S.V.U COLLEGE OF PHARMACEUTICAL SCIENCES : : TIRUPATI

Minutes of the meeting of BOS in Pharmacy held on 30-07-2018 at 4.00P.M. in the Dept. of Pharmacy (in the chamber Principal), S.V.University, Tirupati to discuss the following agenda.

Agenda:

1. Adopting the new syllabus as per the PCI, New Delhi.
2. Approving the panel of Examiners for B.Pharmacy and M.Pharmacy Courses.
3. Discussion and recommendations of PhD guidance.

The above agenda discussed by the BOS members and following resolutions were proposed.

1. It is resolved to accept the PCI syllabus from the next academic year onwards (2019-20).
2. I is also resolved to accept the list of examiners enclosed herewith.
3. It is resolved unanimously to offer PhD programme in Pharmacy with research supervisors from University as Internal Guides (approved by BOS) along with External Guides (Co-Guides) from the Faculty of Pharmacy (approved by BOS).

Members Present:

S.No.	Name and Address	Designation	Signature
1.	Prof. K.Thyagaraju, Dept. of Biochemistry, S.V.Univ. Tirupati	Principal, SVU College of Pharmaceutical Sciences	
2.	Prof. Ch. Appa Rao, Dept. of Biochemistry, S.V.Univ. Tirupati	Dean, SVU College of Pharmaceutical Sciences	
3.	Prof. O.V.S. Reddy, Dept. of Biochemistry, S.V.Univ. Tirupati	Chairman BOS ,SVU College of Pharmaceutical Sciences	
4.	Prof.N.Savithramma, Dept. of Botany, S.V.Univ. Tirupati	Member, Vice-Principal, SVU College of Sciences	
5.	Prof.C.Venkat Rao, Dept. of Chmistry, S.V.Univ. Tirupati	Member	
6.	Prof.V.Padmavathi, Dept. of Chmistry, S.V.Univ. Tirupati	Member	30.07.18
7.	Prof.Ch.Paramageetham, Dept. of Microbiology, S.V.Univ. Tirupati	Member	30/7/18
8.	Dr. M.Balaji, Dept. of Biochemistry, S.V.Univ. Tirupati	Member	
9.	Dr.K.V.Sucharitha, Dept. of Home Sciences, S.V.Univ. Tirupati	Member	30/7/2018
9.	Prof.R.Nagaraju, Inst. of Pharmaceutical Sciences, SPMM, Tirupati	Member	30/7/18
10.	Prof.V,Jayasankar Reddy Dept. of Pharmacology, Krishna Teja Pharmacy College, Tirupati	Member	
11.	Prof.A.Sreenivasa Rao, Principal Bhaskar Pharmacy College Hyderabad- 500075	Member	
12.	Dr.G.Vidyasagar, Dean Sreenivasarao College of Pharmacy PM Palem, Vishakapatnam	Member	

Programme Code	Programme name	Year of Introduction	Status of implementation of CBCS/Elective Course System (ECS)	Year of implementation of CBCS/ECS	Year of revision (if any)	If revision has been carried out in the syllabus during the last 5 years, Percentage of Content added or replaced	Link to the relevant documents
B. Pharmacy M. Pharmacy	SVUPSF SVUPSF1	2013 2006	CBCS: Yes/No ECS:Yes/No	CBCS: **2016 for both B. Pharmacy**	CBCS: **2019 for B. Pharmacy**	CBCS: 100%	CBCS: ECS:

SVU COLLEGE OF PHARMACEUTICAL SCIENCES
SRI VENKATESWARA UNIVERSITY,
Tirupati - 517502

RESTRUCTURED CURRICULUM FOR B. PHARMACY PROGRAMME (Self Supporting Course) TO BE IMPLEMENTED WITH EFFECT FROM THE ACADEMIC YEAR 2019-2020

SYLLABUS
Choice based credit system (CBCS) Pattern

B. PHARMACY PROGRAMME
(PCI Syllabus)
Choice based credit system (CBCS) Pattern

Vision

1. To impart quality and value embedded education and research in Pharmaceutical Sciences.
2. To create technologically superior and ethically strong global manpower, in the arena of Pharmacy Profession.
3. Carving the youth as dynamic, competent, valued and knowledgeable Professionals of Pharmacy field.

Mission

1. Transforming Students into Full-fledged Pharmacists and participate actively in the field of Pharmacy.
2. Promoting Quality Research in Emerging Areas of Pharmaceutical Sciences.
3. To instill scientific zeal and develop skilled human resource to meet contemporary challenges in Pharmacy Profession.
4. To facilitate young adult learners with opportunities to hone their ethics and leadership potential.
5. Imparting technical education that encourages Independent thinking, develops strong domain of knowledge, hones contemporary skills and Positive attitudes towards holistic growth of young minds.
6. Evolving the Institution into a Center of Academic and Research Excellence in Pharmaceutical Education and lead the field of pharmaceutical sciences and pharmacy practice with the mission of strengthening the healthcare of the country.

Programme Educational Objectives

1. To produce Pharmacy graduates with strong fundamental concepts and high technical competence in pharmaceutical sciences and technology.
2. To provide students with a strong and well defined concepts in the¬ various fields of pharmaceutical sciences viz., Pharmaceutics, Pharmaceutical chemistry, Pharmacognosy, Pharmacology and Pharmacy Practice according to the requirement of pharmaceutical industries, community and hospital pharmacy.
3. To develop a sense of teamwork and awareness amongst students¬ towards the importance of interdisciplinary approach for developing competence in solving complex problems in the area of Pharmaceutical Sciences.
4. To encourage the students to participate in life-long learning¬ process for a highly productive career and to relate the concepts of Pharmaceutical Sciences towards serving the cause of the society

Programme Outcomes

After the completion of the B.Pharmacy Programme the students will be able to,

1. Develop an understanding for the need of pharmaceutical sciences and technology towards giving quality life to people in society through the quality of medicines.
2. Apply the knowledge and skills gained through education to gain recognition in professional course and society.
3. Create awareness in society about the effective and safe use of medicines.
4. Act efficiently as a leader in the diverse areas of the profession to demonstrate the ability to plan and implement professional activities.
5. Provide a practical knowledge of the basic pharmaceutical sciences and the skill, acquire to deal with problems in pharmaceutical field
6. Develop ability for in-depth information and critical thinking in order to identify, formulate and solve the issues related to Pharmaceutical Industry, Regulatory Agencies, Hospital Pharmacy & clinical Pharmacy for better services to the community.
7. Identify the goals and regulations involved in the drug discovery and development, manufacture, distribution and sale of medicines and develop problem-based learning approach and analytical thinking in his/her academic and professional life.

8. Update the knowledge through continuous learning to face the challenges for better services to the community.
9. Design and develop process to perform experiments in various pharmaceutical areas like Pharmacognosy, Pharmaceutical Chemistry including Analytical Chemistry, Pharmaceutical Biotechnology, Pharmacology, Formulation and Development.
10. Fill the gap with other health care communities to provide innovative solutions for the purpose of maintain public health.
11. Develop team spirit for the development of student profession to the social needs and professional ethics.
12. Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
13. Create a talent pool by involving students in research projects and to make students to undertake research projects under faculty guidance for publication.
14. Foster ambitious desire among students to undertake higher studies, career growth and life-long learning.

Programme Specific Outcomes

At the end of successful completion of programme, a graduate will

1. Have adequate knowledge and scientific information regarding basic principles of Pharmaceutical & Medicinal Chemistry, Pharmaceutics including Cosmeticology, Pharmacology, and Pharmacognosy including herbal medicines.
2. Be able to develop and assure the quality of various pharmaceutical dosage forms including those of herbal origin as per standards of official books, WHO and other regulatory agencies like USFDA, MHRA etc.
3. Be able to counsel the patients leading to physical and social well being and work as a team member of clinical trial.
4. Be able to do product detailing, marketing, distribution and selling of pharmaceutical products.
5. Be able to perform experimental procedures as per laboratory standards in the area of Pharmaceutics, Pharmaceutical Chemistry, Pharmacology and Pharmacognosy..

6. Be able to perform research on various medical aspects and implement the Pharmaceutical knowledge in formulating the best suitable dosage form to provide high quality medicines to the society.

