CO6: The students would evaluate the processes and analyze their correlation with various body systems</p>



7	Course Description	This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.
8	Outline syllabus	
	1	UNIT-I A. Nervous system Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters. B. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. structure and functions of brain (cerebrum, brain stem, cerebellum), C. spinal cord (gross structure, functions of afferent and efferent nerves, reflex activity)
	2	UNIT-II A. 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. B. Energetics Formation and role of ATP, Creatinine Phosphate and BMR. C. Joints Structural and functional classification, types of joints movements and its articulation



3	<p>UNIT-III</p> <p>A. Respiratory system 10 hours 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.</p> <p>B. 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, C. micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.</p>		
4	<p>UNIT-IV</p> <p>A. Endocrine system Classification of hormones, mechanism of hormone action, B. structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, C. pancreas, pineal gland, thymus and their disorders.</p>		
5	<p>UNIT-V</p> <p>A. 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</p> <p>B. Introduction to genetics C. Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<p>Practical human anatomy and physiology. by S.R.Kale and R.R.Kale. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava. Biology practical manual according to National core curriculum .Biology forum of Karnataka. ProfM.J.H.Shafi</p>		



School:		SOP
Programme:		B.Pharma
Branch:		Semester: 2
1	Course Code	BP202T
2	Course Title	Pharmaceutical organic chemistry-I Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course the student shall be able to <ol style="list-style-type: none">1. Write the structure, name and the type of isomerism of the organic compound2. Write the reaction, name the reaction and orientation of reactions.3. Account for reactivity/stability of compounds.4. Identify/ confirm the identification of organic compound.
6	Course Outcomes	<p>CO1: The students will have the knowledge to identify, name, and write the structure of different aliphatic compounds and their derivatives.</p> <p>CO2: The students will be able to understand and explain the mechanism behind the naming reactions of different aliphatic compounds and their derivatives.</p> <p>CO3: The students can apply the knowledge to prepare the derivatives of aliphatic compounds with different functional groups.</p> <p>CO4: Students will analyze the chemical reactions, stabilities of organic compounds and properties of the compounds prepared by them in the laboratory.</p> <p>CO5: Students would evaluate by comparing compounds prepared by them with standard compounds by chemical and physical properties</p> <p>CO6: Students will analyze the chemical reactions and stabilities of organic compounds</p>
7	Course Description	This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.



8	Outline syllabus	
	1	UNIT-I A. Classification, nomenclature and isomerism Classification of Organic Compounds B. Common and IUPAC systems of nomenclature of organic compounds C. Structural isomerisms in organic compounds
	2	UNIT-II A. Alkanes*, Alkenes* and Conjugated dienes* SP ³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins. B. Stabilization of alkenes, SP ² hybridization of alkenes. E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E1 versus E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition C. reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement
	3	UNIT-III A. Alkyl halides* SN ₁ and SN ₂ reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN ₁ versus SN ₂ reactions, Factors affecting SN ₁ and SN ₂ reactions Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. B. Alcohols* - Qualitative tests, Structure and uses of Ethyl alcohol, C. Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol



4	<p>UNIT-IV A. Carbonyl compounds* (Aldehydes and ketones) Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldolcondensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, B. Qualitative tests of carbonyl compounds Structure and uses of Formaldehyde, Paraldehyde, Acetone, C.Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.</p>		
5	<p>UNIT-V A. 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. B. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid Aliphatic amines. C. Basicity, effect of substituents on basicity, identification test, Structure and uses of Ethanolamine, ethylenediamine, amphetamine.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	Practical human anatomy and physiology. by S.R.Kale and R.R.Kale. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi		
Other References			



School:		SOP
Programme:		B.Pharm
Branch:		Semester: 2
1	Course Code	BP203 T
2	Course Title	Biochemistry- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course, the student shall be able to</p> <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 -Know understand the basic components of anatomy & physiology animal with special reference to human
6	Course Outcomes	<p>CO1: The students will understand the structure and functions of carbohydrate, lipids, nucleic acids, amino acids and proteins. Concept of free energy, endergonic and exergonic reaction, Relationship, between free energy.</p> <p>CO2:The student will be able to summarize the Citric acid cycle-Pathway, energetics and significance, HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency</p> <p>CO3: The student will be able to apply the knowledge of the Amino acid and lipid metabolism.</p> <p>CO4: The students will analyze the correlation of Nucleic acid metabolism and genetic information transfer.</p> <p>CO5: The students would Introduction, properties, nomenclature and IUB classification of enzymes, Enzyme kinetics (Michaelis plot, Line Weaver Burke plot).</p> <p>CO6: The student will understand the importance of biochemistry.</p>
7	Course Description	<p>Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.</p>

8	Outline syllabus	
	1	<p>UNIT-I A. Biomolecules and Bioenergetics Topic1- Introduction, classification, chemical nature and biological role of carbohydrate. Topic2- Introduction, classification, chemical nature and biological role lipids, nucleic acids, amino acids and proteins. B. Topic3-Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. C. Energy rich compounds; classification; biological significances of ATP and cyclic AMP</p>
	2	<p>UNIT-II A. Carbohydrate metabolism and Biological oxidation Topic1- 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). B. Topic2- Gluconeogenesis- Pathway and its significance Hormonal regulation of blood glucose level and Diabetes mellitus C. Topic3- Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate Phosphorylation, Inhibitors ETC and oxidative phosphorylation/Uncouplers level</p>
	3	<p>UNIT-III A. Lipid metabolism and Amino acid metabolism 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. B. General reactions of amino acid metabolism: (Phenylketonuria, Albinism, alcaptonuria, tyrosinemia) Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline Catabolism of heme; hyperbilirubinemia and jaundice</p>
	4	



5	UNIT-V A. Enzymes Topic1- Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) Enzyme inhibitors with examples B.Topic2- Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation C.Topic3- Therapeutic and diagnostic applications of enzymes and isoenzymes, Coenzymes –Structure and biochemical functions		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	Practical human anatomy and physiology. by S.R.Kale and R.R.Kale. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava. Biology practical manual according to National core curriculum .Biology forum of Karnataka. ProfM.J.H.Shafi		



School:		SOP
Programme:		B.Pharm
Branch:		Semester: 2
1	Course Code	BP204T
2	Course Title	Pathophysiology- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>1. To distinguish between environmental factors, physical, psychosocial, and cognitive characteristics of various diseases and conditions.</p> <p>2. To understand basic concepts of inflammatory diseases</p> <p>3. To Demonstrate and understand mechanisms of diseases, the diagnosis of diseases, and the treatment of diseases</p> <p>4. To understand how the various organ systems are interrelated, and use this understanding to promote a holistic approach towards the evaluation and treatment of patients</p>
6	Course Outcomes	<p>CO1: Student will be able to Distinguish environmental factors, physical, psychosocial, and cognitive characteristics of various diseases and conditions.</p> <p>CO2: Student will be able to apply concepts and elements of inflammatory diseases</p> <p>CO3: Student will be able to Demonstrate an understanding of the mechanisms of diseases, the diagnosis of diseases, and the treatment of diseases</p> <p>CO4: Students will be able to understand how the various organ systems are interrelated, and use this understanding to promote a holistic approach towards the evaluation and treatment of patients</p> <p>CO5: Students will be able to compare and discriminate between the Infectious and sexually transmitted diseases.</p> <p>CO6: Students will be able to understand about infectious diseases.</p>
7	Course Description	<p>Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.</p>
8	Outline syllabus	



1	<p>UNIT-I A. Basic principles of Cell injury and Adaptation & Basic mechanism involved in the process of inflammation and repair Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage).</p> <p>A. 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>B. Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's,</p> <p>C. Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis</p>
2	<p>UNIT-II A. Cardiovascular, Respiratory and Renal Diseases Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, B. atherosclerosis and arteriosclerosis) Asthma, Chronic obstructive airways diseases. C. Acute and chronic renal failure</p>
3	<p>UNIT-III A. Hematological, Endocrine, Nervous and GIT diseases Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, B. haemophilia Diabetes, thyroid diseases, disorders of sex hormones & Peptic ulcer C. Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.</p>
4	<p>UNIT-IV A. Cancer and inflammatory diseases Classification, etiology and pathogenesis of cancer Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease. B. Rheumatoid arthritis, C. osteoporosis and gout</p>



5	UNIT-V A. Infectious & Sexually transmitted diseases (STDs) Meningitis, Typhoid, Leprosy, B. Tuberculosis Urinary tract infections C. AIDS, Syphilis & Gonorrhoea		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	Practical human anatomy and physiology. by S.R.Kale and R.R.Kale. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi		
Other References			



School:		SOP
Programme:		B.Pharm
Branch:		Semester: II
1	Course Code	BP205T
2	Course Title	Computer applications in Pharmacy- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course the student shall be able to know the various types of application of computers in pharmacy know the various types of databases know the various applications of databases in pharmacy
6	Course Outcomes	Upon completion of the course, the student shall be able to CO1: understand the Binary number system CO2: interpret the web technologies CO3: apply about application of computers in Pharmacy CO4: the Bioinformatics Databases, Concept of Bioinformatics CO5: Computers as data analysis in Preclinical development: CO6: Students will understand use of Computers in Preclinical development:
7	Course Description	This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.
8	Outline syllabus	
	1	UNIT-I A. 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



2	UNIT-II A. Webtechnologies: Introduction to HTML, XML,CSS and Programmemeing languages, introduction to web servers and Server Products B. Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database		
3	UNIT-III A. Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System		
4	UNIT-IV A. Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery		
5	UNIT-V A. Computers as data analysis in Preclinical development: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)		
Mode of examination	Theory/Jury/Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10	15	75



Text book/s*	<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, USA3. 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
Other References	



School:		SOP
Programme:		B. Pharm
Branch:		Semester: II
1	Course Code	BP206 T
	Course Title	Environmental Sciences (Theory)
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course the student shall be able to:</p> <p>Create the awareness about environmental problems among learners.</p> <p>Impart basic knowledge about the environment and its allied problems.</p> <p>Develop an attitude of concern for the environment.</p> <p>Motivate learner to participate in environment protection and environment improvement.</p> <p>Acquire skills to help the concerned individuals in identifying and solving environmental problems.</p> <p>Strive to attain harmony with Nature.</p>
6	Course Outcomes	<p>CO1: Student shall be able to understand the Multidisciplinary nature of environmental studies</p> <p>CO2: Student shall be able to apply Concept of an ecosystem.</p> <p>CO3: Student shall be able to analyze Structure and function of an ecosystem.</p> <p>CO4: Student shall be able to explain Structure and function of an environment</p> <p>CO5: Student shall be able to analyze computer data in Preclinical development:</p> <p>CO6: Students will be able to understand about water and air pollution</p>
7	Course Description	<p>Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.</p>
8	Outline syllabus	
	1	<p>UNIT-I</p> <p>A. The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources:</p> <p>B. Natural resources and associated problems (a) Forest resources; b) Water resources; c) Mineral resources; C. Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.</p>



2		UNIT-II Ecosystems A. Concept of an ecosystem. B. Structure and function of an ecosystem. Introduction, types, characteristic features, structure and function of the ecosystems: C. Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)		
3		UNIT-III Environmental Pollution: Air pollution; Water pollution; Soil pollution		
Mode of examination	Theory			
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE	
	10	15	75	
Text book/s*		<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. 8. Down of Earth, Centre for Science and Environment 		



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 2
1	Course Code	BP207 P
2	Course Title	Human Anatomy & Physiology-II Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course, the student shall be able to</p> <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 -Know understand the basic components of anatomy & physiology animal with special reference to human
6	Course Outcomes	<p>CO1: The students will understand the structure and functions of various tissues and organs of the body. Also correlate their relevance with each other.</p> <p>CO2: The student will be able to summarize the functioning of various body systems and their homeostasis.</p> <p>CO3: The student will be able to apply the knowledge of the anatomy and physiology of different body parts in explaining the working patterns of different body systems.</p> <p>CO4: The students will analyze the structures of various tissues and their origin to evaluate their damage and repair process.</p> <p>CO5: The students would evaluate the mechanisms of various processes on which the functioning of the various body organs depend. Moreover, will observe the anatomical differentiation of different body parts.</p> <p>CO6: The students would evaluate the molecular mechanisms of various body pathways.</p>
7	Course Description	<p>Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.</p>
8	Outline syllabus	



1	UNIT-I To study the integumentary and special senses, nervous system, endocrine system using specimen, models, etc		
2	UNIT-II a). To demonstrate the general neurological examination. b). To demonstrate the function of olfactory nerve, different types of taste, visual acuity, reflex activity. c). Recording of body temperature		
3	UNIT-III a). To demonstrate positive and negative feed back mechanism. b). Determination of tidal volume and vital Capacity.		
4	UNIT-IV a). Study of digestive, respiratory, cardiovascular systems, urinary and reproductive system with the help of models, charts and specimens. b). Recording of basal mass index		
5	UNIT-V a). Study of family planning devices and pregnancy diagnosis test. b). Demonstration of total blood count by cell analyser Permanent slides of vital organs and gonads.		
Mode of examination	Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05	10	35
Text book/s*	<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 Taylor. Williams & Wilkins Co, Riverview, MI USA 		
Other References			



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 2
1	Course Code	BP208 P
2	Course Title	Pharmaceutical Organic Chemistry-I Practical
3	Credits	2
4	Contact Hours (L-T-P)	4
	Course Type	Compulsory
5	Course Objective	This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.
6	Course Outcomes	<p>CO1 - Students will be able to understand practical laboratory skills and get hands-on training of systematic qualitative analysis of organic compounds.</p> <p>CO2 - Students will be able to apply knowledge and understanding of systematic qualitative analysis of organic compounds and will be able to apply this knowledge in identification of organic compounds.</p> <p>CO3 - Students will be able to prepare the solid derivatives of organic compounds and can apply this knowledge for the identification of drugs and pharmaceuticals also use these skills to modify various characteristics of drugs and Pharmaceuticals.</p> <p>CO4 - Students will be able to analyze professional transferable skills as exemplified by problem solving and teamwork.</p> <p>CO5 - Students will be able to generalize skills for the predicting the atomic structure of drugs and chemicals.</p> <p>CO6 - Students will be able to analyze models of different organ system that will elaborate the learning</p>



7	Course Description	<p>1. Systematic qualitative analysis of unknown organic compounds like</p> <ol 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.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 compoundsIdentification of the unknown compound from the literature Using melting point/ boiling pointPreparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.Minimum 5 unknown organic compounds to be analyzed systematically. <p>2. Preparation of suitable solid derivatives from organic compounds</p> <p>3. Construction of molecular models</p>
8	Outline syllabus	
	1	UNIT-I I. Experiments involving preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc. Physical characteristics Flame Test Bromine Test
	2	UNIT-II Element Detection (Lassaigne's test)
	3	UNIT-III Solubility test
	4	UNIT-IV Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.



5	UNIT-V Melting point/Boiling point of organic compounds Preparation of suitable solid derivatives from organic compounds Construction of molecular models		
Mode of examination	Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05	10	35
Text book/s*	<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 Ahluwaliah/Chatwal. 		
Other References			



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 2
1	Course Code	BP 209 0P
2	Course Title	Biochemistry Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of course student shall able to</p> <p>Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes. Understand the metabolism of nutrient molecules in physiological and pathological conditions.</p> <p>Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.</p>
6	Course Outcomes	<p>CO1: Students will be able to understand the Qualitative analysis of carbohydrates</p> <p>CO2: Students will be able to understand the Quantitative analysis of reducing sugars.</p> <p>CO3: Students will be able to analyze how to determine creatinine</p> <p>CO4: Students will be able to determine serum cholesterol</p> <p>CO5: Students will be able to compare amino acids by Paper Chromatographic Technique.</p> <p>CO6: Students will be able to apply the practical aspect and use of biochemistry.</p>
7	Course Description	<ol style="list-style-type: none"> 1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch) 2. Identification tests for Proteins (albumin and Casein) 3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method) 4. Qualitative analysis of urine for abnormal constituents 5. Determination of blood creatinine 6. Determination of blood sugar 7. Determination of serum total cholesterol 8. Preparation of buffer solution and measurement of pH 9. Study of enzymatic hydrolysis of starch 10. Determination of Salivary amylase activity 11. Study the effect of Temperature on Salivary amylase activity. 12. Study the effect of substrate concentration on salivary amylase activity.



8	Outline syllabus			
	1	UNIT-I a). Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch) b). Identification tests for Proteins (albumin and Casein)		
	2	UNIT-II a). Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method) b). Qualitative analysis of urine for abnormal constituents		
	3	UNIT-III a). Determination of blood creatinine b). Determination of blood sugar		
	4	UNIT-IV a). Determination of serum total cholesterol b). Preparation of buffer solution and measurement of pH		
	5	UNIT-V a). Study of enzymatic hydrolysis of starch b). Determination of amino acids by Paper Chromatographic Technique.		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05	10	35
	Text book/s*	Practical Biochemistry by R.C. Gupta and S. Bhargavan. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition) Practical Biochemistry for Medical students by Rajagopal and Ramakrishna. Practical Biochemistry by Harold Varley		
	Other References			



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 2
1	Course Code	BP210 P
2	Course Title	Computer applications in Pharmacy- Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course the student shall be able to</p> <p>know the various types of application of computers in pharmacy</p> <p>know the various types of databases</p> <p>know the various applications of databases in pharmacy</p>
6	Course Outcomes	<p>Upon completion of the course, the student shall be able to</p> <p>CO1: understand the Binary number system</p> <p>CO2: the web technologies</p> <p>CO3: the application of computers in Pharmacy</p> <p>CO4: the Bioinformatics Databases, Concept of Bioinformatics</p> <p>CO5: Computers as data analysis in Preclinical development</p> <p>CO6: Students will overall understand the use of computers in pharmacy</p>
7	Course Description	<p>Design a questionnaire using a word processing package to gather information about a particular disease.</p> <p>Create a HTML web page to show personal information.</p> <p>Retrieve the information of a drug and its adverse effects using online tools</p> <p>Creating mailing labels Using Label Wizard , generating label in MS WORD</p> <p>Create a database in MS Access to store the patient information with the required fields Using access</p> <p>Design a form in MS Access to view, add, delete and modify the patient record in the database</p> <p>Generating report and printing the report from patient database</p> <p>Creating invoice table using – MS Access</p> <p>Exporting Tables, Queries, Forms and Reports to XML pages</p>



8	Outline syllabus			
	1	UNIT-I A. 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		
	2	UNIT-II A. Webtechnologies: Introduction to HTML, XML,CSS and Programmemeing languages, introduction to web servers and Server Products Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database		
	3	UNIT-III A. Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System		
	4	UNIT-IV A. Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery		
	5	UNIT-V A. Computers as data analysis in Preclinical development: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMs)		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05	05	15



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	Text book/s*	<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, USA3. 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
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School:		SOP
Programme:		B. Pharm
Branch:		Semester: 3
1	Course Code	BP301 T
	Course Title	Pharmaceutical organic chemistry-II- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course the student shall be able to write the structure, name and the type of isomerism of the organic compound write the reaction, name the reaction and orientation of reactions account for reactivity/stability of compounds, prepare organic compounds
6	Course Outcomes	CO1: The students will have the knowledge to identify, name, and write the structure of different aromatic compounds and their derivatives. CO2: The students will be able to understand and explain the mechanism behind the naming reactions of different aromatic compounds and their derivatives. CO3: The students can apply the knowledge to prepare the derivatives of aromatic compounds with different functional groups. CO4: Students will analyze the chemical reactions, stabilities of organic compounds and properties of the compounds prepared by them in the laboratory. CO5: Students would evaluate by comparing compounds prepared by them with standard compounds by chemical and physical properties. CO6: Students would be able to evaluate Poly nuclear hydrocarbons. by comparing structures.
7	Course Description	This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.
8	Outline syllabus	



1	<p>UNIT-I</p> <p>A. Benzene and its derivatives Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule</p> <p>B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.</p> <p>C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction</p> <p>Structure and uses of DDT, Saccharin, BHC and Chloramine</p>
2	<p>UNIT-II</p> <p>A. Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols</p> <p>B. Aromatic Amines* - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts</p> <p>C. Aromatic Acids* –Acidity, effect of substituents on acidity and important reactions of benzoic acid.</p>
3	<p>UNIT-III</p> <p>A. Fatty acids – reactions. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.</p> <p>B. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.</p>
	<p>UNIT-IV</p> <p>A. Polynuclear hydrocarbons: Synthesis, reactions</p> <p>B. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene,</p> <p>C. Diphenylmethane, Triphenylmethane and their derivatives</p>
	<p>UNIT-V</p> <p>A. Cyclo alkanes* 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</p>



Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10	15	75
Text book/s*	<ol style="list-style-type: none">1. Organic Chemistry by Morrison and Boyd2. Organic Chemistry by I.L. Finar, Volume-I3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.4. Organic Chemistry by P.L. Soni5. Practical Organic Chemistry by Mann and Saunders.6. Vogel's text book of Practical Organic Chemistry7. Advanced Practical organic chemistry by N.K. Vishnoi.		



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 3
1	Course Code	BP302T
2	Course Title	Physical Pharmaceutics I- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon the completion of the course student shall be able to</p> <ol style="list-style-type: none"> 1. Understand various physicochemical properties of drug molecules in the designing the dosage forms 2. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms. 3. Apply the concept of surface tension and surfactants in formulation and development.
6	Course Outcomes	<p>CO1: Students would be able to understand the concept of solubility, solutions, diffusion, CST, distribution and apply them in formulation, development and biological systems.</p> <p>CO2: Students would be able to explain the basics of states of matter and physical properties of drugs and use them in pharmaceutical field.</p> <p>CO3: Students would be able to apply the basics of surface and interfacial tension, surface active agents, HLB and adsorption in formulation and development of pharmaceutical systems.</p> <p>CO4: Students would be able to describe Complexation, protein binding and relate it with drug action.</p> <p>CO5: Students would be able to compare the methods of determination of pH and demonstrate the applications of buffered isotonic solutions in pharmaceutical and biological systems.</p> <p>CO6: Students would be able to evaluate the Isoonicity of solutions.</p>
7	Course Description	<p>The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.</p>



8	Outline syllabus	
	1	<p>UNIT-I</p> <p>A. Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems.</p> <p>B. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions.</p> <p>C. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications</p>
	2	<p>UNIT-II</p> <p>A. 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.</p> <p>B. Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment,</p> <p>C. dissociation constant, determinations and applications</p>
	3	<p>UNIT-III</p> <p>A. Surface and interfacial phenomenon: 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.</p>
	4	<p>UNIT-IV</p> <p>A. Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis,</p> <p>B. protein binding,</p> <p>C. Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.</p>
	5	<p>UNIT-V</p> <p>A. buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric),</p> <p>B. B. applications of buffers, buffer equation, buffer capacity,</p> <p>C. buffers in pharmaceutical and biological systems, buffered isotonic solutions.</p>
	Mode of examination	Theory



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Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		10 Marks	15
Text book/s*	Physical Pharmacy by Alfred Martin Experimental Pharmaceutics by Eugene, Parott. Tutorial Pharmacy by Cooper and Gunn. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.		



School:	SOP
Programme:	B. Pharm
Branch:	Semester: 3
1	Course Code BP303 T
2	Course Title Pharmaceutical Microbiology- Theory
3	Credits 4
4	Contact Hours (L-T-P) 3-1-0
	Course Type Compulsory
5	Course Objective <p>Upon completion of the course the student shall be able to tell about the history, scope of microbiology and describe the structure, morphology and cultivation of microorganism.</p> <p>Student shall identify the bacteria on the basis of various staining technique and importance of sterilization in microbiology.</p> <p>Upon completion of the course the student shall understand the various methods for assessment of antibiotic, test for sterility for preparation.</p> <p>Student shall analyze the source of contamination and their prevention in aseptic areas and importance of cell culture technique.</p>
6	Course Outcomes <p>CO1: Students shall have knowledge about history of microbiology, its scope, branches, and application of various kind of microscopy.</p> <p>CO2: Students shall be able the differentiate the types of bacteria on the basis of staining technique and biochemical test and with different type of microscopic technique and their method of validation</p> <p>CO3: Students shall acquire complete knowledge of microorganism (viruses, fungi) like classification reproduction pattern, disinfection and antiseptic their evaluation methods and about sterility testing of various pharmaceutical products.</p> <p>CO4: Students can apply their knowledge to design the aseptic area and standardization of antibiotic, biomolecules.</p> <p>CO5: Students will be able to analyze the sources of contamination and their preventions in pharmaceutical products, and their application in pharmaceutical industry and research.</p> <p>CO6: Students can apply their knowledge about cell cultures.</p>



7	Course Description	• Study of all categories of microorganisms especially for the production of alcohol antibiotics, vaccines, vitamins enzymes etc..
8	Outline syllabus	
1		UNIT-I A. Introduction, history of microbiology, its branches, scope and its importance. B. Introduction to Prokaryotes and Eukaryotes 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). C. Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.
2		UNIT-II A. Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). B. Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization. C. Evaluation of the efficiency of sterilization methods.
3		UNIT-III A. Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions B. Evaluation of bactericidal & Bacteriostatic. C. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.



4	<p>UNIT-IV</p> <p>A. Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.</p> <p>B. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.</p> <p>Assessment of a new antibiotic.</p>		
5	<p>UNIT-V</p> <p>A. Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products.</p> <p>B. sources and types of microbial contaminants, assessment of microbial contamination and spoilage.</p> <p>C. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<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, 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 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 		



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 3
1	Course Code	BP 304 T
2	Course Title	Pharmaceutical Engineering - Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course student shall be able:</p> <p>To know various unit operations used in Pharmaceutical industries.</p> <p>To understand the material handling techniques.</p> <p>To perform various processes involved in pharmaceutical manufacturing process.</p> <p>To carry out various test to prevent environmental pollution.</p> <p>To appreciate and comprehend significance of plant lay out design for optimum use of resources.</p> <p>To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.</p>
6	Course Outcomes	<p>CO1: Students will be able to describe about various unit operations used in pharmaceutical industries. and size separation and their applications in pharmaceutical field.</p> <p>CO2: Students will be able to understand about basic concepts and importance of various heat transfer methods involved in pharmaceutical filed.</p> <p>CO3: Students will be able to illustrate about the concepts, equipments and pharmaceutical applications of drying and mixing.</p> <p>CO4: Students will be able to distinguish between different types of equipments used in various unit operations such as filtration and centrifugation.</p> <p>CO5: Students will be able to predict about various materials used in pharmaceutical plant construction, types of corrosion and its prevention methods and basics of material handling system</p> <p>CO6: Students will be able to evaluate about various mechanisms of unit operations.</p>



7	Course Description	This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.
8	Outline syllabus	
	1	UNIT-I A. Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer. B. 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. C. 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.
	2	UNIT-II A. Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. B. 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. C. Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation



3	<p>UNIT-III</p> <p>A. 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>B. Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles,</p> <p>C. 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>		
4	<p>UNIT-IV</p> <p>A. 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>B. Centrifugation: Objectives, principle & applications of Centrifugation, principles,</p> <p>C. construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.</p>		
5	<p>UNIT-V</p> <p>A. Pharma Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction,</p> <p>B. Theories of corrosion, types of corrosion and there prevention. Ferrous</p> <p>C. Nonferrous metals, inorganic and organic non metals, basic of material handling systems.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



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	Text book/s*	<ol style="list-style-type: none">1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, 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 pharmaceuticals- C.V.S Subrahmanyam et al., Latest edition.8. Cooper and Gunn’s Tutorial pharmacy, S.J. Carter, Latest edition.
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School:		SOP
Programme:		B. Pharm
Branch:		Semester: 3
1	Course Code	BP305 P
	Course Title	Pharmaceutical organic chemistry II – Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course the student shall be able to:</p> <p>Create the awareness about environmental problems among learners. Impart basic knowledge about the environment and its allied problems. Develop an attitude of concern for the environment. Motivate learner to participate in environment protection and environment improvement. Acquire skills to help the concerned individuals in identifying and solving environmental problems. Strive to attain harmony with Nature.</p>
6	Course Outcomes	<p>CO1: The students will have the knowledge to identify, name, and write the structure of different aromatic compounds and their derivatives.</p> <p>CO2: The students will be able to understand and explain the mechanism behind the naming reactions of different aromatic compounds and their derivatives.</p> <p>CO3: The students can apply the knowledge to prepare the derivatives of aromatic compounds with different functional groups.</p> <p>CO4: Students will analyze the chemical reactions, stabilities of organic compounds and properties of the compounds prepared by them in the laboratory.</p> <p>CO5: Students would evaluate by comparing compounds prepared by them with standard compounds by chemical and physical properties.</p> <p>CO6: The students will be able to plan about new derivatives based on the above knowledge.</p>



7	Course Description	<p>1. Experiments involving laboratory techniques</p> <p>a. Recrystallization</p> <p>b. Steam distillation</p> <p>2. Determination of following oil values (including standardization of reagents)</p> <p>a. Acid value</p> <p>b. Saponification value</p> <p>c. Iodine value</p> <p>3. Preparation Of Compounds</p> <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.• 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
8	Outline syllabus	
1		<p>Experiments involving laboratory techniques</p> <p>a). Recrystallization</p> <p>b). Steam distillation</p> <p>c). Derivatives of benzene</p>



2	Determination of following oil values a). Acid value b). Saponification value c). Iodine value		
3	III Preparation of compound a). Benzil b. Phenyl benzoate Benzoic acid Oxalic acid c. Rancidity of oils, Drying oils. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	0 5	10	35
Text book/s*	<ol style="list-style-type: none">1. Organic Chemistry by Morrison and Boyd2. Organic Chemistry by I.L. Finar , Volume-I3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.4. Organic Chemistry by P.L.Soni5. Practical Organic Chemistry by Mann and Saunders.6. Vogel's text book of Practical Organic Chemistry7. Advanced Practical organic chemistry by N.K.Vishnoi.		



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 3
1	Course Code	BP306 P
2	Course Title	Physical pharmaceutics I-Practical
3	Credits	4
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	Upon the completion of the course student shall be able to Understand various physicochemical properties of drug molecules in the designing the dosage forms Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.
6	Course Outcomes	CO1: The students would be able to describe the various methods of determination of physicochemical properties of drugs and pharmaceuticals. CO2: The students would be able to demonstrate methods for determination of HLB value and Critical Micelle concentration of surfactants. CO3: The students would be able to calculate the value of stability constants in complexation by various methods. CO4: The students would be able to compare various methods of determination of stability constants CO5: The students would be able to determine the effect of addition of salt CST and to determine adsorption constants. CO6: The students would be able to determine of Freundlich and Langmuir constants.
7	Course Description	Determination of physicochemical properties of drugs and pharmaceuticals and determination of stability constants, adsorption constants, HLB and CMC values.
8	Outline syllabus	



	1	<p>To determine various physicochemical properties of drugs and Pharmaceuticals</p> <p>a). Determination of solubility of drug at room temperature b). Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.</p> <p>c). Determination of Partition co- efficient of benzoic acid in benzene and water</p> <p>d). Determination of Partition co- efficient of Iodine in CCl₄ and water</p> <p>e). Determination of surface tension of given liquids by drop count and drop weight methods</p>		
	2	<p>To Determine important parameter of Surfactants</p> <p>a). Determination of HLB number of a surfactant by saponification method</p> <p>b). Determination of critical micellar concentration of surfactants</p>		
	3	<p>To determine stability constants of complexation by various methods</p> <p>a). Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method.</p> <p>b). Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method</p>		
	4	<p>To study the effect of addition of salt CST and to determine adsorption constants</p> <p>a). Determination of % composition of NaCl in a solution using phenol-water system by CST method.</p> <p>b). Determination of Freundlich and Langmuir constants using activated char coal</p>		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		0 5 Marks	10	35



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Text book/s*	<p>Physical Pharmacy by Alfred Martin Experimental Pharmaceutics by Eugene, Parott. Tutorial Pharmacy by Cooper and Gunn. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc. Physical Pharmaceutics by Ramasamy C and ManavalanR. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee Physical Pharmaceutics by C.V.S. Subramanyam Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar.</p>
Other References	



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 3
1	Course Code	BP307 P
2	Course Title	Pharmaceutical microbiology Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course the student shall be able to tell about the history, scope of microbiology and describe the structure, morphology and cultivation of microorganism.</p> <p>Student shall identify the bacteria on the basis of various staining technique and importance of sterilization in microbiology.</p> <p>Upon completion of the course the student shall understand the various methods for assessment of antibiotic, test for sterility for preparation.</p> <p>Student shall analyze the source of contamination and their prevention in aseptic areas and importance of cell culture technique.</p>
6	Course Outcomes	<p>CO1: Students shall have knowledge about the various equipment used in experimental microbiology and understand the principle and working of these instruments.</p> <p>CO2: Students shall be able to understand the importance of sterilization in microbiology and apply this knowledge for the preparation of various media.</p> <p>CO3: Students shall acquire complete knowledge of isolation procedure of microorganism (viruses, fungi) and will be able to differentiate microorganism on the basis of various staining technique</p> <p>CO4: Students can apply their knowledge for the standardization of antibiotics.</p> <p>CO5: Students can apply their knowledge for identification of bacteria.</p> <p>CO6: Students can apply their knowledge for nutrient and slab culture.</p>
7	Course Description	To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences
8	Outline syllabus	
	1	<p>a). To study various equipment used in microbiology</p> <p>b). To perform the sterilization of glassware by moist heat and dry heat</p>