SVU COLLEGE OF PHARMACEUTICAL SCIENCES
SRI VENKATESWARA UNIVERSITY,
Tirupati - 517502

B. PHARMACY PROGRAMME
(PCI Syllabus)
Choice based credit system (CBCS) Pattern

SEMESTER I

Course code	Name of the course	Internal Assessment				End Semester Exa	
		Continuous Mode	Sessional Exams		Total	Marks	Dura
			Marks	Duration			
BP101T	Human Anatomy and Physiology I– Theory	10	15	1 Hr	25	75	3 H
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr	25	75	3 H
BP103T	Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 H
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr	25	75	3 H
BP105T	Communication skills – Theory *	5	10	1 Hr	15	35	1.5
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr	15	35	1.5
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs	15	35	4 H
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs	15	35	4 H
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs	15	35	4 H
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs	15	35	4 H
BP111P	Communication skills – Practical*	5	5	2 Hrs	10	15	2 H
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs	10	15	2 H
	Total	**70/75$/80#**	**115/125$/130#**	**23/24$/26#**	**185/200$/210#**	**490/525$/**	**31.5**

			Hrs		**540#**	**35#**

#Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

$Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

* Non University Examination (NUE)

Semester II

Course code	Name of the course	Internal Assessment				End Semeste	
		Continuous Mode	Sessional Exams		Total	Marks	
			Marks	Duration			
BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	25	75	3
BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	25	75	3
BP203T	Biochemistry – Theory	10	15	1 Hr	25	75	3
BP204T	Pathophysiology – Theory	10	15	1 Hr	25	75	3
BP205T	Computer Applications in Pharmacy – Theory*	10	15	1 Hr	25	50	2
BP206T	Environmental sciences – Theory*	10	15	1 Hr	25	50	2
BP207P	Human Anatomy and Physiology II –Practical	5	10	4 Hrs	15	35	4
BP208P	Pharmaceutical Organic Chemistry I– Practical	5	10	4 Hrs	15	35	4
BP209P	Biochemistry – Practical	5	10	4 Hrs	15	35	4
BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hrs	10	15	2
	Total	**80**	**125**	**20 Hrs**	**205**	**520**	**3**

* The subject experts at college level shall conduct examinations

Semester III

Course code	Name of the course	Internal Assessment				End Semeste	
		Continuous Mode	Sessional Exams		Total	Marks	
			Marks	Duration			
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	
BP302T	PhysicalPharmaceuticsI –Theory	10	15	1 Hr	25	75	
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	
Total		**60**	**100**	**20**	**160**	**440**	

Semester IV

Course code	Name of the course	Internal Assessment				End Semeste	
		Continuous Mode	Sessional Exams		Total	Marks	
			Marks	Duration			
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	
Total		**70**	**115**	**21 Hrs**	**185**	**515**	

Semester V

Course code	Name of the course	Internal Assessment				End Semeste	
		Continuous Mode	Sessional Exams		Total	Marks	
			Marks	Duration			
BP501T	Medicinal Chemistry II – Theory	10	15	1 Hr	25	75	
BP502T	Industrial PharmacyI– Theory	10	15	1 Hr	25	75	
BP503T	Pharmacology II – Theory	10	15	1 Hr	25	75	
BP504T	Pharmacognosy II – Theory	10	15	1 Hr	25	75	
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1 Hr	25	75	
BP506P	Industrial PharmacyI– Practical	5	10	4 Hr	15	35	
BP507P	Pharmacology II – Practical	5	10	4 Hr	15	35	
BP508P	Pharmacognosy II – Practical	5	10	4 Hr	15	35	
Total		**65**	**105**	**17 Hr**	**170**	**480**	

Semester VI

Course code	Name of the course	Internal Assessment				End Semeste	
		Continuous Mode	Sessional Exams		Total	Marks	
			Marks	Duration			
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	
BP602T	Pharmacology III – Theory	10	15	1 Hr	25	75	
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	25	75	
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1 Hr	25	75	
BP606T	Quality Assurance– Theory	10	15	1 Hr	25	75	
BP607P	Medicinal chemistry III – Practical	5	10	4 Hrs	15	35	
BP608P	Pharmacology III – Practical	5	10	4 Hrs	15	35	
BP609P	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	
Total		**75**	**120**	**18 Hrs**	**195**	**555**	

Semester VII

Course code	Name of the course	Internal Assessment				End Sem Exam	
		Continuous Mode	Sessional Exams		Total	Marks	
			Marks	Duration			
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	
BP706 PS	Practice School*	25	-	-	25	125	
	Total	**70**	**70**	**8Hrs**	**140**	**460**	

* The subject experts at college level shall conduct examinations

Semester VIII

Course code	Name of the course	Internal Assessment				End Semeste	
		Continuous Mode	Sessional Exams		Total	Marks	
			Marks	Duration			
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3
BP803ET	Pharmaceutical Marketing – Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	
BP804ET	Pharmaceutical Regulatory Science – Theory						
BP805ET	Pharmacovigilance – Theory						
BP806ET	Quality Control and Standardization of Herbals – Theory						
BP807ET	Computer Aided Drug Design – Theory						
BP808ET	Cell and Molecular Biology – Theory						
BP809ET	Cosmetic Science – Theory						
BP810ET	Experimental Pharmacology – Theory						
BP811ET	Advanced Instrumentation Techniques – Theory						
BP812PW	Project Work	-	-	-	-	150	4
	Total	**40**	**60**	**4 Hrs**	**100**	**450**	

SEMESTER I

Course Code	Course Title	No of Hours Per week	No of Credits
BP101T	Human Anatomy and Physiology I– Theory	04	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives:

1. Understanding the gross morphology, structure and functions of various organs of the human body.
2. Knowledge on various homeostatic mechanisms and their imbalances.
3. Identification of the various tissues and organs of different systems of human body.
4. Understanding the coordinated working pattern of different organs of each system.

Course Content:

Unit I

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.

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

Tissue level of organization

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit II

Integumentary system: Structure and functions of skin

Skeletal system

Divisions of skeletal system, types of bone, salient features and functionsof bones of axial and appendicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction

Joints

Structural and functional classification, types of joints movements and its articulation

Unit III

Body fluids and blood

Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

Lymphatic system

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Unit IV

Peripheral nervous system:

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.

Special senses

Structure and functions of eye, ear, nose and tongue and their disorders.

Unit V

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 regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

Text Books:

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA
4. Text book of Medical Physiology- Arthur C,GuytonandJohn.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.

Course Outcomes:

After completion of the course the student able to

1. Know the fundamental knowledge on the structure and functions of the various systems of the human body.
2. Understanding all the homeostatic mechanisms of the body
3. Understand the relationship of anatomy with various disciplines of pharmacy.
4. Understand the dynamic constancy of the body, cell and its components, tissue and types of tissue, blood, and its function and composition.

5. Can understand theimbalance in the normal functioning of various systems under various pathological settings.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	2	2	2	2	2	2	2
CO2	2	2	2	2	2	2	1	2	1	1	1	1
CO3	3	3	3	2	3	3	3	3	3	3	3	3
CO4	2	2	2	1	1	2	2	2	2	2	1	1
CO5	2	2	3	1	3	2	3	2	3	3	1	2

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP102T	Pharmaceutical Analysis I–Theory	04	04
Sessional Marks: 25		**End Semester Examination Marks : 75**	

Objectives:

1. Understand the principles of volumetric and electro chemical analysis
2. Carryout various volumetric and electrochemical titrations
3. Develop analytical skills

Course Content:

Unit I

UNIT-I (a) Pharmaceutical analysis- Definition and scope i) Different techniques of analysis ii) Methods of expressing concentration iii) Primary and secondary standards. iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

(b)Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures (c)Pharmacopoeia, Sources of impurities in medicinal agents,limit tests.

UNIT-II • Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves

• Non aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III • 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. •Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.

• Basic Principles,methods and application of diazotisation titration.

UNIT-IV Redox titrations (a) Concepts of oxidation and reduction (b) Types of redox titrations (Principles and applications) Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate.

UNIT-V • Electrochemical methods of analysis

•Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications.

•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.

• Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications.

Text Books:

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles 6. Indian Pharmacopoeia.

Course Outcomes:

After completion of the course, the student able to

1. It gives knowledge about the fundamental methodology to prepare different strength of solutions.
2. It facilitate the students to predict the sources of mistakes and errors.
3. It also helps to develop the fundamentals of volumetric analytical skills.
4. It provides the basic knowledge in the principles of electrochemical analytical techniques
   The student will be provided with the skillto improve by the course content in terms of analytical techniques to perform the estimation of different category drugs.
5. Develop insight into the fundamental chemical principlesthat facilitate the analytical estimations.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	2	2	2	1	1	1
CO2	3	3	1	1	3	3	3	1	2	1	2	2
CO3	3	3	3	2	3	3	3	2	3	2	2	2
CO4	3	3	3	2	3	3	3	2	3	2	2	1
CO5	3	3	2	1	3	3	3	2	3	1	1	1

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP103 T	Pharmaceutics-I(Theory)	04	04
Sessional Marks: 25		**End Semester Examination Marks : 75**	

Objectives:

1. Know the history of profession of pharmacy
2. Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
3. Understand the professional way of handling the prescription
4. Preparation of various conventional dosage forms.