2	a). Preparation of sterile nutrient broth b). Preparation of sterile nutrient agar media		
3	a). Study of environmental microflora of various region		
4	a). Standardization of antibiotic by cup and plate method Identification of bacteria by gram staining technique identification of bacteria by acid fast staining technique Preparation of nutrient slant and stab culture		
Mode of examination	Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05	10	35
Text book/s*	<p>W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.</p> <p>Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.</p> <p>Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.</p> <p>Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.</p> <p>Rose: Industrial Microbiology.</p> <p>Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan</p> <p>Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.</p> <p>Peppler: Microbial Technology.</p> <p>I.P., B.P., U.S.P.- latest editions.</p> <p>Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai</p> <p>Edward: Fundamentals of Microbiology.</p> <p>N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi</p> <p>Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company</p>		
Other References			



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 3
1	Course Code	BP 308 P
2	Course Title	Pharmaceutical Engineering Practical
3	Credits	4
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course student shall be able:</p> <p>To know various unit operations used in Pharmaceutical industries.</p> <p>To understand the material handling techniques.</p> <p>To perform various processes involved in pharmaceutical manufacturing process.</p> <p>To carry out various test to prevent environmental pollution.</p> <p>To appreciate and comprehend significance of plant lay out design for optimum use of resources.</p> <p>To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.</p>
6	Course Outcomes	<p>CO1: Student shall be able to Understand the different factors effecting rate of filtration, evaporation and overall heat transfer coefficient etc.</p> <p>CO2: Students shall be able to predict humidity of air, effect of time on crystallization rate and laws of size reduction.</p> <p>CO3: Students shall be able to calculate uniformity index of given sample, efficiency of steam distillation and construct various size frequency curves, drying curves etc.</p> <p>CO4: Students shall be able to evaluate size distribution of tablet granulations.</p> <p>CO5: Students shall be able to calculate time of crystallization</p> <p>CO6: Students shall be able to study the effect of time on rate of crystallization.</p>



7	Course Description	This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry and their importance in day to day running of a pharmaceutical unit is emphasized to the students.		
8	Outline syllabus			
	1	a). Students would be able to determine the overall heat transfer coefficient by heat exchanger and calculate the efficiency of steam distillation. b). Students would be able to construct drying curves (for calcium carbonate and starch) and determine moisture content and loss on drying.		
	2	a). Students would be able to determine humidity of air – i) From wet and dry bulb temperatures –use of Dew point method. b). Students would be able to evaluate size distribution of tablet granulations by using sieving method		
	3	a). Students would be able to verify the laws of size reduction using ball mill using Ball Mill b). Students would be able to relate factors affecting Rate of Evaporation and Filtration. c). Students would be able to understand the working of major equipment used in Pharmaceutical industry.		
	4	a). Students would be able to study the effect of time on the Rate of Crystallization b). Students would be able to calculate the uniformity Index for given sample by using Double Cone Blender		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		0 5 Marks	10	35



Text book/s*	<ol style="list-style-type: none">1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, 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.
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School:	SOP
Programme:	B.Pharm
Branch:	Semester: IV
1 Course Code	BP401T
2 Course Title	Pharmaceutical Organic Chemistry III - Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	Upon completion of the course the student shall be able to 1. 1. understand the methods of preparation and properties of organic compounds 2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions 3. 3. know the medicinal uses and other applications of organic compounds
6 Course Outcomes	CO1: Students shall be able to understand the configuration to optical and geometrical isomers. They also get the knowledge of properties of enantiomers and geometrical isomers and diastereomers. CO2: Students shall acquire the knowledge of separation of different isomers and on the basis of this knowledge students can separate the desired isomeric form. CO3: Students shall be able to do nomenclature of heterocyclic compounds and draw the structure of heterocyclic compounds. CO4: students shall gain the knowledge of various heterocyclic compounds in terms of their synthesis, chemical reactions and their applications in medicines. CO5: The students will be able to understand and explain the mechanism behind various naming reactions and acquire the knowledge of their applications in preparation of various drugs and intermediates. CO6: Students shall be able to study the SAR of compounds.
7 Course Description	This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.
8	Outline syllabus



1	UNIT-I Hours A. Stereo isomerism Optical isomerism –Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules B. DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers Reactions of chiral molecules Racemic modification and resolution of racemic mixture. C. Asymmetric synthesis: partial and absolute	10
2	UNIT-II Hours A. Geometrical isomerism Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. B. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions	10
3	Unit III A. Heterocyclic compounds: Nomenclature and classification B. Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene C. Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene	



4	UNIT-IV A. Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, B. Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis C. medicinal uses of Pyrimidine, Purine, azepines and their derivatives		
5	UNIT-V A. Reactions of synthetic importance Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. B. Oppenauer-oxidation and Dakin reaction. C. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<ol style="list-style-type: none"> 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 		
Other References			



School:		SOP
Programme:		B.Pharm
Branch:		Semester: IV
1	Course Code	BP402T
2	Course Title	Medicinal chemistry I - Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of the course the student shall be able to 1. understand the chemistry of drugs with respect to their pharmacological activity 2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs know the Structural Activity Relationship (SAR) of different class of drugs write the chemical synthesis of some drugs
6	Course Outcomes	CO1: The students will be able to apply knowledge to identify, name and classify the different categories of drugs with respect to their pharmacological activities. CO2: The students will be able to understand and explain the structure activity relationship, drug metabolic pathways, adverse effects and their therapeutic activity of different categories of drugs. CO3: The students will be able to apply the knowledge to construct the chemical synthesis of some drugs. CO4: The students will be able to analyze chemical reactions, stabilities of compounds and properties of the compounds prepared by them in the laboratory. CO5: The students would be able to illustrate different drugs acting on Nervous system. CO6: The students would be able to evaluate various transmitters.
7	Course Description	This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.
8	Outline syllabus	



1	<p>UNIT- I</p> <p>A. Introduction to Medicinal Chemistry History and development of medicinal chemistry Physicochemical properties in relation to biological action Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.</p> <p>B. Drug metabolism</p> <p>a). Drug metabolism principles- Phase I and Phase II.</p> <p>b). Factors affecting drug metabolism including stereo chemical aspects.</p>
2	<p>UNIT- II</p> <p>A. Drugs acting on Autonomic Nervous System Adrenergic Neurotransmitters:</p> <p>a). Biosynthesis and catabolism of catecholamine.</p> <p>b). Adrenergic receptors (Alpha & Beta) and their distribution.</p> <p>B. Sympathomimetic agents: SAR of Sympathomimetic agents</p> <p>a). Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.</p> <p>Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.</p> <p>Agents with mixed mechanism: Ephedrine, Metaraminol.</p> <p>C. Adrenergic Antagonists:</p> <p>Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.</p> <p>D. Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.</p>

3

UNIT-III

A. Cholinergic neurotransmitters:

- a). Biosynthesis and catabolism of acetylcholine.
- b). Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

c). Parasympathomimetic agents: SAR of Parasympathomimetic agents

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

C. 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.

4

UNIT- IV

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital, Secobarbital

B. Miscellaneous:

Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meprobamate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

C. 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.

Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*,

5	<p>UNIT - V Drugs acting on Central Nervous System</p> <p>A. General anesthetics:</p> <p>a). Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.</p> <p>b). Ultra short acting barbiturates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.</p> <p>c). Dissociative anesthetics: Ketamine hydrochloride.*</p> <p>B. Narcotic and non-narcotic analgesics</p> <p>a). Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.</p> <p>b). Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.</p> <p>c). Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.</p> <p>C.Actions of synthetic importance</p> <p>a). Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.</p> <p>b). Oppenauer-oxidation and Dakin reaction.</p> <p>c). Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation</p>		
Mode of examination	Theory		
Weightage	Continuous Mode Assessment	Sessional Exam	ESE
Distributi on	10 Marks	15	75



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Text book/s*	<p>Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.</p> <p>Foye's Principles of Medicinal Chemistry.</p> <p>Burger's Medicinal Chemistry, Vol I to IV.</p> <p>Introduction to principles of drug design- Smith and Williams.</p> <p>Remington's Pharmaceutical Sciences.</p> <p>Martindale's extra pharmacopoeia.</p> <p>Organic Chemistry by I.L. Finar, Vol. II.</p> <p>The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.</p> <p>Indian Pharmacopoeia.</p> <p>Text book of practical organic chemistry- A.I.Vogel.</p>
Other Reference s	



School:	SOP
Programme:	B. Pharm
Branch:	Semester: IV
1 Course Code	BP403T
2 Course Title	Physical Pharmaceutics II - Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	Upon the completion of the course student shall be able to 1. Understand various physicochemical properties of drug molecules in the designing the dosage form 2. Know the principles of chemical kinetics & to use them in assigning expiry date for Formulation 3. Demonstrate use of physicochemical properties in evaluation of dosage forms. Appreciate physicochemical properties of drug molecules in formulation research and Development
6 Course Outcomes	CO1: Students would be able to understand the concept of reaction kinetics, degradation pathways, factor effects stability of drugs. CO2: Students would be able to understand flow of liquid, law of flow, determination of viscosity of liquid by viscometer. CO3: Students would be able to apply the basics of surface and interfacial tension, surface active agents. CO4: Students would be able to describe properties of powder like particle size and distribution, determining particle size by different methods. CO5: Students would be able to evaluate about the colloidal dispersion, role of particle size and shape in colloidal dispersion. CO6: Students would be able to illustrate the Stabilization of medicinal agents.
7 Course Description	The course deals with the various physica and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.
8 Outline syllabus	



1	UNIT-I 07 Hours A. 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 B. B. electrical properties. C. Effect of electrolytes, coacervation, peptization& protective action.
2	UNIT-II 10 Hours A. Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers B. Deformation of solids: Plastic and elastic deformation, C. Heckel equation, Stress, Strain, Elastic Modulus
3	UNIT-III 10 Hours A. Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. B. B. Emulsions and theories of emulsification, microemulsion and multiple emulsions; C. Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.
4	UNIT IV A. Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, B. particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, C. adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.



5	UNIT-V 10 Hours		
	<p>A. 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.</p> <p>B. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation.</p> <p>C. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<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. 		



School:	SOP
Programme:	B. Pharm
Branch:	Semester: IV
1 Course Code	BP404T
2 Course Title	Pharmacology I - Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	Upon completion of this course the student should be able to Understand the pharmacological actions of different categories of drugs Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases. Observe the effect of drugs on animals by simulated experiments Appreciate correlation of pharmacology with other bio medical sciences
6 Course Outcomes	CO1: Students will able to understand the pharmacological actions of different categories of drugs. CO2: Students will able to explain the mechanism of drug action at organ system/sub cellular/macromolecular levels. CO3: Students will able to apply the basic pharmacological knowledge in the prevention and treatment of various diseases. CO4: Students will able to illustrate the effect of drugs on animals by simulated experiments. CO5: Students will able to apply the correlation of pharmacology with other biomedical Sciences. CO5: Students will able to evaluate the mechanisms and action of drugs under CNS CO6: Students will able to evaluate the mechanisms and action of drugs.



7	Course Description	The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.
8 Outline syllabus		
1		UNIT-I A. General Pharmacology a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination c. Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis,
2		UNIT-II Hours 12 A. General Pharmacology Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. a. Adverse drug reactions. b. Drug interactions (pharmacokinetic and pharmacodynamic) Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, c. clinical trial phase, phases of clinical trials and pharmacovigilance.



3	<p>UNIT-III 10</p> <p>Hours</p> <p>Pharmacology of drugs acting on peripheral nervous system</p> <p>A. Organization and function of ANS. Neurohumoral transmission, co-transmission and classification of neurotransmitters. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).</p> <p>B. Local anesthetic agents.</p> <p>C. Drugs used in myasthenia gravis and glaucoma</p>		
4	<p>UNIT-IV 08</p> <p>Hours</p> <p>Pharmacology of drugs acting on central nervous system</p> <p>a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.</p> <p>b. General anesthetics and pre-anesthetics.</p> <p>c. Sedatives, hypnotics and centrally acting muscle relaxants. Anti-epileptics, Alcohols and disulfiram</p>		
5	<p>UNIT-V 07</p> <p>Hours</p> <p>Pharmacology of drugs acting on central nervous system</p> <p>a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.</p> <p>b. Drugs used in Parkinsons disease and Alzheimer’s disease.</p> <p>c. CNS stimulants and nootropics.</p> <p>Opioid analgesics and antagonists</p> <p>Drug addiction, drug abuse, tolerance and dependence.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



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Text book/s*	<ol style="list-style-type: none">1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill Goodman and Gilman's, The Pharmacological Basis of Therapeutics4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
Other References	



School:	SOP
Programme:	B.Pharm
Branch:	Semester: IV
1 Course Code	BP405T
2 Course Title	Pharmacognosy and Phytochemistry I - Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	Upon the completion of the course student shall be able to Understand the techniques in the cultivation and production of crude drugs. Identify the crude drugs, their uses and chemical nature. Understand the evaluation techniques for the herbal drugs. Carry out the microscopic and morphological evaluation of crude drugs
6 Course Outcomes	CO1: Students shall be able to define pharmacognosy, identify the sources of crude drugs, and describe type of adulteration, evaluation of crude drugs, cultivation techniques, various medicine systems and plant tissue culture. CO2: Students will be able to classify the crude drugs, understand their properties, chemical nature and uses and are able to distinguish drugs with the help of chemical tests and describe various cultivation techniques. CO3: Students will be able to apply their knowledge in identification, cultivation, evaluation of drugs, and prescribing the crude drug for various health issues. CO4: Students will analyze the crude drugs and its chemical nature and their activities. CO5: Students would be able to compare two drugs with the help of chemical and physical properties, and evaluate them for their quality. CO6: Students will be able to study plant tissue culture techniques.
7 Course Description	The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.
8 Outline syllabus	



1	UNIT-I Hours A. 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). B. Classification of drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs C. Quality control of Drugs of Natural Origin: a. Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. b. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.	10
2	UNIT-II Hours A. Cultivation, Collection, Processing and storage of drugs of natural origin: a. Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications. b. Polyploidy, mutation and hybridization with reference to medicinal plants B. Conservation of medicinal plants	10
3	UNIT-III Hours A. Plant tissue culture: Historical development of plant tissue culture, B. types of cultures, Nutritional requirements, growth and their maintenance. C. Applications of plant tissue culture in pharmacognosy. Edible vaccines	07
4	UNIT V Hours A. Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs B. Plant Products: Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens	08



5	<p>UNIT V 08</p> <p>Hours Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs</p> <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, 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>Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax Marine Drugs: Novel medicinal agents from marine sources</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<p>W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.</p> <p>Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.</p> <p>Text Book of Pharmacognosy by T.E. Wallis</p> <p>Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.</p> <p>Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.</p> <p>Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.</p> <p>Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007</p> <p>Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae</p> <p>Anatomy of Crude Drugs by M.A. Iyengar</p>		



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Other References	
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School:		SOP
Programme:		B. Pharm
Branch:		Semester: 4
1	Course Code	BP406 P
2	Course Title	Medicinal chemistry-i (practical)
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	Upon completion of the course, the student shall be able to -Know the classification and salient features of five kingdoms of life -Understand the basic components of anatomy & physiology of plant -Know understand the basic components of anatomy & physiology animal with special reference to human
6	Course Outcomes	CO1: Students will be able to understand about practical laboratory skills and get hands-on experience of modern scientific instrumentation and methodology, particularly in relation to the chemistry of pharmaceuticals CO2: Students will be able to apply knowledge and understanding of the fundamental principles of chemistry and their applications to pharmaceuticals. CO3: Students will be able to use and apply their skills and methodology to a range of techniques used in pharmaceutical chemistry. CO4: Students will be able to generalize professional transferable skills as exemplified by problem solving and teamwork. CO5: Students will be able to predict the skills to make synthetic scheme for certain reactions involved in synthesis of drugs. CO6: Students will be able to apply knowledge about different analytical methods to establish qualitative as well as quantitative reports about the chemical entity.
7	Course Description	Preparation of drugs/ intermediates, assay of drugs and determination of Partition coefficient.
8	Outline syllabus	
	1	I Preparation of drugs/ intermediates 1,3-pyrazole 1,3-oxazole Benzimidazole



	2	Benztriazole 2,3- diphenyl quinoxaline Benzocaine Phenytoin Phenothiazine		
	3	Assay of drugs Barbiturate II Assay of drugs Chlorpromazine Phenobarbitone Atropine Ibuprofen		
	4	Determination of Partition coefficient for any two drugs		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05	10	35
	Text book/s*	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. Martindale's extra pharmacopoeia		
	Other References			



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 4
1	Course Code	BP407P
2	Course Title	Physical pharmaceutics II (Practical)
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course, the student shall be able to</p> <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 -Know understand the basic components of anatomy & physiology animal with special reference to human
6	Course Outcomes	<p>CO1: The students would be able to describe the derived properties of powder like angle of repose, bulk density, true density and porosity.</p> <p>CO2: The students would be able to demonstrate methods for determination of HLB value and Critical Micelle concentration of surfactants.</p> <p>CO3: The students would be able to analyze the particle size, particle size distribution by using methods like Sieving and Microscopic.</p> <p>CO4: The students would be able to describe the viscosity, effect of sedimentation on suspension</p> <p>CO5: The students would be able to plan about rate of reaction and accelerated stability studies according to ICH guidelines.</p> <p>CO6: The students would be able to compare different types of stability parameters.</p>
7	Course Description	Determination of particle size, particle size distribution, derived properties of powder, viscosity, effect of suspending agent on sedimentation volume, factors affecting viscosity, viscosity determination and various stability studies as per ICH guidelines
8	Outline syllabus	



1		<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 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 of 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 <p>Accelerated stability studies</p>
2		<p>Determination of particle size, particle size distribution using sieving method & microscopic method</p> <ol style="list-style-type: none"> I. Determination of particle size II. Determination of particle size distribution III. Using the sieving method
3		<p>To determine the derived properties of powder</p> <ul style="list-style-type: none"> • Determine the bulk density, true density and porosity of the powder • Determine the flow properties of powder • Determine the effect of glidants on flow properties of powder
4		<p>Determination of viscosity of liquids & semi solids</p> <ul style="list-style-type: none"> • Determination of viscosity of liquid by using Ostwald's viscometer • Determination of viscosity of different concentration of glycerine by using Ostwald's viscometer
5		<p>Determination of sedimentation volume of suspension</p> <ol style="list-style-type: none"> I. Determination sedimentation volume with effect of different suspending agent II. Determination of sedimentation volume with
Mode of examination	of	Practical/Viva



Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05	10
Text book/s*	<ol style="list-style-type: none">1. Physical Pharmacy by Alfred Martin, Sixth edition2. Experimental pharmaceutics by Eugene, Parott.3. Tutorial pharmacy by Cooper and Gunn.4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.		
Other References			



School:		SOP
Programme:		B. Pharm
Branch:		Semester: 4
1	Course Code	BP408 P
2	Course Title	Pharmacology I Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	Objectives: 1. Upon the completion of the course student shall be able to 2. Understand the pharmacological actions of different categories of drugs. 3. Observe the effect of drugs on animals by simulated experiments 4. Appreciate correlation of pharmacology with other bio medical sciences
6	Course Outcomes	CO1: The students would be able to explain the pharmacological aspects of drugs. CO2: The students would be able to understand and carry out the animal experiments CO3: The students would be able to appreciate the importance of Pharmacology subject as a basis of therapeutics. CO4: The students would be able to Correlate and apply the knowledge therapeutically. CO5: The students would be able to apply experimental concepts. CO6: The students will be able to explore CNS action on experimental models.



7	Course Description	<p>Introduction to experimental pharmacology.</p> <p>Commonly used instruments in experimental pharmacology. Study of common laboratory animals.</p> <p>Maintenance of laboratory animals as per CPCSEA guidelines.</p> <p>Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.</p> <p>Study of different routes of drugs administration in mice/rats.</p> <p>Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.</p> <p>Effect of drugs on ciliary motility of frog oesophagus</p> <p>Effect of drugs on rabbit eye.</p> <p>Effects of skeletal muscle relaxants using rota-rod apparatus.</p> <p>Effect of drugs on locomotor activity using actophotometer.</p> <p>Anticonvulsant effect of drugs by MES and PTZ method.</p> <p>Study of stereotype and anti-catatonic activity</p>
8	Outline syllabus	
	1	<p>Basic Pharmacology Experiment</p> <p>a). Introduction to experimental pharmacology.</p> <p>b). Commonly used instruments in experimental pharmacology.</p> <p>c). Study of common laboratory animals.</p> <p>d). Maintenance of laboratory animals as per CPCSEA guidelines.</p>



2	<p>To Study common lab techniques and study the effects of Drugs</p> <p>a. Common laboratory techniques. Blo withdrawal, serum and plasma separation, anesthetics and euthanasi</p> <p>b. Study of different routes of drugs administration in mice/rats.</p> <p>c. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.</p> <p>d. Effect of drugs on ciliary motility of frog oesophagus</p> <p>e. Effect of drugs on rabbit eye.</p> <p>f. Effects of skeletal muscle relaxants using rota-rod apparatus.</p> <p>g. Effect of drugs on locomotor activity using actophotometer.</p> <p>h. Anticonvulsant effect of drugs by MES an</p>		
Mode of examination	Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05	10	35
Text book/s*	<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 		



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	Other References	
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School:		SOP
Programme:		B. Pharm
Branch:		Semester: 4
1	Course Code	BP409 P
2	Course Title	Pharmacognosy and Phytochemistry Practical
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	Upon completion of the course the student shall be able to understand different methods for analysis of crude drugs by various evaluation parameters i.e. Physical, chemical and organoleptic and anatomical parameters.
6	Course Outcomes	<p>CO1: Students will discover practical laboratory skills and get hands- on experience of modern scientific instrumentation in relation to the Pharmacognosy.</p> <p>CO2: Students will receive knowledge and understanding of the fundamental principles of pharmacognosy and their applications to pharmaceuticals.</p> <p>CO3: Students will be able to use and apply their skills to a range of techniques used in pharmacognosy.</p> <p>CO4: Students will analyze various crude drugs by various methods.</p> <p>CO5: Students would be able to evaluate various crude drugs for their quality.</p> <p>CO6: Students would be able to study about chemical and quantitative analysis.</p>
7	Course Description	<p>Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil</p> <p>Determination of stomatal number and index</p> <p>Determination of vein islet number, vein islet termination and palisade ratio.</p> <p>Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer</p> <p>Determination of Fiber length and width</p> <p>Determination of number of starch grains by Lycopodium spore method</p> <p>Determination of Ash value</p> <p>Determination of Extractive values of crude drugs Determination of moisture content of crude drugs</p> <p>Determination of swelling index and foaming index.</p>
8	Outline syllabus	



1	I Experiments involving laboratory techniques <ul style="list-style-type: none"> • Chemical analysis • Macroscopical and microscopical analysis • Use of microscope, camera lucida, eye piece micrometer etc. 		
2	II Determination of physical evaluation parameters <ul style="list-style-type: none"> • Ash values • Extractive values • Moisture content • Swelling and foaming index 		
3	III Evaluation of crude drugs by anatomical/microscopical evaluation <ul style="list-style-type: none"> • Stomatal number and Stomatal Index • Vein islet, vein termination and Palisade ratio • Fiber length and width • Size of starch grains and calcium oxalate crystals 		
4	Chemical and Quantitative analysis <ul style="list-style-type: none"> • Analysis of crude drugs by chemical tests • Quantitative analysis by lycopodium spore method 		
Mode of examination	Practical/Viva		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	05	10	35
Text book/s*	1. W.C.Evans, Trease and Evans Pharmacognosy, 16 th edition, W.B. Saunders & Co., London, 2009. 2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9 th Edn., Lea and Febiger, Philadelphia, 1988. 3. Text Book of Pharmacognosy by T.E. Wallis 4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi. 5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37 th Edition, Nirali Prakashan, New Delhi. 6. Herbal drug industry by R.D. Choudhary (1996), 1 st Edn, Eastern Publisher, New Delhi		
Other References			



School:	SOP
Programme:	B.Pharm
Branch:	Semester: V
1 Course Code	BP501T
2 Course Title	Medicinal Chemistry-II - Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	Upon completion of the course the student shall be able to 1. understand the chemistry of drugs with respect to their pharmacological activity 2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs 3. know the Structural Activity Relationship (SAR) of different class of drugs write the chemical synthesis of some drugs
6 Course Outcomes	CO1: The students will be able to understand different categories of drugs with respect to their pharmacological activities. CO2: The students will apply and explain the structure activity relationship, drug metabolic pathways, adverse effects and their therapeutic activity of different categories of drugs. CO3: The student's will be able to plan the knowledge to construct the chemical synthesis of some drugs. CO4: The students will analyse chemical reactions, stabilities of compounds and properties of the compounds prepared by them in the laboratory. CO5: The students will be able to modify and design new chemical compounds with therapeutic activity. CO6: Students will be able to analyze chemical compounds with therapeutic activity in different diseases.
7 Course Description	This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.
8 Outline syllabus	



1	<p>Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)</p> <p>Unit I</p> <p>A. Antihistaminic agents: Histamine, receptors and their distribution in the human body.</p> <p>B. 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</p> <p>a. H₂-antagonists: Cimetidine*, Famotidine, Ranitidin.</p> <p>b. Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole</p> <p>C. Anti-neoplastic agents:</p> <p>a). Alkylating agents: Meclroethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa</p> <p>b). Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine</p> <p>c). Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin</p> <p>Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate Miscellaneous: Cisplatin, Mitotane.</p>
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2	<p>Unit II</p> <p>A. Anti-anginal:</p> <p>B. Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.</p> <p>C. Calciumchannel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.</p> <p>Diuretics:</p> <p>Carbonicanhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.</p> <p>Thiazides:Chlorthiazide*,Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,</p> <p>Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid. Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol</p> <p>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>
3	<p>Unit III</p> <p>A. Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcaïnide hydrochloride, Amiodarone, Sotalol.</p> <p>B. Anti-hyperlipidemicagents: Clofibrate, Lovastatin,Cholesteramineand Cholestipol</p> <p>C. Coagulant&Anticoagulants:Menadione,Acetomenadione,Warfarin*, Anisindione, clopidogrel</p> <p>Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.</p>



4	<p>UNIT- IV 08 Hours</p> <p>A. Drugs acting on Endocrine system Nomenclature, Stereochemistry and metabolism of steroids</p> <p>B. Sex hormones: Testosterone, Nandralone, Progesterones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.</p> <p>C. Drugs for erectile dysfunction: Sildenafil, Tadalafil. Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol Corticosteroids: Cortisone, Hydrocortisone Prednisolone, Betamethasone, Dexamethasone Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.</p>		
5	<p>UNIT - V 07 Hours</p> <p>A. Antidiabetic agents: Insulin and its preparations Sulfonyl ureas Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. Thiazolidinedion Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acarbose, Voglibose.</p> <p>B. Local Anesthetics: SAR of Local anesthetics</p> <p>C. 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, Dipiperodon, Dibucaine.*</p>		
Mode of examination	Theory		
Weightage	Continuous Mode Assessment	Sessional Exam	ESE



Distribution	10 Marks	15	75
Text book/s*	<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 to 5.9. Indian Pharmacopoeia.10. Text book of practical organic chemistry- A.I.Vogel.		
Other References			



School:		SOP
Programme:		B. Pharm
Branch:		Semester: V
1	Course Code	BP502 T
2	Course Title	Industrial Pharmacy I - Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course the student shall be able to</p> <ol style="list-style-type: none"> 1. Know about the various pharmaceutical dosage forms and their manufacturing techniques (large scale equipment's etc) 2. Understand the various considerations in development of pharmaceutical dosage forms 3. Develop solid, liquid dosage forms and evaluate them for their quality <p>Know about containers, closures and packaging material used for different type of dosage forms.</p>
6	Course Outcomes	<p>CO1: Students would be able to understand the concept of preformulation studies for the development of safe and effective dosage form.</p> <p>CO2: Students would be able to apply the knowledge various types of dosage form. (tablet, capsule, parenteral , liquid orals , pellets cosmetic preparations etc)</p> <p>CO3: Students would be able to understand the formulation component and manufacturing procedures for different dosage form on Laboratory scale.</p> <p>CO4: Students would be able to formulate ophthalmic Preparations.</p> <p>CO5: Students would be able to formulate and evaluate the formulations for their quality.</p> <p>CO6: Students shall be able to interpret regarding various packaging material for pharmaceutical products and evaluate them for quality.</p>
7	Course Description	Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.
8	Outline syllabus	



1	<p>Unit I</p> <p>Preformulation studies-I Introduction to Preformulation, Goals and Objective, study of physicochemical characteristics of drug substances.</p> <p>A. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism</p> <p>B. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significant</p> <p>Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.</p>
2	<p>Unit II</p> <p>A. Tablets: 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>Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia</p>
3	<p>Unit III</p> <p>Capsules:</p> <p>A. Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.</p> <p>B. Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.</p> <p>C. Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets</p>



4	<p>Unit IV</p> <p>A. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity</p> <p>B. Production procedure, production facilities and controls, aseptic processing c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.</p> <p>C. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products. Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations</p>		
5	<p>Unit V</p> <p>A. Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens</p> <p>B. Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.</p> <p>C. 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>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



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Text book/s*	<p>Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J. B. Schwartz</p> <p>Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman</p> <p>Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman</p> <p>Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition</p> <p>Remington: The Science and Practice of Pharmacy, 20th edition</p> <p>Pharmaceutical Science (RPS)</p> <p>Theory and Practice of Industrial Pharmacy by Liberman & Lachman</p> <p>Pharmaceutics- The science of dosage form design by M.E. Aulton, Churchill livingstone, Latest edition</p> <p>Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea & Febiger, Philadelphia, 5th edition, 2005</p> <p>Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.</p>
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School:		SOP
Programme:		B. Pharm
Branch:		Semester: V
1	Course Code	BP503 T
2	Course Title	Pharmacology II-Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of this course the student should be able to</p> <ol style="list-style-type: none"> 1. Understand the mechanism of drug action and its relevance in the treatment of different diseases 2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments 3. Demonstrate the various receptor actions using isolated tissue preparation 4. Appreciate correlation of pharmacology with related medical sciences
6	Course Outcomes	<p>CO1: Students would be able to define and describe various categories of drugs to be used in the treatment of cardiovascular, haematological, endocrine and inflammatory disorders.</p> <p>CO2: Students would be able to understand and explain the mechanisms, pharmacokinetic profile, adverse effects and uses of various drugs.</p> <p>CO3: Students would be able to demonstrate the use of various categories of drugs and their bioassays.</p> <p>CO4: Students would be able to analyze and explain the pathology of the cardiovascular, blood related and endocrine disorders.</p> <p>CO5: Students would be able to evaluate and discriminate amongst the normal and abnormal physiological processes, and various drugs that can be employed for different treatment protocols.</p> <p>CO6: Students would be able to plan about mechanism and therapeutic actions of drugs related to CVS, hormones.</p>
7	Course Description	<p>This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition, emphasis on the basic concepts of bioassay.</p>
8	Outline syllabus	



1	<p>Unit-1</p> <p>A. Pharmacology of drugs acting on cardio vascular system</p> <p>a. Introduction to hemodynamic and electrophysiology of heart.</p> <p>b. Drugs used in congestive heart failure</p> <p>c. Anti-hypertensive drugs.</p> <p>d. Anti-anginal drugs.</p> <p>e. Anti-arrhythmic drugs.</p> <p>f. Anti-hyperlipidemic drugs.</p>
2	<p>Unit-2</p> <p>A. Pharmacology of drugs acting on cardio vascular system</p> <p>a. Drug used in the therapy of shock.</p> <p>b. Hematinics, coagulants and anticoagulants.</p> <p>c. Fibrinolytics and anti-platelet drugs</p> <p>d. Plasma volume expanders</p> <p>B. Pharmacology of drugs acting on urinary system</p> <p>a. Diuretics</p> <p>b. Anti-diuretics.</p>
3	<p>Unit-3</p> <p>A. Autocoids and related drugs</p> <p>a. Introduction to autacoids and classification</p> <p>b. Histamine, 5-HT and their antagonists.</p> <p>c. Prostaglandins, Thromboxanes and Leukotrienes.</p> <p>d. Angiotensin, Bradykinin and Substance P.</p> <p>e. Non-steroidal anti-inflammatory agents</p> <p>f. Anti-gout drugs</p> <p>g. Antirheumatic drugs.</p>
4	<p>Unit-4</p> <p>A. Pharmacology of drugs acting on endocrine system</p> <p>B. Basic concepts in endocrine pharmacology.</p> <p>Anterior Pituitary hormones- analogues and their inhibitors.</p> <p>C. Thyroid hormones- analogues and their inhibitors.</p> <p>Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.</p> <p>d. Insulin, Oral Hypoglycemic agents and glucagon.</p> <p>ACTH and corticosteroids.</p>



5	<p>Unit-5</p> <p>A. Pharmacology of drugs acting on endocrine system</p> <p>a. Androgens and Anabolic steroids.</p> <p>b. Estrogens, progesterone and oral contraceptives.</p> <p>c. Drugs acting on the uterus.</p> <p>B. Bioassay</p> <p>a. Principles and applications of bioassay.</p> <p>b. Types of bioassay</p> <p>c. Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<ol style="list-style-type: none"> 1. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher 2. Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert. 3. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata. 4. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan. 		