Course Content:

Unit I

Historical background and development of profession of pharmacy: HistoryofprofessionofPharmacy inIndianinrelationtopharmacyeducationindustryand organization, Pharmacy as a career, Pharmacopoeias: Introduction totheIP, BP,USP and ExtraPharmacopoeia.

Dosageforms: Introductiontodosageforms,classificationanddefinitions

Prescription: Definition, Parts of prescription, handling of Prescription andErrorsin prescription.

Posology: Definition, Factors affecting posology. Pediatric dose calculationsbasedonage,body weight and bodysurfacearea.

Unit II

Pharmaceutical calculations: Weights and measures – Imperial &Metricsystem, Calculations

involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing pointandmoleweighteightt.

Powders: Definition, classification, advantages and disadvantages, Simple &compound powders – official preparations, dusting powders, effervescent,efflorescentandhygroscopicpowders,eutecticmixtures.Geometricdilutions.

Liquid dosage forms: Advantages and disadvantages of liquid dosage forms.Excipients used in formulation of liquid dosage forms. Solubility enhancementtechniques

Unit III

Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes,Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments andLotions.

Biphasicliquids:

Suspensions: Definition, advantages and disadvantages, classifications,Preparation of suspensions; Flocculated and Deflocculated suspension &stabilityproblemsand methods to overcome.

Emulsions: Definition, classification, emulsifying agent, test for the identificationof type of Emulsion, Methods of preparation & stability problems and methods toovercome.

Unit IV

Suppositories: Definition, types, advantages and disadvantages, types of bases,methods of preparations. Displacement value & its calculations, evaluation ofsuppositories.

Pharmaceutical incompatibilities: Definition, classification, physical, chemicalandtherapeuticincompatibilities with examples.

Unit V

Semisolid dosage forms: Definitions, classification, mechanisms and factorsinfluencing dermal penetration of drugs. Preparation of ointments, pastes, creamsand gels. Excipients used in semi solid dosage forms. Evaluation of semi soliddosagesforms

Text Books:

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.

11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.

12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.Dispensing Pharmacy, Cooper &Gunns CBS, Publ. and Distributors New Delhi – (2008).

13 Dispensing Pharmacy, R.M Metha, 2006 Vallabh Publication, New Delhi.

REFERENCES

1. Text Book of Pharmaceutics, E.A. Rawlins, Bentley‟s ELBS publ.

2. Essential dosage calculations -Hospital Pharmacy. Lorria& William, William Hassan.

Course Outcomes:

After Completion of the course the student able to

1. Recognize the formulation aspects of different dosage forms;
2. Formulate different types of dosage forms;
3. Appreciate the importance of good formulation for effectiveness.
4. Do different pharmaceutical calculation involved in formulation.
5. Gain basic knowledge of various Pharmacopoeias and their significance with respect to the various fields of pharmaceutical sciences.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	3	3	3	3	3	3	1	1
CO2	2	2	2	2	3	3	3	2	2	2	1	1
CO3	2	2	2	1	3	3	2	2	2	2	1	1
CO4	2	3	2	2	2	3	3	2	2	2	1	1
CO5	3	3	2	2	2	3	3	2	3	3	1	1

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP104T	Pharmaceutical Inorganic Chemistry–Theory	04	04
Sessional Marks: 25	**End Semester Examination Marks : 75**		

Objectives:

1.Knowledge on the history and concept of pharmacopoeia and its editions.

2**.** Understanding the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.

3. The medicinal and pharmaceutical importance of inorganic compounds.

4. Knowledge on various anions and cations of different pharmaceutical inorganic compounds.

5. Knowledge on methods to prepare inorganic pharmaceuticals.

Course Content:

UNIT I

Impurities in pharmaceutical substances:

History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate.

General methods of preparation, assay for the compounds superscripted with asterisk (*), properties and medicinal uses of inorganic compounds belonging to the following classes .

UNIT II

Acids, Bases and Buffers

Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

Major extra and intracellular electrolytes

Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.

Dental products

Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

UNIT III

Gastrointestinal agents Acidifiers

Ammonium chloride* and Dil. HCl

Antacid

Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture

Cathartics

Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

Antimicrobials

Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations.

UNIT IV

Miscellaneous compounds Expectorants

Potassium iodide, Ammonium chloride*.

Emetics

Copper sulphate*, Sodium potassium tartarate Haematinics: Ferrous sulphate*, Ferrous gluconate

Poison and Antidote

Sodium thiosulphate*, Activated charcoal, Sodium nitrite333

Astringents

Zinc Sulphate, Potash Alum

UNIT V

Radiopharmaceuticals

Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I131 , Storage conditions, precautions & pharmaceutical application of radioactive substances.

Text Books

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4 th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3 rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand&Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia.

Course Outcomes:

1.To understand the history and concept of pharmacopoeia and its editions.

2. Knowledge about the sources of impurities and methods to determine the impurities in inorganic pharmaceuticals.

3. Identification of limit tests of different pharmaceutical inorganic compounds.

4. Understand the method to prepare inorganic pharmaceuticals.

5. Justify the medicinal importance of acidifiers, antacids, cathartics and antimicrobial agents as gastrointestinal agents in addition to the awareness on handling and applications of radiopharmaceuticals.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	2	3	2	1	1
CO2	3	2	2	2	3	3	2	2	2	2	1	1
CO3	2	2	1	2	3	3	3	2	3	3	1	1
CO4	2	3	2	3	2	3	2	3	3	2	1	1
CO5	2	2	2	1	2	2	2	2	3	2	1	1

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP105T	Communication skills– Theory	02	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

Objectives:

1. To enable students speak effectively in formal and informal situation.
2. To equip the students with a wide range of vocabulary,so as to enable them use language more effectively.
3. To understand the strategies of the interviews to facilitate better response during the"placement" interviews.
4. To understand the characteristics of successful group discussions.
5. To identify areas of evaluation of GDs(group discussion) conducted by organization as part of the selection presentation.
6. Effectively manage the team as a team player.

Course Content:

Unit I

Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

- **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological

Barriers, Emotional barriers

- **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment**Unit Unit II**

- **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication
- **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

Unit III

- **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations
- **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
- **Writing Effectively:** Subject

Unit IV

- **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview
- **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

Unit V

- **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

Text Books:

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konarnira, 2ndEdition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning indiapvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009
12. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

Course Outcomes:

After Completion of the course the student able to

1. To equip students with Pre-presentations and to understand the structure of a good presentation and devise various techniques for delivering a successful presentation.
2. To help students overcome stage fear and take questions.
3. To enable the students to become global citizens.
4. This course will prepare the young pharmacy student to interact effectively with doctors, nurses and other health workers.
5. At the end of the course the students will get the soft skills set to work cohesively with the team as a team player and add value to the pharmaceutical business.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	3	2	1	1	2	1	1	2	2
CO2	2	2	1	2	1	3	2	3	2	2	2	1
CO3	3	3	3	3	2	2	2	3	2	2	2	2
CO4	3	2	2	3	2	2	2	2	1	2	2	2
CO5	1	1	2	3	1	1	2	2	2	1	2	2

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP106RBT	Remedial Biology –Theory	02	02
Sessional Marks:15End Semester Examination Marks :35			

Objectives: The student shall be able to know

1.Know the classification and salient features of five kingdoms of life.

2.Understand the basic components of anatomy and physiology of plant.

3.Know understand the basic components of anatomy and physiology animal with special reference to human.

Course Content:

Unit I

Living world:

Definition and characters of living organisms.

Diversity im the living world.

Binomial nomenclature

Five kingdoms of life and basis of classification salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus.

MORPHOLOGY OF FLOWERING PLANTS

Morphology of different parts of flowering plants-Root, stem, inflorescence, flower, leaf, fruit, seed.

General anatomy of Root, stem, leaf of monocotyledons and dicotyledons.

Unit II

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.

Digestion and Absorption

Human alimentary canal and digestive glands.

Role of digestive enzymes.

Digestion, absorption and assimilation of digested food.

Breathing and respiration

Human respiratory system.

Mechanism of breathing and its regulation.

Exchange of gases, transport of gases, and regulation of respiration.

Respiratory volumes.

Unit III

Excretory products and their elimination

Modes of excretion.

Human excretory system-structure and function.

Urine formation.

Renin angiotensin system.

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.

Chemical coordination and regulation

Endocrine glands and their secretions.

Functions of hormones secreted by endocrine glands.

Human Reproduction

Parts of female reproductive system.

Parts of male reproductive system.

Spermatogenesis and Oogenesis.

Menstrual cycle.

Unit IV

Plants and mineral nutrition:

Essential mineral, macro and micro nutrients.