School:	SOP
Programme:	B. Pharm
Branch:	Semester: V
1 Course Code	BP504T
2 Course Title	Pharmacognosy – II Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	<p>Upon completion of the course, the student shall be able</p> <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 <p>to carryout isolation and identification of phytoconstituents</p>
6 Course Outcomes	<p>CO1: Students would be able to define and describe various metabolic pathways, various secondary metabolites like alkaloids glycosides by spectroscopic techniques and chromatography and various extraction methods</p> <p>CO2: Students would be able to explain applications of phytoconstituents and their industrial production, isolation process and extraction methods</p> <p>CO3: Students would be able to apply and demonstrate various identification process and latest technique of phytoconstituents</p> <p>CO4: Students would be able to separate and analyse various phytoconstituents</p> <p>CO5: Students would be able to evaluate various phytoconstituent</p> <p>CO6 : Students would be able to understand about metabolic pathways.</p>
7 Course Description	The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine
8 Outline Syllabus	



1	<p>UNIT-I</p> <p>Metabolic pathways in higher plants and their determination</p> <ol style="list-style-type: none">Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway,Acetate pathways and Amino acid pathway.Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.
2	<p>UNIT-II</p> <p>14 Hours</p> <p>General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following</p> <ol style="list-style-type: none">secondary metabolites: <p>Alkaloids: Vinca, Rauwolfia, Belladonna, Opium, Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander, Tannins: Catechu, Pterocarpus</p> <ol style="list-style-type: none">Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, ColophonyGlycosides: Senna, Aloes, Bitter Almond Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids
3	<p>UNIT-III</p> <p>06 Hours</p> <p>Isolation, Identification and Analysis of Phytoconstituents</p> <p>A Terpenoids: Menthol, Citral, Artemisin B. Glycosides: Glycyrrhetic acid & Rutin C. Alkaloids: Atropine, Quinine, Reserpine, Caffeine Resins: Podophyllotoxin, Curcumin</p>
4	<p>UNIT-IV</p> <p>10 Hours</p> <ol style="list-style-type: none">Industrial production, estimation and utilization of the following phytoconstituents:Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin,Caffeine, Taxol, Vincristine and Vinblastine



5	UNIT V Hours <ol style="list-style-type: none"> 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. 		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<p>W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.</p> <p>Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.</p> <p>Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.</p> <p>Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.</p> <p>Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007</p> <p>Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.</p> <p>A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.</p> <p>R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.</p> <p>Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.</p>		
Other References			



School:	SOP
Programme:	B.Pharm
Branch:	Semester: V
1 Course Code	BP505T
2 Course Title	Pharmaceutical Jurisprudence - Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	<p>Upon completion of the course, the student shall be able to understand:</p> <ol style="list-style-type: none"> 1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals. Various Indian pharmaceutical Acts and Laws 3. The regulatory authorities and agencies governing the manufacture and sale of Pharmaceuticals Code of ethics
6 Course Outcomes	<p>CO1: Students would be able to identify and understand the knowledge of Legal definitions of schedules to the Act and Rules, license for manufacturing and sale of drugs.</p> <p>CO2: Students would be able to explain various schedules labelling and packaging of drugs and various acts and rules.</p> <p>CO3: Students would be able to differentiate various acts and rules Schedules sale of drugs and various Acts and Rules and apply Rules.</p> <p>CO4: Students would be able to interpret various Acts and Rules and how to apply various acts and Rules.</p> <p>CO5: Students would be able to summarize the acts and code and conduct and also would explain Intellectual Proprietary Rights</p> <p>CO6: Students would be able to plan about various schedules of D&C Act.</p>
7 Course Description	This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India
8	Outline syllabus



1	<p>UNIT-I Drugs and Cosmetics Act, 1940 and its rules 1945: Objectives, Definitions, Legal definitions of schedules to the Act and Rules</p> <ul style="list-style-type: none">a. Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.b. Manufacture of drugs – Prohibition of manufacture and sale of certain
2	<p>UNIT-II</p> <p>A. Drugs and Cosmetics Act, 1940 and its rules 1945. Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA) Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties</p> <p>B. Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.</p> <p>C. 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>
3	<p>UNIT-III</p> <p>A. 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</p> <p>B. 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.</p> <p>C. 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>



4	<p>UNIT-IV</p> <p>A. 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</p> <p>B. Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for 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</p> <p>C. 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>		
5	<p>UNIT-V</p> <p>A. Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee</p> <p>B. Code of Pharmaceutical ethics Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist’s oath</p> <p>C. Medical Termination of Pregnancy Act</p> <p style="text-align: center;">Right to Information Act</p> <p style="text-align: center;">Introduction to Intellectual Property Rights (IPR)</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



Text book/s*	<ol style="list-style-type: none">1. Text book of Forensic Pharmacy by B.M. Mithal2. Hand book of drug law-by M.L. Mehra3. A text book of Forensic Pharmacy by N.K. Jain4. Drugs and Cosmetics Act/Rules by Govt. of India publications.5. Medicinal and Toilet preparations act 1955 by Govt. of India publications.6. Narcotic drugs and psychotropic substances act by Govt. of India publications7. Drugs and Magic Remedies act by Govt. of India publication8. Bare Acts of the said laws published by Government. Reference books (Theory)
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School:	SOP
Programme:	B.Pharm
Branch:	Semester: V
1 Course Code	BP506P
2 Course Title	Industrial Pharmacy- I Practical
3 Credits	2
4 Contact Hours (L-T-P)	0-0-4
Course Type	Compulsory
5 Course Objective	Upon completion of the course the student shall be able to 1. Know about the various pharmaceutical dosage forms and their manufacturing techniques(large scale equipment's etc) 2. Understand the various considerations in development of pharmaceutical dosage forms 3. Develop solid, liquid dosage forms and evaluate them for their quality Know about containers, closures and packaging material used for different type of dosage forms.
6 Course Outcomes	CO1: Students would be able to understand various types of dosage form. (tablet, capsule , Parenterals , creams etc) CO2: Students would be able to plan about the manufacturing procedures for different dosage form on laboratory scale. (tablet, capsule, Parenterals , creams etc) CO3: Students would be able to evaluate the Aerosols. CO4: Students would be able to plan various packaging material for pharmaceutical products and evaluate them for quality CO5: Students shall be able to formulate Cosmetics. CO6: Students shall be able to evaluate the different types of Dosage forms.



7	Course Description	<p>To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences</p> <p>Formulation and evaluation of the following dosage forms containing drugs mentioned in pharmacopoeia.</p> <ol style="list-style-type: none"> 1. Capsules. 2. Microcapsules/microspheres 3. Tablets by dry and wet granulation methods 4. Film coated tablets/ Enteric coated tablets, Ear drops 		
8	Outline Syllabus			
	1	To study the various instruments used in evaluation of tablet.		
	2	Evaluation of tablet as per IP.		
	3	Prepare and evaluate granules of Calcium lactate 50 Tablets.		
	4	To compress the prepared granules Of Acetyl salicylic acid by using Tablet Making Machine and determine their Disintegration Time and hardness of prepared tablets.		
	5	To study the effect of coating on disintegration of tablets.		
	6	To prepare effervescent granules by hot and wet method.		
	7	To prepare microcapsules by using phase separation & coacervation technique brought about by polymer polymer interaction.		
	8	To prepare and submit cold cream		
	9	Preparation of injection		
	10	To prepare and submit vanishing cream		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05Marks	10	35
	Text book/s*	<p>Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B.Schwartz.</p> <p>Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman</p> <p>Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman</p>		



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Other References	
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School:	SOP
Programme:	B. Pharm
Branch:	Semester: V
1 Course Code	BP507P
2 Course Title	Pharmacology- II Practical
3 Credits	2
4 Contact Hours (L-T-P)	0-0-4
Course Type	Compulsory
5 Course Objective	Upon completion of this course the student should be able to 1. Understand the mechanism of drug action and its relevance in the treatment of different diseases 2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments 3. Demonstrate the various receptor actions using isolated tissue preparation 4. Appreciate correlation of pharmacology with related medical sciences
6 Course Outcomes	CO1: Students would be able to define and describe various instruments and methods used in the evaluation of <i>in vitro</i> and <i>in vivo</i> evaluation of various drugs. CO2: Students would be able to understand and explain the working principles of the instruments used and actions of various drugs on biological systems. CO3: Students would be able to demonstrate the effects of various categories of drugs and bioassays of physiological substances. CO4: Students would be able to analyze and explain the outcomes of experiments through simulation studies. CO5: Students would be able to evaluate and discriminate amongst the normal and abnormal physiological processes, and various drugs that can be employed for different treatment protocols. CO6: Students would be able to plan about the effects of various bioassays of physiological substance and its application.



7	Course Description	<ol style="list-style-type: none"> 1. Introduction to <i>in-vitro</i> 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. 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. <p>Analgesic activity of drug using central and peripheral methods</p>		
8	Outline Syallabus			
1		Introduction to <i>in-vitro</i> 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.		
Mode of examination		Practical/Viva		
Weightage Distribution		Continuous Mode Assessment	Sessional Exam	ESE
		05Marks	10	35



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Text book/s*	Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.
Other References	



School:	SOP
Programme:	B. Pharm
Branch:	Semester: V
1 Course Code	BP508P
2 Course Title	Pharmacognosy - II Practical
3 Credits	2
4 Contact Hours (L-T-P)	0-0-4
Course Type	Compulsory
5 Course Objective	<ol style="list-style-type: none">1. Explain correct use of various equipments in Pharmacognosy laboratory.2. Handle simple/compound microscope in technically correct way.3. Explain and understand the Morphology, histology and powder characteristics4. Demonstrate skill of plant material sectioning, staining, mounting & focusing.5. Decide on staining reagents required for specific part of plant.6. Demonstrate Isolation and detection methods7. Separate phytoconstituents by TLC
6 Course Outcomes	<p>CO1: Students would able to identify and describe the morphology and chemical test of crude drugs</p> <p>CO2: Students would be able to explain and compare the microscopy of crude drugs and powder</p> <p>CO3: Students would be able to calculate the Rf value of phytoconstituents</p> <p>CO4: Students would be able to separate and analyze the phytoconstituents</p> <p>CO5: Students would be able to apply knowledge to isolate the compounds.</p> <p>CO6: Students would be able to evaluate the Phytoconstituents.</p>



7	Course Description	<p>Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander</p> <p>Exercise involving isolation & detection of active principles</p> <ol style="list-style-type: none"> Caffeine - from tea dust. Diosgenin from Dioscorea Atropine from Belladonna Sennosides from Senna <ol style="list-style-type: none"> Separation of sugars by Paper chromatography TLC of herbal extract Distillation of volatile oils and detection of phytoconstituents by TLC Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh 		
8	Outline Syllabus			
	1	To study the morphological and microscopy of Cinchona bark.		
	2	To study the morphological and microscopy of Fennel fruits.		
	3	To study the morphological characteristics of Senna leaves, Cinnamon bark and Ephedra stem		
	4	To study the powder characteristics of clove buds and Cinnamon bark		
	5	To study the morphological, and histological characteristics of clove bud		
	6	To study the morphological, microscopy and powder characteristics of Ephedra stem		
	7	To extract Caffeine from tea powder and identify by Thin Layer chromatography		
	8	To perform separation of sugars by Paper chromatography		
	9	To perform Thin Layer chromatography of the given herbal extract.		
	10	To isolate volatile oil by hydrodistillation method using Clavengers apparatus Determination of viscosity of liquid using Ostwald's viscometer		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05 Marks	10	35



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Text book/s*	<ol style="list-style-type: none">1. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.2. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.3. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.4. The formulation and preparation of cosmetic, fragrances and flavours.5. Remington's Pharmaceutical sciences.6. Text Book of Biotechnology by Vyas and Dixit.7. Text Book of Biotechnology by R.C. Dubey.
Other References	



School:	SOP
Programme:	B.Pharm
Branch:	Semester: VI
1 Course Code	BP601T
2 Course Title	Medicinal Chemistry III – Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	Upon completion of the course student shall be able to- 1. Understand the importance of drug design and different techniques of drug design. 2. Understand the chemistry of drugs with respect to their biological activity. 3. Know the metabolism, adverse effects and therapeutic value of drugs. Know the importance of SAR of drugs.
6 Course Outcomes	CO1: Student will be able to describe get fundamental knowledge of the structure, chemistry and its correlation with the therapeutic value of drugs. CO2: Students will be able to apply conceptual knowledge and background of drugs and ensure their rational use. CO3: Students will be able to plan about the synthesis and Structure Activity Relationships (SAR) associated with the drugs structure. CO4: Students will also conclude about the chemistry, mechanism of action, metabolism, adverse effects, and therapeutic uses of important drugs. CO5: Students will be able to the modern techniques of rational drug design like quantitative structure activity relationship CO6: Students will be able to construct the Drug design
7 Course Description	This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.



8	Outline syllabus
1	<p>UNIT – I</p> <p>A. Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.</p> <p>β-Lactam antibiotics: Penicillin, Cephalosporins, β- Lactamase inhibitors, Monobactams</p> <p>Aminoglycosides: Streptomycin, Neomycin, Kanamycin</p> <p>Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline</p>
2	<p>UNIT – II</p> <p>A. Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.</p> <p>B. Macrolide: Erythromycin, Clarithromycin, Azithromycin.</p> <p>C. Miscellaneous: Chloramphenicol*, Clindamycin.</p> <p>Prodrugs: Basic concepts and application of prodrugs design.</p> <p>Antimalarials: Etiology of malaria.</p> <p>Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.</p> <p>Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.</p> <p>Miscellaneous: Pyrimethamine, Artesunate, Artemether, Atovaquone</p>



3

UNIT - III

A. Anti-tubercular Agents

B. Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

C. Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine
Streptomycine, Capreomycin sulphate. Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gati

floxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents:

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir,



4	<p>UNIT - IV</p> <p>8 Hours 0</p> <p>A. Antifungal agents:</p> <p>B. Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.</p> <p>C. Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconazole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.</p> <p>Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.</p> <p>Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.</p> <p>Sulphonamides and Sulfones</p> <p>Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxazole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.</p> <p>Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.</p> <p>Sulfones: Dapsone*.</p>
5	<p>UNIT - V</p> <p>A. Introduction to Drug Design</p> <p>Various approaches used in drug design.</p> <p>Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammett's electronic parameter, Taft's steric parameter and Hansch analysis.</p> <p>Pharmacophore modeling and docking techniques.</p> <p>B. Combinatorial Chemistry: Concept and applications chemistry:</p> <p>C. solid phase and solution phase synthesis.</p>



Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	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. Introduction to principles of drug design- Smith and Williams		
Other References	Text book of practical organic chemistry- A.I.Vogel.		