Nitrogen metabolism, Nitrogen cycle, Biological nitrogen fixation.

Photosynthesis

Autotrophic nutrition, photosynthesis, photosynthetic pigments, Factors affecting photosynthesis.

Unit V

Plant respiration: Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development

Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators.

Cell – The unit of life

Structure and functions of cell and cell organelles. Cell division.

Tissues

Definition, types of tissues, location and functions.

Text books

a. Text book of Biology by S.B. Gokhale.
b. A Text book of biology by Dr.Thulajappa and Dr.Seetaram.

Reference Books

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. Ekambaranathaayyer and T.N. Ananthakrishnan.

e. A manual for pharmaceutical Biology practical by S.B. Gokhale and C.K. Kokate.

Course Outcomes:

After Completion of the course the student able to

1.Know the kingdoms of life.

2.Know the body fluids, absorption, digestion, respiration.

3.Know the excretory products, neural control, chemical coordination, and human reproduction.

4.Know the Nutrition in plants and photosynthesis.

5.Know the respiration in plants, cell, and tissues.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1	2	1	1	1
CO3	1	1	1	1	1	1	1	1	2	1	1	1
CO4	1	1	1	1	1	1	1	1	2	1	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP106RMT	Remedial Mathematics– Theory	02	02
Sessional Marks:15	**End Semester Examination Marks :35**		

Objectives:

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

Course Content:

Unit-I

- **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

- **Logarithms**

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

- **Function***:*

Real Valued function, Classification of real valued functions,

- **Limits and continuity** :

Introduction , Limit of a function, Definition of limit

Unit-II

- **Matrices and Determinant:**

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem,Applicationof Matrices in solving Pharmacokinetic equations

Unit- III

- **Calculus**

Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of *xnw.r.t*x,where*n*is any rational number, Derivative of *ex,*, Derivative of loge *x ,* Derivative of *ax* ,Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions

Unit- IV

- **Analytical Geometry**

Introduction: Signs of the Coordinates, Distance formula,

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

Integration:

Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

Unit- V

- **Differential Equations** : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations
- **Laplace Transform** : Introduction, Definition, Properties of Laplace

transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations

Text Books

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal

Course Outcomes:

1. This program shall create an awareness about the mathematical problems, to develop an statistical evaluation.
2. To adopt skills in identifying and solving problems.
3. Know the theory and their application in Pharmacy research
4. Solve the different types of problems by applying theory in drug discovery
5. Deal with mathematical correlations in pharmacokinetic modeling studies.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	1	1	1	2	1	3	1	1	1
CO2	1	2	1	1	2	1	3	1	3	1	2	1
CO3	2	2	2	1	2	2	2	2	3	2	1	2
CO4	1	2	2	1	1	2	2	2	3	2	1	1
CO5	2	2	1	1	1	1	2	1	3	1	1	2

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP107P	Human Anatomy and Physiology – Practical	04	02
Sessional Marks : 15	**End Semester Examination Marks : 35**		

Objectives:

1. Knowledge on various experiments related to special senses and nervous system.
2. Understanding the procedure for estimation of the various experiments related to the haemotology.
3. Perform and record the blood pressure, heart rate, pulse rate.
4. Knowledge on basic terminologies used in anatomy and physiology to identify body parts, directional terms, body planes and various organ system within human body.

Course Content:

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Text Books:

6. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
7. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
8. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA
9. Text book of Medical Physiology- Arthur C,GuytonandJohn.E. Hall. Miamisburg, OH, U.S.A.
10. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
11. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
12. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.

Course Outcomes:

After Completion of the course the student is able to

1. Differentiate the structures of the various systems of the human body.
2. Perform the experiments like blood cell count, hemoglobin content, bleeding and clotting time and various physiological Parameters theoretically and practically.
3. Identify the structural (microscopically and macroscopically) and functional details about different organ systems such as cardiovascular, lymphatic, digestive,and muscular system
4. Understand some simple clinical methods employed in thegeneral diagnosis of diseases.
5. Insight into the influence of a given disease condition on certain vital clinical parameters.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	2	2	2	2	2	2	2
CO2	2	2	2	2	2	2	1	2	1	2	1	1
CO3	3	3	3	2	3	3	3	3	3	3	3	3
CO4	2	2	2	1	1	2	2	2	2	2	1	1
CO5	2	2	3	1	3	2	3	2	3	3	2	2

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP108P	Pharmaceutical Analysis I – Practical	04	02
Sessional Marks: 15	**End Semester Examination Marks : 35**		

Objectives:

1. Thissubjects deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

2. Knowledge on various type of titrations

3. Handling of physico-chemical equipment .

4. Calculation of molarity, normality, percentage puity etc.

Course Content:

I .Limit Test of the following

(1) Chloride

(2) Sulphate

(3) Iron

(4) Arsenic

II .Preparation and standardization of

(1) Sodium hydroxide

(2) Sulphuric acid

(3) Sodium thiosulfate

(4) Potassium permanganate

(5) Ceric ammonium sulphate

III .Assay of the following compounds along with Standardization of Titrant

(1) Ammonium chloride by acid base titration

(2) Ferrous sulphate by Cerimetry

(3) Copper sulphate by Iodometry

(4) Calcium gluconate by complexometry

(5) Hydrogen peroxide by Permanganometry

(6) Sodium benzoate by non-aqueous titration

(7) Sodium Chloride by precipitation titration

IV .Determination of Normality by electro-analytical methods

(1) Conductometric titration of strong acid against strong base

(2) Conductometric titration of strong acid and weak acid against strong base

(3) Potentiometric titration of strong acid against strong base

Text Books:

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London

2. A.I. Vogel, Text Book of Quantitative Inorganic analysis

3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry

4. Bentley and Driver's Textbook of Pharmaceutical Chemistry

5. John H. Kennedy, Analytical chemistry principles

6. Indian Pharmacopoeia.

Course Outcomes:

1. This course is designed to perform and get trained to the electro chemical tests like potentiometery, complexometery, polarimetery.

2. Hands on training on different titrations like complexometric titrations, precipitation titrations, redox titrations.

3.Under stand the process of limit test and procedures.

4.Gain knowledge on the determination of Normality, Molarity, Molality.

5. Understand the process how to prepare the solution and its standardization.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	2	2	2	1	1	1
CO2	3	3	1	1	3	3	3	3	2	1	2	2
CO3	3	3	3	2	3	3	3	2	3	2	2	2
CO4	3	3	3	2	3	3	3	3	3	2	2	1
CO5	3	3	2	2	3	3	3	2	3	1	1	1

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP109P	Pharmaceutics I – Practical	04	02
Sessional Marks: 15	**End Semester Examination Marks : 35**		

OBJECTIVES;

1. Understand the basics of different dosage forms,
2. Know the importance pharmaceutical calculations.
3. Understanding Preparation and procedures of various conventional dosage forms;
4. Understanding pharmaceutical incompatibilities and their side-effects

Course Content:

Syrups

a) SyrupIP'66
b) CompoundsyrupofFerrousPhosphate BPC'68

2. Elixirs
a)Piperazinecitrateelixir
b)Paracetamolpediatric elixir

3. Linctus
a)TerpinHydrateLinctusIP'66

4. Solutions
b)IodineThroatPaint(MandlesPaint)
a) Strongsolutionofammoniumacetate
b) Cresolwithsoapsolution
c) Lugol'ssolution

5. Suspensions
a) Calaminelotion
b) MagnesiumHydroxidemixture
c) AluminimumHydroxidegel

6. Emulsions
a) TurpentineLiniment
b) Liquidparaffine emulsion

7. PowdersandGranules
a) ORSpowder(WHO)
b) Effervescentgranules
c) Dustingpowder
d)Divdedpowders

8. Suppositories
a) Glycerogelatinsuppository
b) Cocabutter suppository
c) ZincOxide suppository

9. Semisolids
a) Sulphurointment

b) Non-staining-iodineointmentwithmethylsalicylate
c) Carbopalgel

10. GarglesandMouthwashes
a) Iodinegargle
b) Chlorhexidinemouthwash

COURSE OUTCOMES:

1. This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts of preparing the different conventional dosage forms.
2. To understand the different pharmaceutical calculation involved in formulation;
3. Practical knowledge on formulation procedure of different dosage forms;
4. Highlights the Practical allowance to formulate different types of dosage forms;and
5. Gain Knowledge on criteria to appreciate the good formulation for effectiveness.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	3	3	3	3	3	3	1	1
CO2	2	2	2	1	3	3	3	2	2	2	1	1
CO3	2	2	2	2	3	3	2	3	2	2	1	1
CO4	2	3	2	1	2	3	3	3	2	2	1	1
CO5	3	3	2	2	2	3	3	2	3	3	1	1

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP110P	Pharmaceutical Inorganic Chemistry– Practical	04	02
Sessional Marks: 15	**End Semester Examination Marks :35**		

Objectives:

1. Understanding the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.

2. The medicinal and pharmaceutical importance of inorganic compounds.

4. Identification on different types of limit test in pharmaceutical inorganic compounds.

5. Knowledge on methods to prepare inorganic pharmaceuticals.

Course Content:

I Limit tests for following ions

Limit test for Chlorides and Sulphates

Modified limit test for Chlorides and Sulphates

Limit test for Iron

Limit test for Heavy metals

Limit test for Lead

Limit test for Arsenic

II Identification test

Magnesium hydroxide

Ferrous sulphate

Sodium bicarbonate

Calcium gluconate

Copper sulphate

III Test for purity

Swelling power of Bentonite

Neutralizing capacity of aluminum hydroxide gel

Determination of potassium iodate and iodine in potassium Iodide

IV Preparation of inorganic pharmaceuticals

Boric acid

Potash alum

Ferrous sulphate

Text Books

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, StahlonePress of University of London, 4 th edition.
2. Indian Pharmacopoeia

Course Outcomes:

1. To recall the sources of limit tests, preparation and identification of compounds.
2. To demonstrate the preparation of inorganic pharmaceuticals
3. To apply knowledge to perform modified limit tests.
4. To analyze various inorganic pharmaceutical compounds.
5. Knowledge of preparation methods ofinorganic pharmaceuticals.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	2	3	2	1	1
CO2	3	3	2	1	2	3	2	2	2	1	1	1
CO3	2	2	1	1	3	3	2	2	3	2	1	1
CO4	3	3	3	3	3	3	2	2	2	1	1	1
CO5	2	2	2	1	2	2	2	2	3	1	1	1

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP111P	Communication skills– Practical	02	01
Sessional Marks : 10		**End Semester Examination Marks : 15**	

Objectives:

1. To enable students speak effectively in formal and informal situation.
2. To equip the students with a wide range of vocabulary,so as to enable them use language more effectively.
3. To understand the strategies of the interviews to facilitate better response during the"placement" interviews.
4. To understand the characteristics of successful group discussions.
5. To identify areas of evaluation of GDs(group discussion) conducted by organization as part of the selection presentation.

Course Content:

Thefollowing learning modules are to be conducted using wordsworth® English language lab software

Basic communication covering the following topics
Meeting People
Asking Questions
Making Friends
What did you do?
Do’s and Dont’s

Pronunciations covering the following topics
Pronunciation (Consonant Sounds)
Pronunciation and Nouns
Pronunciation (Vowel Sounds)

Advanced Learning
Listening Comprehension / Direct and Indirect Speech
Figures of Speech
Effective Communication
Writing Skills
Effective Writing
Interview Handling Skills
E-Mail etiquette
Presentation Skills

Text Books:

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konarnira, 2ndEdition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning indiapvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009
12. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

Course Outcomes:

After Completion of the course the student able to

1. To equip students with Pre-presentations and to understand the structure of a good presentation and devise various techniques for delivering a successful presentation.
2. To help students overcome stage fear and take questions.
3. To enable the students to become global citizens.

4. This course will prepare the young pharmacy student to interact effectively with doctors, nurses and other health workers.
5. At the end of the course the students will get the soft skills set to work cohesively with the team as a team player and add value to the pharmaceutical business.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	3	2	1	1	2	1	1	2	2
CO2	1	1	2	2	1	1	1	1	1	1	1	1
CO3	1	3	1	3	1	2	2	3	1	2	2	2
CO4	1	2	2	3	1	1	1	2	1	2	2	2
CO5	1	1	2	3	2	2	1	2	2	1	2	2

3-High, 2-Medium, 1-Low

BP112RBP REMEDIAL BIOLOGY-PRACTICAL

Course Code	Course Title	No of Hours Per week	No of Credits
BP112RBP	Remedial biology – Practical	02	01
Sessional Marks:10End Semester Examination Marks :15			

OBJECTIVES:

1.To know about microscope, different cutting techniques, mounting, staining and permanent slide preparation.
2.To study about cell and morphology of plants and its modifications.
3.To study about frog by using computer models.
4.To study and identify bones and microscopic tissues.
5.To determine blood groups, blood pressure and tidal volume.

1.Introduction to experiments in biology
   a. Study of microscope.
   b. Section cutting techniques.
   c. Mounting and staining.
   d. Permanent slide preparation.
2. Study of cell and its inclusions.
3. Study of stem, root, leaf, seed, fruit, flower and their modifications.
4. Detailed study of frog by using computer models.
5. Microscopic study and identification of tissues pertinent to stem, root, leaf, seed, fruit and flower.
6. Identification of bones.
7. Determination of blood group.
8. Determination of blood pressure.
9. Determination of tidal volume.

REFERENCE BOOKS:

1.Practical human anatomy and physiology by S.R. Kale and R.R.Kale.

2. A manual for pharmaceutical biology practical by S.B. Gokhale, C.K.Kokate and S,P.shriwastava.

3. Biology practical manual according to National core curriculum. Biology forum of Karnataka. Prof. M.J.H. Shafi.

OUTCOMES: The student able to know

1. How to use microscope, section cutting, mounting, staining, and permanent slide preparation.
2. About the cell and its functions.
3. About the frog with respect to human.
4. About the bone and tissues in humans and plants.
5. About the blood groups, blood pressure and tidal volume.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1	2	1	1	1
CO3	1	1	1	1	1	1	1	1	2	1	1	1
CO4	1	1	1	1	1	1	1	1	2	1	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1

3-High, 2-Medium, 1-Low

SEMESTER II

Course Code	Course Title	No of Hours Per week	No of Credits
BP 201T	Human Anatomy and Physiology-II – Theory	4	04
Sessional Marks : 25	**End Semester Examination Marks : 75**		

Objectives:

1. Understand the gross morphology, structure and functions of various organs of the human body.

2. Thorough knowledge on various homeostatic mechanisms and their imbalances.
3. Step wise procedures to understand and perform the hematological tests like blood cell count, Hb estimation, bleeding time, clotting time etc
4. To know the working pattern of different organs of each system.
5. Differentiate various tissues and organs of different systems of human body.
6. knowledge on interlinked mechanisms in the maintenance of normal functioning of human body.

Course Content:

UNIT I

- **Nervous system**

  Organization of nervous system, neuron neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

  Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid, structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity).

UNIT II

- **Digestive system**
  Anatomy of GIT 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.
- **Energetics**
  Formation and role of ATP, creatinine phosphate and BMR.

UNIT III

- **Respiratory system**
  Anatomyof 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.
- **Urinary system**
  Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

UNIT IV

- **Endocrine system**
  classification of hormones, mechanism of hormone action, structure and function of pituitary gland, thyroid gland, parathyroid gland,adrenal gland, pancreas, pineal gland, thymus and their disorders.

UNIT V

- **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.
- **Introduction to genetics**
  Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.

Text Books

1. Essentials of Medical Physiology by K.Sembulingam and P.sembulingam. Jaypee brothes 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. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA USA.
5. Text book of Human histology by Inderbir singh.
6. Text book of Medical physiology by Arthur C Guyton.

Course Outcomes:

1. Know the gross morphology, structure and functions of various organs of the human body.
2. Perform all the hematological tests with the help of specimens
3. Note all the points regarding the tissues various organs of human body
4. Brief knowledge on clinical significance of various systems in our body.
5. Application of the role of genetics in day to day life.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	3	1	1	2	1	2	2	2
CO2	3	3	2	2	3	1	2	3	1	2	2	2
CO3	3	2	3	2	3	2	2	3	1	2	2	2
CO4	2	3	3	3	3	1	2	2	1	3	3	3
CO5	2	3	2	3	2	1	2	2	1	1	3	3

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP202T	Pharmaceutical Organic Chemistry I - Theory	04	04
Internal Marks :25		**End Semester Examination Marks :** 75	

Objectives:

1. To impart knowledge on writing organic structures, various methods of nomenclature, and isomerism respectively.
2. To create awareness on the aspects of chemical reactivity and stability.
3. To motivate towards understanding the organic reactions.

Course Content:

Generalmethodsofpreparation/ synthesisand chemical reactionsof the compound classessuperscriptedwithasterisk(*)tobe discussed.

Emphasisondefinition,types,classification,principles/mechanisms,applications,examples anddifferences.