School:	SOP
Programme:	B.Pharm
Branch:	Semester: VI
1 Course Code	BP602T
2 Course Title	Pharmacology - III – Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	<p>Upon completion of this course the student should be able to:</p> <ol style="list-style-type: none"> 1. understand the mechanism of drug action and its relevance in the treatment of different infectious diseases 2. comprehend the principles of toxicology and treatment of various poisonings 3. appreciate correlation of pharmacology with related medical sciences.
6 Course Outcomes	<p>CO1: Students would be able to define and describe various categories of drugs to be used in the treatment of respiratory, gastrointestinal, infectious and malignant disorders.</p> <p>CO2: Students would be able to understand and explain the mechanisms, pharmacokinetic profile, adverse effects and uses of various drugs.</p> <p>CO3: Students would be able to demonstrate the use of various categories of drugs and their bioassays.</p> <p>CO4: Students would be able to analyze and explain the pathology of cancer, infectious, respiratory and gastrointestinal diseases.</p> <p>CO5: Students would be able to evaluate and discriminate amongst the normal and abnormal physiological processes, and various drugs that can be employed for different treatment protocols.</p> <p>CO6: The student would be able to conclude the rational use of antibiotics.</p>
7 Course Description	<p>This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition, emphasis on the principles of toxicology and chronopharmacology.</p>
8	Outline syllabus

1	<p>UNIT-I</p> <p>A. Pharmacology of drugs acting on Respiratory system</p> <ol style="list-style-type: none"> Anti -asthmatic drugs Drugs used in the management of COPD Expectorants and antitussives Nasal decongestants <p>B. Respiratory stimulants Pharmacology of drugs acting on the Gastrointestinal Tract</p> <ol style="list-style-type: none"> Antiulcer agents. Drugs for constipation and diarrhoea. Appetite stimulants and suppressants. Digestants and carminatives. Emetics and anti-emetics.
2	<p>UNIT-II</p> <p>A. Chemotherapy</p> <ol style="list-style-type: none"> General principles of chemotherapy. Sulfonamides and cotrimoxazole. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides
3	<p>UNIT-III</p> <p>A. Chemotherapy</p> <ol style="list-style-type: none"> Antitubercular agents Antileprotic agents Antifungal agents Antiviral agents Anthelmintic agents Antimalarial drugs Antiamoebic agents



4	<p align="center">UNIT-IV</p> <p>A. Chemotherapy l. Urinary tract infections and sexually transmitted diseases. m. Chemotherapy of malignancy.</p> <p>B. Immunopharmacology a. Immunostimulants b. Immunosuppressant Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars</p>		
5	<p>UNIT-V</p> <p>A. Principles of toxicology a. Definition and basic knowledge of acute, subacute and chronic toxicity. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity General principles of treatment of poisoning c. Clinical symptoms and management of barbiturates, morphine, organophosphorus compound and lead, mercury and arsenic poisoning.</p> <p>B. Chronopharmacology a. Definition of rhythm and cycles. b. Biological clock and their significance leading to chronotherapy.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



Text book/s*	<ol style="list-style-type: none">1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical 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. VallabhPrakashan,10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.
Other Referenc es	



School:	SOP
Programme:	B.Pharm
Branch:	Semester: VI
1 Course Code	BP603T
2 Course Title	Herbal Drug Technology – Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	<p>Upon completion of the course, the student shall be able to</p> <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. <p>know the herbal cosmetics, natural sweeteners, nutraceuticals.</p>
6 Course Outcomes	<p>CO1: Students would be able to define herbal medicine, identify and authentication of herbal materials, describe nutraceuticals and herbal drug interactions</p> <p>CO2: Students would be able to differentiate Indian system of medicine and would be able to describe Stability testing of herbal drugs and explain patenting</p> <p>CO3: Students would be able apply and various identification process and latest technique of phytoconstituents</p> <p>CO4: Students would be able to demonstrate evaluation of drugs according to W.H.O. guidelines. Patenting and regulatory requirements of natural and analyse various phytoconstituents</p> <p>CO5: Students would be able to evaluate various phytoconstituents Herbal drug Industry Schedule T-Good manufacturing practices of Indian system of medicine</p> <p>CO6: Students would be able to formulate herbs or natural origin drugs as raw materials for preparation of cosmetics, excipients, conventional herbal formulation and novel dosage forms like Phytosomes</p>
7 Course Description	<p>This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs</p>
8 Outline syllabus	

1	<p>UNIT-I</p> <p>A. 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>B. Biodynamic Agriculture Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.</p> <p>C. Indian Systems of Medicine a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy a) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.</p>
2	<p>UNIT-II</p> <p>A. Nutraceuticals a. 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. b. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina</p> <p>B. Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions:</p> <p>C. Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.</p>
3	<p>Unit III</p> <p>A. 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>B. Herbal excipients: Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.</p> <p>C. Herbal formulations : Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes</p>



4	<p>UNIT- IV</p> <p>A. Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.</p> <p>B. Patenting and Regulatory requirements of natural products:</p> <p>a. Definition of the terms: Patent, IPR, Farmers right, Breeder’s right, Bioprospecting and Biopiracy</p> <p>b. Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.</p> <p>C. 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	<p>UNIT-V</p> <p>A. 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>B. Schedule T – Good Manufacturing Practice of Indian systems of medicine</p> <p>a. Components of GMP (Schedule – T) and its objectives Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



Text book/s*	<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 Gokhale4. Essential of Pharmacognosy by Dr.S.H.Ansari5. Pharmacognosy & Phytochemistry by V.D.Rangari6. 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.
Other Referenc es	



School:	SOP
Programme:	B.Pharm
Branch:	Semester: VI
1 CourseCode	BP604T
2 Course Title	Biopharmaceutics & Pharmacokinetics – Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	<p>Upon completion of the course student shall be able to:</p> <ol style="list-style-type: none"> 1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance. 2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination. 3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance. <p>Understand various pharmacokinetic parameters, their significance & applications.</p>
6 Course Outcomes	<p>CO1: Students will be able to define and differentiate the meaning of Biopharmaceutics and Pharmacokinetics</p> <p>CO2: Students will be able to plan about basic concepts and importance of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.</p> <p>CO3: Students will be able to categorize, sketch and relate various compartment models and their orientation while learning the parameters involved in the biopharmaceutical expression and infer the findings from such studies.</p> <p>CO4: Students will be able to correlate a study and interpret basic concepts, measurement and calculation of zero order and first order absorption rate constant involved in various biopharmaceutical and pharmacokinetics measurements.</p> <p>CO5: Students will be able to interpret various constraints in developing data-base for individuals in diseased conditions and compare with the functioning of normal person while incorporating the concept of pharmacokinetic study.</p> <p>CO6: Students will be able to analyze Non linear Pharmacokinetics.</p>



7	Course Description	This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein.
8 Outline syllabus		
1		<p>Unit I Introduction to Biopharmaceutics</p> <p>a. Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes,</p> <p>b. Distribution Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding.</p> <p>c. Kinetics of protein binding, Clinical significance of protein binding of drugs</p>
2		<p>UNIT- II 10 Hours</p> <p>A. Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs</p> <p>B. Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, <i>in-vitro</i> drug dissolution models, <i>in-vitro-in-vivo</i> correlations,</p> <p>C. bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.</p>
3		<p>UNIT- III 10 Hours</p> <p>A. Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model.</p> <p>(a). Intravenous Injection (Bolus)</p> <p>(b). Intravenous infusion and</p> <p>(c) Extra vascular administrations.</p> <p>B. Pharmacokinetics parameters - KE, $t_{1/2}$, V_d, AUC, K_a, Cl_t and CLR- definitions methods of eliminations,</p> <p>C. understanding of their significance and application</p>
4		<p>UNIT- I</p> <p>A. Multicompartment models: Two compartment open model. IV bolus</p> <p>B. Kinetics of multiple dosing, steady state drug levels,</p> <p>C. calculation of loading and mainetnace doses and their significance in clinical settins.</p>



5	UNIT- V Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity. a. Michaelis-menton method of estimating parameters, c.Explanation with example of drugs.		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<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 Inernational edition.USA 4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi 5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel 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 9. 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 Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987. 12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania 		
Other References			



School:	SOP
Programme:	B.Pharm
Branch:	Semester: VI
1 Course Code	BP605T
2 Course Title	Pharmaceutical Biotechnology – Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	Upon completion of the subject student shall be able to; <ol style="list-style-type: none">1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries2. Genetic engineering applications in relation to production of pharmaceuticals3. Importance of Monoclonal antibodies in Industries4. Appreciate the use of microorganisms in fermentation technology
6 Course Outcomes	CO1: Students will be able to understand the importance of Immobilized enzymes in Pharmaceutical Industries. CO2: Students will be able to describe genetic engineering applications in relation to production of Pharmaceuticals CO3: Students will be able to conclude about importance of Monoclonal antibodies in Industries CO4: Students will be able to understand the use of microorganisms in fermentation technology CO5: Students will be able to plan various fermentation methods CO6: Students will be able to explore recent developments in fermentation technology.



3	<p>Unit III</p> <p>a. Types of immunity- humoral immunity, cellular immunity</p> <p>b. Structure of Immunoglobulins Structure and Function of MHC Hypersensitivity reactions, Immune stimulation and Immune suppressions.</p> <p>c. General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.</p> <p>Storage conditions and stability of official vaccines</p> <p>Hybridoma technology- Production, Purification and Applications</p> <p>Blood products and Plasma Substitutes.</p>		
4	<p>Unit IV</p> <p>a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.</p> <p>b) Genetic organization of Eukaryotes and Prokaryotes</p> <p>c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.</p> <p>Introduction to Microbial biotransformation and applications.</p> <p>Mutation: Types of mutation/mutants.</p>		
5	<p>Unit V</p> <p>a. Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.</p> <p>b. Large scale production fermenter design and its various controls.</p> <p>c. Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,</p> <p>Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



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Text book/s*	<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. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.4. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.5. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi
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School:	SOP
Programme:	B.Pharm
Branch:	Semester: VI
1 Course Code	BP606T
2 Course Title	Pharmaceutical Quality Assurance – Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	Upon completion, students will be familiar with various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs
6 Course Outcomes	<p>CO1: Students will be able to describe about upon completion of the course student shall be able to understand the cGMP aspects in a pharmaceutical industry</p> <p>CO2: Students will be able to associate basic concepts and importance of appreciate the importance of documentation</p> <p>CO3: Students will be able to interpret and understand basic concepts on quality certifications applicable to pharmaceutical industries</p> <p>CO4: Students will be able to summarize and understand the responsibilities of QA & QC departments along with GLP and validation aspects</p> <p>CO5: Students will be able to analyze Complaints and evaluation of complaints in addition to Handling of return goods</p> <p>CO6: Students will be able to compare about all the documents used in the Pharmaceutical industry.</p>
7 Course Description	This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory
8 Outline syllabus	



1	<p>UNIT – I</p> <p>10 Hours</p> <p>A. Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP</p> <p>B. Total Quality Management (TQM): Definition, elements, philosophies</p> <p>C. ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines Quality by design (QbD): Definition, overview, elements of QbD Programme, tools ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration NABL accreditation : Principles and procedures</p>
2	<p>UNIT - II</p> <p>A. 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>B. Equipments and raw materials: Equipment selection, purchase specifications, maintenance,</p> <p>C. purchase specifications and maintenance of stores for raw materials.</p>
3	<p>UNIT - III</p> <p>A. Quality Control: Quality control test for containers, rubber closures and secondary packing materials.</p> <p>B. Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles,</p> <p>C. Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities</p>
4	<p>UNIT - IV</p> <p>A. Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.</p> <p>B. Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit,</p> <p>C. Quality Review and Quality documentation, Reports and documents, distribution records.</p>



5	UNIT - V A. Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, B. types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation. C. Warehousing: Good warehousing practice, materials management		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*	<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 Guidelines 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 		



School:	SOP
Programme:	B. Pharm
Branch:	Semester: V
1 Course Code	BP607P
2 Course Title	Medicinal Chemistry III - Practical
3 Credits	2
4 Contact Hours (L-T-P)	0-0-4
Course Type	Compulsory
5 Course Objective	Upon completion of the course student shall be able to <ol style="list-style-type: none">1. Understand the importance of drug design and different techniques of drug design.2. Understand the chemistry of drugs with respect to their biological activity.3. Know the metabolism, adverse effects and therapeutic value of drugs.4. Know the importance of SAR of drugs.
6 Course Outcomes	CO1: Student will be able to understand the structure, chemistry and its correlation with the therapeutic value of drugs. CO2: Student will be able to formulate of drugs and preparation of drugs. CO3: Student will be able to apply the basic knowledge about the synthesis of sulphanilamide. CO4: Student will be able to generalize about the synthesis of Chlorobutanol, metronidazole. CO5: Student will be able to conclude about the synthesis of chloroquine, dapsone CO6: Student will be able to plan about the synthesis of Tolbutamide.



7	Course Description	<p>I Preparation of drugs and intermediates</p> <p>1 Sulphanilamide</p> <p>2 7-Hydroxy, 4-methyl coumarin</p> <p>3 Chlorobutanol</p> <p>4 Triphenyl imidazole</p> <p>5 Tolbutamide</p> <p>6 Hexamine</p> <p>II Assay of drugs</p> <p>1 Isonicotinic acid hydrazide</p> <p>2 Chloroquine</p> <p>3 Metronidazole, Dapsone</p> <p>4 Chlorpheniramine maleate, Benzyl penicillin</p>		
8	Outline Syllabus			
	1	Preparation of Sulphanilamide		
	2	Preparation of Chlorpheniramine maleate		
	3	Preparation of 7-Hydroxy, 4-methyl coumarin		
	4	Preparation of Chloroquine		
	5	Preparation of Chlorobutanol		
	6	Preparation of Triphenyl imidazole		
	7	Preparation of Benzyl penicillin		
	8	Preparation of Preparation of Preparation of Tolbutamide		
	9	Preparation of Metronidazole		
	10	Preparation of Dapsone		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05 Marks	10	35



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Text book/s*	<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.
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School:	SOP
Programme:	B. Pharm
Branch:	Semester: VI
1 Course Code	BP608P
2 Course Title	Pharmacology III- Practical
3 Credits	2
4 Contact Hours (L-T-P)	0-0-4
Course Type	Compulsory
5 Course Objective	Upon completion of this course the student should be able to 1. Understand the mechanism of drug action and its relevance in the treatment of different diseases 2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments 3. Demonstrate the various receptor actions using isolated tissue preparation Appreciate correlation of pharmacology with related medical sciences
6 Course Outcomes	CO1: Students would be able to define various instruments and methods used in the evaluation of <i>in vitro</i> and <i>in vivo</i> evaluation of various drugs. CO2: Students would be able to understand the working principles of the instruments used and actions of various drugs on biological systems. CO3: Students would be able to demonstrate the effects of various categories of drugs and bioassays of physiological substances. CO4: Students would be able to analyze the outcomes of experiments through simulation studies. CO5: Students would be able to evaluate the normal and abnormal physiological processes, and various drugs that can be employed for different treatment protocols. CO6: The student will be able to perform bioassays of various drugs.



7	Course Description	<ol style="list-style-type: none"> 1. Dose calculation in pharmacological experiments 2. Antiallergic activity by mast cell stabilization assay 3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model. 4. Study of effect of drugs on gastrointestinal motility 5. Effect of agonist and antagonists on guinea pig ileum 6. Estimation of serum biochemical parameters by using semi-autoanalyser 8. Effect of saline purgative on frog intestine Insulin hypoglycemic effect in rabbit 9. Test for pyrogens (rabbit method) 10. Determination of acute oral toxicity (LD50) of a drug from a given data 11. Determination of acute skin irritation / corrosion of a test substance 12. Determination of acute eye irritation / corrosion of a test substance 13. Calculation of pharmacokinetic parameters from a given data 14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA) 15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test) 		
8	Outline Syllabus			
	1	Dose calculation in pharmacological experiments		
	2	Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.		
	3	Study of effect of drugs on gastrointestinal motility		
	4	Effect of agonist and antagonists on guinea pig ileum		
	5	Estimation of serum biochemical parameters by using semi- autoanalyser		
	6	Estimation of serum biochemical parameters by using semi- autoanalyser		
	7	Effect of saline purgative on frog intestine		
	8	Insulin hypoglycemic effect in rabbit		
	9	Test for pyrogens (rabbit method)		
	10	Determination of acute oral toxicity (LD50) of a drug from a given data		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE



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	05 Marks	10	35
'Text book/s*	1. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert, 2. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata, 3. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan, 4. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.		
Other References			



School:	SOP
Programme:	B. Pharm
Branch:	Semester: VI
1 Course Code	BP609P
2 Course Title	Herbal Drug Technology - Practical
3 Credits	2
4 Contact Hours (L-T-P)	0-0-4
Course Type	Compulsory
5 Course Objective	<ol style="list-style-type: none"> 1. Explain correct use of various equipments in Pharmacognosy laboratory. 2. Evaluation of drugs and various formulations 3. Demonstrate various herbal preparations 4. Formulations of various herbal cosmetics 5. Analyse the phytoconstituents
6 Course Outcomes	<p>CO1: Students would able to prepare crude drug extract, identify extract through phytochemical screening and also identify herbal drugs through chemical test</p> <p>CO2: Students would be able to distinguish excipients of natural origin and estimate alcohol content in alcoholic formulations</p> <p>CO3: Students would be able to formulate herbal creams, shampoo</p> <p>CO4: Students would be able to analyze evaluation parameters for herbal shampoo and creams</p> <p>CO5: Students would be able to formulate and evaluate syrups.</p> <p>CO6: Students will be able to understand about herbal drug preparations.</p>
7 Course Description	<ol style="list-style-type: none"> 1. To perform preliminary phytochemical screening of crude drugs. 2. Determination of the alcohol content of Asava and Arista 3. Evaluation of excipients of natural origin 4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation. 5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements. 6. Monograph analysis of herbal drugs from recent Pharmacopoeias 7. Determination of Aldehyde content 8. Determination of Phenol content <p>Determination of total alkaloids</p>
8 Outline Syllabus	
1	To determine phenol content in clove oil.
2	To determine total alkaloids in crude drug sample.