Unit I

- **Classification,nomenclatureandisomerism**

  ClassificationofOrganicCompounds

  CommonandIUPACsystemsofnomenclatureof organiccompounds(upto10Carbonsopenchainandcarbocycliccompounds) Structuralisomerismsinorganiccompounds

Unit II

- **Alkanes*,Alkenes*and Conjugateddienes***

  SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins.Stabilitiesofalkenes,SP^2hybridizationinalkenes E_1andE_2reactions–kinetics,orderofreactivityofalkylhalides,rearrangementofcarbocations, Saytzeffs orientation and evidences.E_1 verses E_2 reactions, Factors affecting E_1andE_2reactions.Ozonolysis,electrophilicadditionreactionsofalkenes,Markownikoff'sorientation,freeradi caladditionreactionsofalkenes,AntiMarkownikoff'sorientation.

  Stabilityofconjugateddienes,Diel-Alder,electrophilicaddition,freeradicaladditionreactionsofconjugated dienes,allylicrearrangement

Unit III

- **Alkyl halides***

  SN_1andSN_2reactions- kinetics,orderofreactivityofalkylhalides,stereochemistryandrearrangementofcarbocations.

  SN_1versusSN_2reactions,Factorsaffecting$SN_1$and SN_2reactions

  Structureandusesofethylchloride,Chloroform,trichloroethylene,tetrachloroethylene,dichloromethane,tetrachlo romethaneandiodoform.

- **Alcohols*-** Qualitativetests,StructureandusesofEthylalcohol,Methylalcohol,chlorobutanol,Cetosterylalco hol,Benzyl alcohol,Glycerol,Propyleneglycol

Unit IV

- **Carbonylcompounds*(Aldehydesandketones)**

  Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation,Cannizzaroreaction,CrossedCannizzaroreaction,Benzoincondensation,Perkincondensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone,Chloralhydrate,Hexamine,Benzaldehyde,Vanilin,Cinnamaldehyde.

Unit V

- **Carboxylicacids***

  Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitativetestsfor carboxylicacids,amideand ester

  Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalicacid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate andAcetylsalicylicacid

- **Aliphaticamines*-**Basicity,effectofsubstituentonBasicity.Qualitativetest,Structureandusesof Ethanolamine,Ethylenediamine,Amphetamine

Text Books (All Latest Editions):

1. Organic ChemistrybyMorrisonandBoyd
2. OrganicChemistrybyI.L.Finar ,Volume-I
3. Textbook of OrganicChemistrybyB.S.Bahl&ArunBahl.
4. Organic ChemistrybyP.L.Soni
5. Reaction and reaction mechanisms by Ahluwaliah/ Chatwal.

Course Outcomes:

After Completion of this course, the student could be able to:

1. Guess and writethestructure, systematic/ trivial name, and pharmaceutical uses (if any)associated with the specifiedorganic compounds.
2. Understand the general concept of isomerism and distinguish structural isomers.
3. Infer the chemical nature of the compounds on the basis of qualitative chemical tests.
4. Understand the significance of certain electronic effects with respect to the reactivity/ stability of organic compounds specified.
5. Understand and gain insight into the organic reactions by analyzing their fair reaction mechanisms.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	3	3	2	3	3	1	2	3
CO2	2	2	3	1	3	1	2	3	3	1	1	3
CO3	3	3	3	2	3	3	3	3	3	2	2	3
CO4	3	3	3	3	3	2	3	2	3	2	2	3
CO5	3	3	3	3	3	3	2	2	3	2	2	3

6. 3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP203T	Biochemistry – Theory	04	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives:

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Content:

Unit I

- **Biomolecules**

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

- **Bioenergetics**

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.
Energy rich compounds; classification; biological significances of ATP and cyclic AMP

Unit II

Carbohydrate metabolism

Glycolysis – Pathway, energetics and significance
Citric acid cycle- Pathway, energetics and significance
HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency
Glycogen metabolism Pathways and glycogen storage diseases (GSD)
Gluconeogenesis- Pathway and its significance
Hormonal regulation of blood glucose level and Diabetes mellitus

- **Biological oxidation**

Electron transport chain (ETC) and its mechanism.
Oxidative phosphorylation & its mechanism and substrate phosphorylation
Inhibitors ETC and oxidative phosphorylation/Uncouplers

Unit III

Lipid metabolism

β-Oxidation of saturated fatty acid (Palmitic acid)
61
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.

• **Amino acid metabolism**

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders
Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)
Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline
Catabolism of heme; hyperbilirubinemia and jaundice

Unit IV

Lipid metabolism

β-Oxidation of saturated fatty acid (Palmitic acid)
61
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.

• **Amino acid metabolism**

General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders
Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)
Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline
Catabolism of heme; hyperbilirubinemia and jaundice

Unit V

• **Enzymes**

Introduction, properties, nomenclature and IUB classification of enzymes
Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)
Enzyme inhibitors with examples
Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation
Therapeutic and diagnostic applications of enzymes and isoenzymes
Coenzymes –Structure and biochemical functions

Text Books:

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical student

Course Outcomes:

After Completion of the course the student able to

1. Know the fundamental knowledge on the biochemical Pathways of the body
2. Understanding the catalytic role of enzymes, importance of enzyme inhibitors
3. Understand the genetic organization of mammalian genome
4. To Understand the DNA in the synthesis of RNAs and proteins
5. Present the results, conclusions, and relevance of scientific experiments to a specific audience

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	3	3	2	3	3	1	2	3
CO2	2	2	3	1	3	1	2	3	3	1	1	3
CO3	3	3	3	2	3	3	3	3	3	2	2	3
CO4	3	3	3	3	3	2	3	2	3	2	2	3
CO5	3	3	3	3	3	3	2	2	3	2	2	3

7. 3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP 204T	PathopphysiologyI–Theory	04	04
Sessional Marks: 25		**End Semester Examination Marks : 75**	

Objectives:

1. This subject describe the etiology and pathogenesis of the selected disease states.
2. Knowledge on name the signs and symptoms of the diseases.
3. It also describe and Mention the complications of the diseases.

Course Content:

Unit I

UNIT-I Basic principles of Cell injury and Adaptation: Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury,Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage),Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia),Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis &Alkalosis,Electrolyte imbalance.

- Basic mechanism involved in the process of inflammation and repair: Introduction, Clinical signs of inflammation, Different types of Inflammation,Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's,Mediators of inflammation,Basic principles of wound healing in the skin,Pathophysiology of Atherosclerosis

UNIT-II Cardiovascular System: Hypertension, congestive heart failure, ischemic heart disease (angina,myocardial infarction, atherosclerosis and arteriosclerosis)

- Respiratory system:Asthma, Chronic obstructive airways diseases.
- Renal system:Acute and chronic renal failure .

UNIT-III Haematological Diseases: Iron deficiency, megaloblasticanemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia

- Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones
- Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.
- Gastrointestinal system: Peptic Ulcer

UNIT-IV Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.

- Disease of bones and joints: Rheumatoid arthritis, osteoporosis and gout
- Principles of cancer: classification, etiology and pathogenesis of cancer
- Diseases of bones and joints:Rheumatoid Arthritis, Osteoporosis,Gout
- Principles of Cancer: Classification, etiology and pathogenesis of Cancer

UNIT-V- Infectious diseases:Meningitis,Typhoid, Leprosy, Tuberculosis Urinary tract infections
- Sexually transmitted diseases:AIDS, Syphilis, Gonorrhea

Text Books:

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins &Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6 th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12 th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
5. William and Wilkins, Baltimore;1991 [1990 printing].

6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.

7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12 th edition; WB Saunders Company; 2010.

8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9 th edition; London; McGraw-Hill Medical; 2014.

9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6 th edition; Philadelphia; WB Saunders Company; 1997. 10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3 rd edition; London; Churchill Livingstone publication; 2003.

Course Outcomes:

After Completion of the course the student able

1. Identifies Name the signs, symptoms and complications of the diseases.
2. Students Get thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms.
3. To Study the aetiology and pathogenesis of the selected disease states
4. The baseline knowledge required to practice medicine safely, confidently, rationally and effectively.
5. The ability to search the medical literature, including electronic databases, and to locate and interpret up-to-date evidence to optimize patient care

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	1	2	1	3	3	1	1	2
CO2	2	3	3	2	3	1	1	3	2	3	2	3
CO3	3	3	3	3	3	2	1	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	3	3	1	2	3	3	2	3

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP205T	Computer Applications in Pharmacy – Theory	03	03
Sessional Marks : 25		**End Semester Examination Marks : 50**	

Objectives:

1. know the various types of application of computers in pharmacy

2. know the various types of databases
3. know the various applications of databases in pharmacy

UNIT I

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

Concept of Information Systems and Software : **I**nformation gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

UNIT II

Web technologies:Introduction to HTML, XML,CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

UNIT III

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

UNIT IV

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT V

Computers as data analysis in Preclinical development:

Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)

Text Books:

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA

3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

Course Outcomes:

After Completion of the course the student is able to

1 know the various types of application of computers in pharmacy profession

2. know the various types of databases used in profession

3. know the usage of softwares in pharmacy

4. Operate a variety of advanced spreadsheet, operating system and word processing functions.

5. Maintain quality assurance through critically evaluating procedures and results.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	3	2	2	3	1	1	1	3
CO2	2	3	3	2	3	1	1	3	2	3	2	3
CO3	1	2	3	2	2	2	1	3	2	3	2	2
CO4	2	3	3	3	3	3	3	2	2	2	2	3
CO5	3	3	3	1	3	3	3	2	3	3	2	3

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP206T	Environmental Science– Theory	03	03
Sessional Marks:25	**End Semester Examination Marks :50**		

Objectives:

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Course Content:

Unit-I

The Multidisciplinary nature of environmental studies

Natural Resources

Renewable and non-renewable resources

Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

Unit-II

Ecosystems

Concept of an ecosystem.