	3	Evaluation of excipients of natural origin		
	4	Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.		
	5	To perform Preliminary phytochemical screening of crude drugs.		
	6	To determine the alcohol content of Asava and Arishta.		
	7	To formulate and evaluate herbal cream containing <i>Curcuma longa</i> .		
	8	To formulate and evaluate Polyherbal shampoo.		
	9	To formulate and evaluate herbal cough syrup		
	10	To perform Preliminary phytochemical screening of crude drugs.		
	Mode of examination	Practical/Viva		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05 Marks	10	35
	Text book/s*	<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 		



School:		SOP
Programme:		B.Pharm
Branch:		Semester: VII
1	Course Code	BP701T
2	Course Title	Instrumental Methods of Analysis
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
Course Type		Compulsory
5	Course Objective	<p>Upon completion of this course the student should be able to</p> <ol style="list-style-type: none"> 1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis. 2. Understand various techniques in Analysis of various Pharmaceuticals. 3. Study the applications of various Instruments in analysis of Pharmaceuticals. 4. Perform quantitative & qualitative analysis of drugs using various analytical instruments.
6	Course Outcomes	<p>CO1: Students will be able to understand about Analytical techniques in Instrumental Methods of Analysis.</p> <p>CO2 Students will be able to apply the principle of Modern instruments using in Analysis of Pharmaceuticals</p> <p>CO3: Students will be able to compare about applications of Modern instruments using in Analysis of Pharmaceuticals</p> <p>CO4: Students will be able to identify how to operate the Modern instruments in analysis of Pharmaceuticals.</p> <p>CO5: Students will be able to interpret the chromatographic separation and analysis of drugs.</p> <p>CO6: Students will be able to analyze the chromatographic separation and analysis of drugs</p>
7	Course Description	<p>This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.</p>
8	Outline syllabus	



1		<p>A. UV Visible spectroscopy Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.</p> <p>B. Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.</p> <p>C. Applications - Spectrophotometric titrations, Single component and multi component analysis</p> <p>D. Fluorimetry</p>
2		<p>A. IR spectroscopy Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications</p> <p>B. Flame Photometry-Principle, interferences, instrumentation and applications</p> <p>C. Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications</p> <p>Nepheloturbidometry- Principle, instrumentation and applications</p>
3		<p>A. Introduction to chromatography Adsorption and partition column chromatography-Methodology, advantages,disadvantages and applications.</p> <p>B. Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.</p> <p>C. Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications</p> <p>Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications</p>
4		<p>A. Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature Programmement, advantages, disadvantages and applications</p> <p>B. High performance liquid chromatography (HPLC)-Introduction, theory,</p> <p>C. instrumentation, advantages and applications.</p>
5		<p>A. Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications</p> <p>B. Gel chromatography- Introduction, theory, instrumentation and applications Affinity</p> <p>C. chromatography- Introduction, theory, instrumentation and applications</p>
Mode of examination	Theory	



Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		10 Marks	15
Text book/s*			
Other References	Recommended Books (Latest Editions) <ol style="list-style-type: none">1. Instrumental Methods of Chemical Analysis by B.K Sharma2. Organic spectroscopy by Y.R Sharma3. Text book of Pharmaceutical Analysis by Kenneth A. Connors4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake6. Organic Chemistry by I. L. Finar7. Organic spectroscopy by William Kemp8. Quantitative Analysis of Drugs by D. C. Garrett9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi10. Spectrophotometric identification of Organic Compounds by Silverstein		



School:		SOP
Programme:		B.Pharm
Branch:		Semester: VII
1	Course Code	BP-702T
2	Course Title	Industrial Pharmacy-II Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>Upon completion of the course, the student shall be able to:</p> <ol style="list-style-type: none"> 1. Know the process of pilot plant and scale up of pharmaceutical dosage forms 2. Understand the process of technology transfer from lab scale to commercial batch 3. Know different Laws and Acts that regulate pharmaceutical industry 4. Understand the approval process and regulatory requirements for drug products
6	Course Outcomes	<p>CO1: Students shall be able to understand about the process of pilot plant and scale up of pharmaceutical dosage forms</p> <p>CO2: Students shall be able to describe the process of technology transfer from lab scale to commercial batch.</p> <p>CO3: Students shall be able to plan about stepwise product development process from NDA filing to final FDA submission</p> <p>CO4 Students shall be to able to analyze the different laws and acts that regulate pharmaceutical industry in India and US</p> <p>CO5: Students shall be to able to Develop the concept of quality management and knowledge of required certifications</p> <p>CO6: Students will be able to design about all the process and regulatory requirements for drug product.</p>
7	Course Description	This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market
8	Outline syllabus	
	Unit 1	A. Pilot plant scale up techniques:



	<p>B. 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</p> <p>C. relevant documentation, SUPAC guidelines, Introduction to platform technology.</p>
Unit 2	Technology development and transfer
	<p>A. Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol,</p> <p>B. Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer,</p> <p>C. Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues</p>
Unit 3	Regulatory affairs
	<p>A. Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department,</p> <p>B. Responsibility of Regulatory Affairs Professionals 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,</p> <p>C. Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies</p>
Unit 4	Quality management systems
	<p>A. Quality management systems: Quality management & Certifications: Concept of Quality,</p> <p>B. Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS),</p> <p>C. Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP</p>
Unit 5	Indian Regulatory Requirements
	<p>A. Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority:</p> <p>B. B. Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP),</p> <p>C. Regulatory requirements and approval procedures for New Drugs</p>
Mode of examination	Theory



Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		10 Marks	15
Text book/s	<ol style="list-style-type: none">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.php3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.4. Regulatory Affairs brought by learning plus, inc. available at http://www.cgmp.com/ra.htm.		



School:	SOP	
Programme:	B. Pharm	
Branch:	Semester:VII	
1	Course Code	BP703T
2	Course Title	Pharmacy Practice Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>This course has been designed to impart the fundamental knowledge of pharmacy practice and ethics along with the aspects of hospital organization. Objectives: Upon the completion of this course the students shall be able to</p> <ol style="list-style-type: none">1. know various drug distribution methods in a hospital2. appreciate the pharmacy stores management and inventory control3. monitor drug therapy of patient through medication chart review and clinical review4. obtain medication history interview and counsel the patients5. identify drug related problems6. detect and assess adverse drug reactions7. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states8. know pharmaceutical care services9. do patient counselling in community pharmacy;10. Appreciate the concept of rational drug therapy.
6	Course Outcomes	<p>CO1: Student will be able to understand Ability to discuss the controversies in drug therapy</p> <p>CO2: Student will be able to apply the therapeutic approach to management of hospital</p> <p>CO3: Student will be able to identify the patient specific parameters relevant in monitoring therapy</p> <p>CO4: Student will be able to conclude the importance of individualized therapeutic plans based on diagnosis</p> <p>CO5: Student will be able to analyze data collected at their research work.</p> <p>CO6: Students shall be able to generalize the role of a Pharmacist in a community.</p>



7	Course Description	In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.
8	Outline syllabus	
Unit 1		Hospital and it's organization
		<p>A. 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>B. Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists 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>D. 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 2		Drug distribution system in a hospital
		<p>A. 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. 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>B. Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring. Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.</p> <p>C. Need for the patient medication history interview, medication interview forms. Financial, materials, staff, and infrastructure requirements</p>
Unit 3		Pharmacy and therapeutic committee



<p>A. 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. Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.</p> <p>B. Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist. Role of pharmacist in the education and training Programme, Internal and external training Programme, 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>C. Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.</p>			
Unit 4		Budget preparation and implementation	
<p>A. Budget preparation and implementation.</p> <p>B. 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>Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.</p> <p>C. Introduction and sale of over the counter, and Rational use of common over the counter medications.</p>			
Unit 5		Drug store management and inventory control	
<p>A. 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 Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.</p> <p>B. Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.</p> <p>C. Blood chemistry, hematology, and urinalysis.</p>			
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



	Text book/s*	
	Other References	<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>, 1st ed. Chennai: Orient Longman 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; 2009.5. Parmar N.S. <i>Health Education and Community Pharmacy</i>, 18th ed. India: CBS Publishers & Distributers; 2008.



School:		SOP
Programme:		B. Pharm
Branch:		Semester: VII
1	Course Code	BP 704T
2	Course Title	Novel drug delivery systems- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	After the successful completion of this course, the student shall be able to: 1. The course aims to provide an understanding of basic knowledge on the area of novel drug delivery systems. 2. To understand various approaches for development of novel drug delivery systems. 3. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation
6	Course Outcomes	CO1: The students will understand the concepts and applications of Novel Drug Delivery Systems and to study various properties for sustained and controlled drug delivery systems. CO2: The student will be able to apply knowledge in developing various novel formulations as per requirements and to learn mucosal and Implantable drug delivery. CO3: The student will be able to analyze various evaluation parameters for oral, parenteral, topical etc. drug delivery systems. CO4: The students will be able to formulate industrially feasible, cost effective strategy for development of new dosage forms CO5: The students will be able to plan about site specific drug delivery. CO6: The Students will be able to develop ocular drug delivery, its issues and challenges, drug selection.
7	Course Description	This subject is designed to impart basic knowledge on the area of novel drug delivery systems. 1. To understand various approaches for development of novel drug delivery systems. 2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation
8	Outline syllabus	



1	<p>A. 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>B. Polymers: Introduction, classification, properties,</p> <p>C. advantages and application of polymers in formulation of controlled release drug delivery systems.</p>
2	<p>A. Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications</p> <p>B. Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems</p> <p>C. Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump</p>
3	<p>A. Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches</p> <p>B. Gastroretentive drug delivery systems: Introduction, advantages, disadvantages</p> <p>C. approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications</p>
4	<p>A. Targeted drug Delivery: Concepts and approaches advantages and disadvantages,</p> <p>B. introduction to liposomes, niosomes, nanoparticles,</p> <p>C. monoclonal antibodies and their applications</p>
5	<p>A. Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts</p> <p>B. Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages,</p> <p>C. development of intra uterine devices (IUDs) and applications</p>



Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*			
Other References	Recommended Books (Latest Editions) <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 Wiley4. Interscience Publication, John Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi5. Spectrophotometric identification of Organic Compounds by Silverstein.		



School:	SOP	
Programme:	B.Pharm	
Branch:	Semester: VII	
1	Course Code	BP705P
2	Course Title	Instrumental Methods of Analysis- theory
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Type	Compulsory
5	Course Objective	Upon completion of this course the student should be able to 1. Understand applications of instruments in drug analysis 2. Understand operation of instruments in Analysis of various Pharmaceuticals. 3. Study the preparation of various analytes 4. Perform quantitative & qualitative analysis of drugs using various analytical instruments.
6	Course Outcomes	CO1: Students will be able to understand Analytical techniques in Instrumental Methods of Analysis. CO2: Students will be able to describe conceptual knowledge about operation of Modern instruments using in Analysis of Pharmaceuticals CO3: Students will be able to apply the basic knowledge about applications of Modern instruments using in Analysis of Pharmaceuticals CO4: Student will be able to plan about how to operate the Modern instruments in analysis of Pharmaceuticals. CO5: Students will be able to understand the chromatographic separation and analysis of drugs. CO6 Students will be able to interpret the chromatographic separation and analysis of drugs.



7	Course Description	<p>Subject covers operation of various modern instruments used in analysis of Pharmaceuticals</p> <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 		
8	Outline syllabus			
	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		
	Mode of examination	Practical		
	Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
		05 Marks	10	35
	Text book/s*			



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Other References	<p>Recommended Books (Latest Editions)</p> <ol style="list-style-type: none">1. Instrumental Methods of Chemical Analysis by B.K Sharma2. Organic spectroscopy by Y.R Sharma3. Text book of Pharmaceutical Analysis by Kenneth A. Connors4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake6. Organic Chemistry by I. L. Finar7. Organic spectroscopy by William Kemp8. Quantitative Analysis of Drugs by D. C. Garrett9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi <p>Spectrophotometric identification of Organic Compounds by Silverstein</p>
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School:		SOP
Programme:		B.Pharm
Branch:		Semester: VIII
1	Course Code	BP801T
2	Course Title	Biostatistics & Research Methodology- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
Course Type		Compulsory
5	Course Objective	<ol style="list-style-type: none"> 1. Know the operation of M.S. Excel, SPSS, R and MINITAB[®], DoE (Design of Experiment) 2. Know the various statistical techniques to solve statistical problems 3. Appreciate statistical techniques in solving the problems
6	Course Outcomes	<p>CO1: Students will be able to Describe statistics, Biostatistics and interpretation of frequency distribution table, and their pharmaceutical examples</p> <p>CO2: Students will be able to Calculate the measures of central tendency and dispersion of a data and describe the method used for analysis, including a discussion of advantages, disadvantages, and necessary assumptions.</p> <p>CO3: Students will be able to Describe the properties of Regression, Curve fitting, Multiple regression and their pharmaceutical examples. .</p> <p>CO4: Students will be able to Calculate and interpret the correlation between two variables.</p> <p>CO5: Students will be able to Understand the concept of Probability and different types of distributions, Poisson's distribution and its properties.</p> <p>CO6: Students will be able to plan about the concept of Probability and different types of distributions, Poisson's distribution and its properties.</p>
7	Course Description	To understand the applications of Biostatics in Pharmacy. This subject deals with 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, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel.
8	Outline syllabus	



1		<p>Unit-I</p> <p>A. Introduction: Statistics, Biostatistics, Frequency distribution</p> <p>B. Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples</p> <p>C. Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems</p> <p>D. Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples</p>
2		<p>Unit-II</p> <p>A. 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</p> <p>B. Probability: Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples</p> <p>C. Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference</p>
3		<p>Unit-III 10 Hours</p> <p>A. Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test</p> <p>B. Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism</p> <p>C. Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph</p> <p>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.</p>
4		<p>Unit-IV</p> <p>A. Blocking and confounding system for Two-level factorials Regression modeling: Hypothesis testing in Simple and Multiple regression models</p> <p>B. Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB DESIGN OF EXPERIMENTS, R</p> <p>C. Online Statistical Software's to Industrial and Clinical trial approach</p>
5		<p>Unit-V</p> <p>A. Design and Analysis of experiments: Factorial Design: Definition, 2, 2 design. Advantage of factorial design</p> <p>B. Response Surface methodology: Central composite design,</p> <p>C. Historical design, Optimization Techniques</p>



Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*			
Other References	Recommended Books (Latest edition): <ol style="list-style-type: none">1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery		



School:		SOP
Programme:		B.Pharm
Branch:		Semester: VIII
1	Course Code	BP802T
2	Course Title	Social & Preventive Pharmacy- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	Upon completion of this course the student should be able to <ol style="list-style-type: none">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
6	Course Outcomes	CO1: The students will understand the issues related to social issues of health. CO2: The student will be able to summarize the impact of govt. health policies run for various health issues. CO3: The student will be able to apply the knowledge of understanding the health issues of the society on finding the effective solution for eradication of diseases. CO4: The students will compare the correlation of various factors affecting the health status of common people and will assess the action plans to combat the health issues. CO5: The students would evaluate the processes of various national Programmes related to social health and prevention of various diseases. CO6: The students would elaborate the processes of various .preventions of diseases
7	Course Description	The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health Programmemes. The roles of the pharmacist in these contexts are also discussed.
8	Outline syllabus	



1	<p>Unit I:</p> <p>A. 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.</p> <p>D. Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.</p> <p>Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health</p> <p>Hygiene and health: personal hygiene and health care; avoidable habits</p>		
2	<p>Unit II:</p> <p>A. Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS,</p> <p>B. Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic</p> <p>C. filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse</p>		
3	<p>Unit III:</p> <p>A. National health Programmes, its objectives, functioning and outcome of the following: HIV AND AIDS control Programmeme, TB, Integrated disease surveillance Programme (IDSP),</p> <p>B. National leprosy control Programmeme, National mental health Programme, National Programmeme for prevention and control of deafness,</p> <p>C. Universal immunization Programmeme, National Programmeme for control of blindness, Pulse polio Programmeme.</p>		
4	<p>Unit IV:</p> <p>A. National health intervention Programmeme for mother and child, National family welfare Programmeme, National tobacco control Programmeme,</p> <p>B. National Malaria Prevention Programme, National Programmeme for the health care for the elderly,</p> <p>C. Social health Programmeme; role of WHO in Indian national Programme</p>		
5	<p>Unit V:</p> <p>A. 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.</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE



	10 Marks	15	75
Text book/s*			
Other References	Recommended Books (Latest Editions) <ol style="list-style-type: none">1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2 2010, ISBN: 9789380704104, JAYPEE Publications Edition,2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Royth Edition, 2013, ISBN: 9789350901878, JAYPEE3. Rabindra Nath, Saha Indranil, 4 Publications Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6 Edition, 2014, ISBN: 9789351522331, JAYPEE Publications4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, nd5. Hiremath Dhananjaya A, 2 Edition, 2012, ISBN: 9789350250440, JAYPEE Publications Park Textbook of Preventive and Social Medicine, K Park, 21 Edition, 2011,6. ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad		



School:		SOP
Programme:		B.Pharm
Branch:		Semester: VIII
1	Course Code	BP803ET
2	Course Title	Pharma marketing management- Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Compulsory
5	Course Objective	<p>After the successful completion of this course, the student shall be able to:</p> <ol style="list-style-type: none"> 1. The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry 2. Have a critical way of thinking based on different marketing strategy for product development. 3. The aim here is to develop a community around the brand whereby audiences can interact with certain content. In the pharmaceutical industry, more so big pharma, and just like most other consumer-facing industries, there are more products and more messages subsequently meaning more noise.
6	Course Outcomes	<p>CO1: The students will understand the Marketing concepts and techniques and the application of the same in the pharmaceutical industry.</p> <p>CO2: The student will be able to summarize the Market research and distribution channels along with their implementation in the pharmaceutical industry.</p> <p>CO3: The student will be able to apply the knowledge regarding the Concepts of product line and product mix decisions, branding and product management.</p> <p>CO4: The students will analyze the Theories on promotion techniques for OTC Products, sales and pricing of a product.</p> <p>CO5: The students would evaluate the processes of issues in price management in the pharmaceutical industry.</p> <p>CO6: The students will be able to conclude about the Emerging concepts in marketing and Global Marketing concept.</p>
7	Course Description	The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.



8	Outline syllabus	
1		<p>Unit I:</p> <p>A. 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>A. 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;</p> <p>C. Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist. Analyzing the Market; Role of market research.</p>
2		<p>Unit II:</p> <p>A. Product decision: Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning;</p> <p>B. New product decisions; Product branding, packaging and labeling decisions,</p> <p>C. Product management in pharmaceutical industry.</p>
3		<p>Unit III:</p> <p>A. Promotion: Methods, determinants of promotional mix, promotional budget;</p> <p>B. An overview of personal selling, advertising, direct mail, journals, sampling, retailing,</p> <p>C. medical exhibition, public relations, online promotional techniques for OTC Products.</p>
4		<p>Unit IV:</p> <p>A. 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>B. Professional sales representative (PSR): Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating,</p> <p>C. compensation and future prospects of the PSR.</p>



5	Unit V: A. 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). B. Emerging concepts in marketing: Vertical & Horizontal Marketing; RuralMarketing; Consumerism; C. Industrial Marketing; Global Marketing.		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*			



Other References	<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 Delhi2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, IndianContext,Macmilan India, New Delhi.7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel7. Rabindra Nath, Saha Indranil, 4 Publications Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6 Edition, 2014, ISBN: 9789351522331, JAYPEE Publications8. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, nd9. Hiremath Dhananjaya A, 2 Edition, 2012, ISBN: 9789350250440, JAYPEE Publications Park Textbook of Preventive and Social Medicine, K Park, 21 Edition, 2011,10. ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad
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School:	SOP
Programme:	B.Pharm
Branch:	Semester: V
1 Course Code	BP804ET
2 Course Title	Pharmaceutical Regulatory Science - Theory
3 Credits	4
4 Contact Hours (L-T-P)	3-1-0
Course Type	Compulsory
5 Course Objective	<p>Upon completion of the subject student shall be able to;</p> <p>Know about the process of drug discovery and development</p> <p>Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals</p> <p>Know the regulatory approval process and their registration in Indian and international markets</p>
6 Course Outcomes	<p>CO1: Students would be able to understand about the process of drug discovery and development</p> <p>CO2: Students would be able to apply the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals</p> <p>CO3: Students would be able to explain the regulatory approval process</p> <p>CO4: Students would be able to analyze the registration of drug in Indian and international market.</p> <p>CO5 Students would be able to plan about clinical trials, ethical committee and protocol designing.</p>
7 Course Description	<p>This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia,UK etc. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.</p>
8	Outline syllabus



1	<p>Unit I A. New Drug Discovery and development Stages of drug discovery, B. Drug development process, pre-clinical studies, non-clinical activities, clinical studies, C. Innovator and generics, Concept of generics, Generic drug product development.</p>		
2	<p>Unit II</p> <p>A. Regulatory Approval Process Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA.</p> <p>B. Regulatory authorities and agencies Overview of regulatory authorities of India, United States, European Union, C. Australia, Japan, Canada (Organization structure and types of applications)</p>		
3	<p>Unit III</p> <p>A. Registration of Indian drug product in overseas market 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. B. pelletization process, C. equipments for manufacture of pellets</p>		
4	<p>Unit IV</p> <p>A. Clinical trials Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, B. GCP obligations of Investigators, sponsors & Monitors, C. Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials</p>		
5	<p>Unit V</p> <p>A. Regulatory Concepts Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75



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Text book/s*	<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 Mantis.6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.1437. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene9. Drugs: From Discovery to Approval, Second Edition By Rick Ng
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School:		SOP
Programme:		B.Pharm
Branch:		Semester: VIII
1	Course Code	BP805ET
2	Course Title	Pharmacovigilance Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Type	Elective
5	Course Objective	<p>This course has been designed to impart the fundamental knowledge of pharmacy practice and ethics along with the aspects of hospital organization.</p> <p>Objectives: Upon the completion of this course the students shall be able to</p> <p>Tell Why drug safety monitoring is important? History and development of pharmacovigilance</p> <p>National and international scenario of pharmacovigilance Dictionaries, coding and terminologies used in pharmacovigilance Detection of new adverse drug reactions and their assessment International standards for classification of diseases and drugs</p> <p>Adverse drug reaction reporting systems and communication in Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle</p> <p>Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation</p> <p>Pharmacovigilance Programme of India (PvPI) requirement for ADR reporting in India</p> <p>ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning</p> <p>CIOMS requirements for ADR reporting</p> <p>Writing case narratives of adverse events and their quality.</p>
6	Course Outcomes	<p>Student will be able to</p> <p>CO1: Understand the history of Pharmacovigilance</p> <p>CO2: Apply about the Detection of new adverse drug reactions and their assessment</p> <p>CO3: Analyze the suspected drug events</p> <p>CO4: Interpret the importance of PV PI</p> <p>CO5: Understand reports like ICSR, PSUR</p> <p>CO6: Apply the ADR for vaccines</p>



7	Course Description	This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance Programme in an organization, various methods that can be used to generate safety data and signal detection. This paper also develops the skills of classifying drugs, diseases and adverse drug reactions.
8	Outline syllabus	
	1	<p>A. Introduction to Pharmacovigilance</p> <ul style="list-style-type: none">a. History and development of Pharmacovigilanceb. Importance of safety monitoring of Medicinec. WHO international drug monitoring Programme <p>B. Pharmacovigilance Programme of India(PvPI)</p> <p>C. Introduction to adverse drug reactions</p> <p>Definitions and classification of ADR</p> <p>Detection and reportin</p> <p>Methods in Causality assessment</p> <p>Severity and seriousness assessment</p> <p>Predictability and preventability assessment prevention.</p> <p>Management of adverse drug reactions</p> <p>Basic terminologies used in pharmacovigilance</p> <ul style="list-style-type: none">Terminologies of adverse medication related eventsRegulatory terminologies



2		<p>Drug and disease classification</p> <p>A. Drug dictionaries and coding in pharmacovigilance Anatomical, therapeutic and chemical classification of drugs International classification of diseases Daily defined doses International Non proprietary Names for drugs</p> <p>B. Information resources in pharmacovigilance Basic drug information resources Specialised resources for ADRs</p> <p>WHO adverse reaction terminologies MedDRA and Standardised MedDRA queries WHO drug dictionary Eudravigilance medicinal product dictionary</p> <p>C. Establishing pharmacovigilance Programmeme Establishing in a hospital Establishment & operation of drug safety department in industry Contract Research Organisations (CROs) Establishing a national Programmeme</p>
3		<p>A. Vaccine safety surveillance Vaccine Pharmacovigilance Vaccination failure Adverse events following immunization</p> <p>B. 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>C. Communication in pharmacovigilance Effective communication in Pharmacovigilance Communication in Drug Safety Crisis management Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media</p>



4	<p>A. Safety data generation</p> <ol style="list-style-type: none"> 1. Pre clinical phase 2. Clinical phase 3. Post approval phase (PMS) <p>B. ICH Guidelines for Pharmacovigilance</p> <ol style="list-style-type: none"> 1. Organization and objectives of ICH 2. Expedited reporting 3. Individual case safety reports 4. Periodic safety update reports 5. Post approval expedited reporting 6. Pharmacovigilance planning 7. Good clinical practice in pharmacovigilance studies 		
5	<p>A. Pharmacogenomics of adverse drug reactions. Genetics related ADR with example focusing PK parameters.</p> <p>B. Drug safety evaluation in special population</p> <ol style="list-style-type: none"> a. Paediatrics b. Pregnancy and lactation c. Geriatrics <p>C. CIOMS</p> <p>CIOMS Working Groups CIOMS Form</p> <p>CDSO (India) and Pharmacovigilance</p> <p><input type="checkbox"/> <input type="checkbox"/> D&C Act and Schedule Y</p> <p><input type="checkbox"/> <input type="checkbox"/> Differences in Indian and global pharmacovigilance requirements</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*			



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Other References	<p>Recommended Books (Latest edition)</p> <p>Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.</p> <p>Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.</p> <p>Mann's Pharmacovigilance: Elizabeth B. Andrews, Nicholas, Wiley Publishers.</p> <p>Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.</p> <p>An Introduction to Pharmacovigilance: Patrick Waller, Wiley Publishers.</p> <p>Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert, Jones & Bartlett Publishers.</p>
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School:		SOP
Programme:		B.Pharm
Branch:		Semester: VIII
1	Course Code	BP808ET
2	Course Title	Cell and molecular biology - Theory
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
Course Type		Elective
5	Course Objective	<p>Upon the completion of the course student shall be able to:</p> <ol style="list-style-type: none"> 1. Summarize cell and molecular biology history. 2. Summarize cellular functioning and composition. 3. Describe the chemical foundations of cell biology. <ol style="list-style-type: none"> a. Summarize the DNA properties of cell biology. b. Describe protein structure and function. 4. Describe cellular membrane structure and function. 5. Describe basic molecular genetic mechanisms.
6	Course Outcomes	<p>CO1: Students would be able to understand the concept of cell theory and basics of cellular structure and the mechanism of immune system.</p> <p>CO2: Students would be able to apply cellular reproduction in eukaryotic cells and increase their knowledge about nucleic acids</p> <p>CO3: Students would be able to interpret DNA, RNA and their role in central dogma of life, Protein synthesis and types of RNA.</p> <p>CO4: Students would be able to apply Transgenics and Genomic Analysis, Cell Cycle analysis, role of genetics, mitosis and meiosis.</p> <p>CO5: Students would be able to explain Cell Signals, Receptors for Cell Signals, Signaling Pathways, Misregulation of Signaling Pathways and Protein- Kinases: Functioning</p> <p>CO6: Students will be able to analyze different aspect of cell function which will help them to think about research involving cell biology.</p>



7	Course Description	<ul style="list-style-type: none"> • Cell biology is a branch of biology that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function. • This is done both on a microscopic and molecular level. • Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organisms such as humans, plants, and sponges.
8	Outline syllabus	
	1	Unit I <ol style="list-style-type: none"> Cell and Molecular Biology: Definitions theory and basics and Applications. Cell and Molecular Biology: History and Summation. Properties of cells and cell membrane. Prokaryotic versus Eukaryotic Cellular Reproduction chemical Foundations – an Introduction and Reactions (Types)
	2	Unit II <ol style="list-style-type: none"> DNA and the Flow of Molecular Information <ol style="list-style-type: none"> DNA Functioning DNA and RNA Types of RNA Transcription and Translation
	3	Unit III <ol style="list-style-type: none"> Proteins: Defined and Amino Acids Protein Structure Regularities in Protein Pathways Cellular Processes Positive Control and significance of Protein Synthesis
	4	Unit IV <ol style="list-style-type: none"> Science of Genetics Transgenics and Genomic Analysis Cell Cycle analysis Mitosis and Meiosis Cellular Activities and Checkpoints
	5	Unit V <ol style="list-style-type: none"> Cell Signals: Introduction Receptors for Cell Signals Signaling Pathways: Overview Misregulation of Signaling Pathways Protein-Kinases: Functioning
	Mode of examination	Theory



Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	75
Text book/s*			
Other References	<p>Recommended Books (latest edition):</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, Distributors, Delhi. edition, CBS Publishers & 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. Edward: Fundamentals of Microbiology. 10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi 11. Bergeys manual of systematic bacteriology, Williams and Wilkins-A Waverly a. company 12. 12.B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and 13. Applications of RecombinantDNA: ASM Press Washington D.C. 13. RA Goldshy et. al., : Kuby Immunology. 		



School:		SOP
Program:		B.Pharm
Branch:		Semester: 3
1	Course Code	KVE 301T
2	Course Title	Universal Human values and Professional Ethics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
Course Type		Compulsory
5	Course Objective	<ol style="list-style-type: none"> 1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings. 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature <p>Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.</p>
6	Course Outcomes	<p>CO1: The students will Understand the concept of human aspirations, relationships, happiness and prosperity.</p> <p>CO2: The student will be able to summarize the fulfillment human aspirations and live in harmony at various levels.</p> <p>CO3: The student will be able to utilize the professional competence for augmenting universal human order.</p> <p>CO4: The students will analyze the correlation of various body systems and how they result in particular kind of functions.</p> <p>CO5: The students would Identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models.</p> <p>CO6: The students would socially and ecologically responsible and adopt ethical practices.</p>
7	Course Description	The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for a happy and prosperous society.



8	Outline syllabus	
1		<p>UNIT-I</p> <p>D. Course Introduction - Need, Basic Guidelines, Content and Process for Value Education. Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration</p> <p>E. Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority</p> <p>F. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels</p>
2		<p>UNIT-II</p> <p>D. Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’ 8. Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha</p> <p>E. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer) 10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’</p> <p>F. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Swasthya - Practice Exercises and Case Studies will be taken up in Practice Sessions.</p>



3	<p>UNIT-III</p> <p>D. Understanding Harmony in the Family and Society- Harmony in Human Human Relationship Understanding Harmony in the family – the basic unit of human interaction 14. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship</p> <p>E. Understanding the meaning of Vishwas; Difference between intention and competence 16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship micturition reflex and role of kidneys in acid base balance, role of RAS in kidneyand disorders of kidney.</p> <p>F. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals 18. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family! - Practice Exercises and Case Studies will be taken up in Practice Sessions.</p>
4	<p>UNIT-IV</p> <p>B. Understanding Harmony in the Nature and Existence - Whole existence as Co-existence Understanding the harmony in the Nature 20. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature</p> <p>Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.</p>



5	<p>UNIT-V</p> <p>D. Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values 24. Definitiveness of Ethical Human Conduct 25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order</p> <p>E. Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people-friendly and eco friendly production systems, c) Ability to identify and develop appropriate technologies and management patterns for above production systems.</p> <p>F. Case studies of typical holistic technologies, management models and production systems 28. Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations</p>		
Mode of examination	Theory		
Weightage Distribution	Continuous Mode Assessment	Sessional Exam	ESE
	10 Marks	15	50
Text book/s* Reference Material	<p>a. The text book R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2</p> <p>b. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010</p> <p>c. A set of DVDs containing Video of Teachers' Orientation Program• PPTs of Lectures and Practice Sessions• Audio-visual material for use in the practice sessions•</p>		