Structure and function of an ecosystem.

Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit- III

Environmental Pollution

Air pollution; Water pollution; Soil pollution

Text Books

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers,
Bangalore

2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

3. BharuchaErach, The Biodiversity of India, MapinPublishingPvt. Ltd.,
Ahmedabad – 380 013, India, 4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

5. Clark R.S., Marine Pollution, Clanderson 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.

Course Outcomes:

1. This program shall create an awareness about environmental problems, develop an attitude towards of concern for the environment.

2 To compare the natural, renewable and non-renewable resources and the problems associated with them.

3 To motivate the learners to participate in environment protection and improvement.

4 To analyze the concepts of eco system including structure and functions.

5 To adopt skills in identifying and solving environmental problems.

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	1	1	2	1	1	1	2

CO2	2	1	1	1	1	1	1	2	1	1	2	1
CO3	2	2	2	3	3	2	1	2	1	1	1	2
CO4	2	2	1	1	1	1	1	2	1	2	2	2
CO5	1	2	2	1	1	1	1	2	1	1	1	1

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP207P	Human Anatomy And Physiology II – (Practical)	04	02
Sessional Marks : 15	**End Semester Examination Marks : 35**		

Objectives:

1. know the gross morphology, structure and functions of various organs of the human body.

2. Perform all the hematological tests with the help of specimens.

3 Note all the points regarding the tissues various organs of human body.

4 Brief knowledge on clinical significance of various systems in our body.

5 Application of the role of genetics in day to day life.

Course Content:

1. To study the integumentary and special senses using specimen and models
2. To Study the nervous system and endocrine system using specimen and models
3. To demonstrate the function of olfactory nerve.
4. To demonstrate the visual and reflex activity.
5. Recording of body temperature.
6. To examine the different types of taste.
7. Recording of basal mass index.
8. Study of family planning devices and pregnancy diagnosis test.
9. To demonstrate positive and negative feedback mechanism.
10. To determine Tidal volume and vital capacity.
11. Permanent slides of vital organs and gonads.
12. To demonstrate total blood count by cell analyser

Text Books

1. Practical workbook of Human physiology by Srinageswari and Rajeev Sharma.

2. Note all the points regarding the tissues various organs of human body
3. Brief knowledge on clinical significance of various systems in our body.
4. Application of the role of genetics in day to day life.

Course Outcomes:

This subject is to inculcate the students about the structure and functioning of various systems and to perform hematological tests, body temperature and BMI.

1. Prepare the charts and tables for easy understanding of various systems and positive & negative feed back mechanism.

2. Awareness on family planning devices and pregnancy diagnosis test.

3. Identify the structural (microscopically and macroscopically) and functional details about different organ systems such as cardiovascular, lymphatic, digestive, muscular system

4. Identify the various tissues and organs of different systems of human body.

5. Homeostasis mechanisms and their imbalances

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	2	2	1	1	1	2	1	3	2	1
CO3	1	1	1	1	1	1	1	1	1	2	1	1
CO4	1	1	1	1	2	1	1	1	2	2	1	2
CO5	1	1	1	1	2	1	2	1	2	2	1	1

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP208P	Pharmaceutical Organic Chemistry I - Practical	04	02
Internal Marks :15		**End Semester Examination Marks :** 35	

Objectives:

1. To impart practical knowledge on various fundamental tests for the identification of some elements and compounds of pharmaceutical importance.
2. To create awareness on basic techniques practiced in the organic synthesis.
3. Allow to gain insight into the construction of molecular models and their significance.

Course Content:

1. Systematicqualitativeanalysisofunknownorganiccompoundslike

Preliminarytest:color,odour,aliphatic/aromaticcompounds,saturationandunsaturation, etc.

Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne'stest

Solubilitytest

FunctionalgrouptestlikePhenols,Amides/ Urea,Carbohydrates,Amines,Carboxylicacids,AldehydesandKetones,Alcohols,Esters,AromaticandHalogenatedHydrocarbons,NitrocompoundsandAnilides.

Meltingpoint/Boilingpointoforganiccompounds

Identificationoftheunknowncompoundfromtheliteratureusing meltingpoint/ boilingpoint.

Preparationofthederivativesandconfirmationoftheunknowncompoundbymeltingpoint/ boilingpoint.

Minimum5unknownorganiccompoundsto beanalysedsystematically.

2. Preparationofsuitablesolidderivativesfromorganiccompounds

3. Constructionofmolecularmodels

Text Books:

1. Practical OrganicChemistrybyMannand Saunders.
2. Vogel'stextbookofPracticalOrganicChemistry
3. AdvancedPracticalorganicchemistrybyN.K.Vishnoi.
4. Introduction toOrganicLaboratorytechniquesbyPavia,Lampman andKriz.

Course Outcomes:

After Completion of the course the student could be able to:

1. Assess the identity in terms of the physico-chemical properties of the compounds of specified chemical classes.
2. Get hands- on- experience in basic techniques of organic synthesis.
3. Account for reactivity / stability of compounds.
4. Write the reaction, name the reaction and orientation of reaction.
5. Write the structure, name and the type of isomerisms of the organic compounds.

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	2	2	1	1	2	1	1	2
CO2	1	1	1	1	1	1	2	2	1	2	1	2
CO3	1	1	1	1	1	2	2	1	2	1	1	2
CO4	1	1	1	1	2	2	1	2	3	1	1	2
CO5	1	1	1	1	2	2	2	1	2	1	1	2

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP209P	Biochemistry – Practical	04	02
Sessional Marks : 15	**End Semester Examination Marks : 35**		

Objectives:

5. Understanding the gross morphology, structure and functions of various organs of the human body.
6. Knowledge on various homeostatic mechanisms and their imbalances.

7. Identification of the various tissues and organs of different systems of human body.
8. Understanding the coordinated working pattern of different organs of each system.

Course Content:

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.

Text Books:

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf

Course Outcomes:

After Completion of the course the student able to perform

1.Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch), Proteins (albumin and Casein)
2. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
3. Qualitative analysis of urine for abnormal constituents
4. Determination of blood creatinine, blood sugar, serum total cholesterol
5.Study the effect of substrate concentration on salivary amylase activity.

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	2	2	1	2	1	1	2
CO2	3	2	1	1	2	2	1	1	2	1	1	2
CO3	3	3	1	2	2	2	1	1	2	1	1	2
CO4	3	2	1	1	2	2	2	1	2	1	1	2
CO5	2	2	1	1	2	2	2	1	2	1	1	2

3-High, 2-Medium, 1-Low

	Course Title	**No of Hours**	**No of Credits**

Course Code		Per week	
BP210P	Computer Applications in Pharmacy – Practical	02	01
Sessional Marks : 10		**End Semester Examination Marks : 15**	

Objectives:

1. know the various types of application of computers in pharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

Course Content

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3 Retrieve the information of a drug and its adverse effects using online tools
4 Creating mailing labels Using Label Wizard , generating label in MS WORD
5 Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Text Books:

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

Course Outcomes:

After Completion of the course the student is able to

1 know the various types of application of computers in pharmacy profession
2. know the various types of databases used in profession
3. know the usage of softwares in pharmacy
4.create a HTML, web page to show personal information.
5.Generating report and printing the report from patient database

CO-PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	2	1	3	2	3	2	3	2
CO2	2	3	2	2	3	2	2	2	1	1	1	2
CO3	2	3	1	1	2	2	3	2	3	2	2	3
CO4	2	3	1	1	3	3	2	1	2	1	2	3
CO5	2	2	3	2	2	3	2	1	2	3	2	3

3-High, 2-Medium, 1-Low

SEMESTER III

Course Code	Course Title	No of Hours Per week	No of Credits
BP 301 T	Pharmaceutical organic chemistry II (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives: Upon completionofthecoursethestudentshallbeableto

1. writethestructure,nameandthetypeofisomerismoftheorganic compound
2. writethereaction,namethereactionandorientationofreactions
3. account for reactivity/stabilityof compounds,
4. prepareorganiccompounds

CourseContent:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to beexplained

To emphasize on definition,types,classification,principles/mechanisms,applications, examplesanddifferences

UNITI

- **Benzeneanditsderivatives**
  - **A.** Analytical, synthetic and other evidences in the derivation of structureofbenzene,Orbitalpicture,resonanceinbenzene,aromaticcharacters,Huckel'sru le
  - **B.** Reactionsofbenzene-nitration,sulphonation,halogenation-reactivity,Friedelcraftsalkylation-reactivity,limitations,Friedelcraftsacylation.
  - **C.** Substituents,effectofsubstituentsonreactivity andorientationofmonosubstitutedbenzenecompoundstowardselectrophilicsubstitutio nreaction
  - **D.** StructureandusesofDDT,Saccharin, BHCandChloramine

UNITII

- **Phenols*-** Acidityofphenols,effectofsubstituentsonacidity,qualitativetests,Structureandusesofphenol,cresols, resorcinol,naphthols
- **AromaticAmines*-**Basicityofamines,effectofsubstituentsonbasicity,andsyntheticusesof aryldiazonium salts
- **AromaticAcids*–** Acidity,effectofsubstituentsonacidityandimportantreactionsofbenzoicacid.

UNITIII

- **FatsandOils**
  a. Fattyacids–reactions Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Dryingoils.
  b. Analyticalconstants–Acidvalue,Saponificationvalue,Estervalue,Iodine value, Acetyl value, Reichert Meissl (RM) value – significance andprincipleinvolvedintheirdetermination.

UNITIV

- **Polynuclearhydrocarbons:**
  a. Synthesis,reactions
  b. StructureandmedicinalusesofNaphthalene,Phenanthrene,Anthracene,Diphenylmethane,Triphenylmethaneandtheirderivatives

UNITV

- **Cycloalkanes***
  Stabilities–Baeyer'sstraintheory,limitationof Baeyer'sstraintheory,Coulson and Moffitt's modification, Sachse Mohr's theory (Theory ofstrainlessrings),reactionsofcyclopropaneandcyclobutaneonly.

Recommended Books(LatestEditions)

1.OrganicChemistrybyMorrison andBoyd

1. OrganicChemistrybyI.L.Finar, Volume-I
2. Textbook of OrganicChemistrybyB.S.Bahl&ArunBahl.
3. Organic ChemistrybyP.L.Soni
4. Practical OrganicChemistrybyMannand Saunders.
5. Vogel'stextbookofPracticalOrganicChemistry
6. AdvancedPracticalorganicchemistrybyN.K.Vishnoi.
7. Introduction toOrganicLaboratorytechniquesbyPavia,LampmanandKriz.

COURSE OUTCOME:

After Completion of this course, the student could be able to:

1. Guess and writethestructure according to the stereochemical specifications.
2. Fairly understand the aspects of heterocyclic chemistry in terms of naming and reactivity.
3. Assess and understand the pharmaceutical applications and importance of the specified named reactions

4. Infer the chemical nature of the compounds on the basis of qualitative chemical tests.
5. Understand the significance of certain electronic effects with respect to the reactivity/ stability of organic compounds specified.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	1	1	1	2	1	3	3	3
CO2	3	1	2	1	1	1	1	2	1	3	3	3
CO3	3	1	2	1	1	1	1	1	1	3	3	3
CO4	3	1	2	1	1	1	2	1	1	3	3	3
CO5	3	1	2	1	1	1	2	1	1	3	3	3

3- High, 2- Medium, 1- Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP 302 T	Physical Pharmaceutics I (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives: Uponthecompletionofthecoursestudentshallbeableto

1. Understandvariousphysicochemicalpropertiesofdrugmoleculesinthedesigningthedosageforms
2. Knowtheprinciplesofchemicalkinetics&tousethem forstabilitytestingnaddeterminationofexpirydateofformulations
3. Demonstrate use of physicochemical properties in the formulationdevelopmentandevaluationofdosageforms.

CourseContent:

UNIT-I

Solubilityofdrugs: Solubilityexpressions,mechanismsofsolutesolventinteractions,idealsolubility parameters,solvation&association,quantitativeapproachtothefactorsinfluencingsolubilityofdrugs,diffusion principlesinbiologicalsystems.Solubilityofgas in liquids,solubility of liquidsin liquids,(Binary solutions,idealsolutions)Raoult'slaw,realsolutions. Partially miscible liquids, Critical solution temperature andapplications.Distributionlaw,its limitationsandapplications

UNIT-II

States of Matter and properties of matter: State of matter, changes in the state of matter,latentheats,vapourpressure,sublimationcriticalpoint,eutecticmixtures,gases,aerosolsinhalers,relativehumidity,liquidcomplexes,liquidcrystals,glassystates,solid-crystalline,amorphous& polymorphism.

Physicochemicalpropertiesofdrugmolecules: Refractiveindex,opticalrotation,dielectricconstant ,dipolemoment,dissociationconstant,determinationsandapplications

UNIT-III

Surfaceandinterfacialphenomenon: Liquidinterface,surface&interfacialtensions,surface free energy, measurement of surface & interfacial tensions, spreading coefficient,adsorptionatliquidinterfaces,surfaceactiveagents,HLBScale,solubilisation,detergency,adsor ptionatsolidinterface.

UNIT-IV

Complexationandproteinbinding: Introduction,ClassificationofComplexation,Application s,methodsofanalysis,proteinbinding,Complexationanddrugaction,crystalline structures ofcomplexesandthermodynamictreatment ofstabilityconstants.

UNIT-V

pH,buffersandIsotonicsolutions: Sorensen'spHscale,pHdetermination(electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity,buffersinpharmaceuticalandbiologicalsystems,bufferedisotonicsolutions.

Recommended Books:(LatestEditions)

1. PhysicalPharmacybyAlfredMartin
2. ExperimentalPharmaceuticsbyEugene,Parott.
3. TutorialPharmacybyCooper and Gunn.
4. StocklosamJ.PharmaceuticalCalculations,Lea &Febiger,Philadelphia.
5. LibermanH.A,LachmanC.,PharmaceuticalDosageforms,Tablets, Volume-1to3,MarcelDekkarInc.
6. LibermanH.A,LachmanC,PharmaceuticalDosageforms.Dispersesyste ms,volume1,2,3.Marcel DekkarInc.
7. Physical PharmaceuticsbyRamasamyCandManavalanR.

COURSE OUTCOME

1. The course deals with the various physical and physicochemical properties
2. Principles involved in dosage forms/formulations.
3. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development
4. Stability studies of pharmaceutical dosage forms
5. Standardisation of the pharmaceutical dosage forms

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	3	1	1	1	2	2	2	2	3
CO2	3	1	2	3	1	1	1	2	2	2	2	3
CO3	3	1	2	3	1	1	1	2	2	2	2	3
CO4	3	1	3	3	1	1	1	2	2	1	1	3
CO5	3	1	3	3	1	1	1	2	2	1	1	3

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP 303 T	Pharmaceutical Microbiology (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives: Upon completionofthesubjectstudentshallbeableto;

1. Understandmethodsofidentification,cultivationandpreservationofvariousmicroorganisms
2. To understand the importance and implementation of sterlization inpharmaceuticalprocessingandindustry
3. Learn sterilitytestingof pharmaceutical products.
4. Carriedoutmicrobiological standardizationofPharmaceuticals.
5. Understandthecellculturetechnologyanditsapplicationsinpharmaceuticalindustries.

Coursecontent:

UnitI

Introduction,historyofmicrobiology,itsbranches,scopeanditsimportance.IntroductiontoProkaryotesandEukaryotesStudyofultra-structureandmorphologicalclassificationofbacteria,nutritional requirements, raw materials used for culture media and physicalparameters forgrowth,growth curve, isolationand preservation methodsforpurecultures,cultivationofanaerobes,quantitativemeasurementofbacterialgrowth (total &viablecount).Studyofdifferenttypesofphaseconstrastmicroscopy,darkfieldmicroscopyandelectron microscopy.

UnitII

Identificationofbacteriausingstainingtechniques(simple,Gram's&Acidfaststaining)andbiochemicaltests (IMViC).Study of principle, procedure, merits, demerits and applications of physical,chemicalgaseous,radiationandmechanicalmethodofsterilization.Evaluation of theefficiencyof sterilization methods.Equipmentsemployedinlargescalesterilization.Sterilityindicators.

UnitIII

Study of morphology, classification, reproduction/replication andcultivationofFungi andViruses.Classificationandmode

ofactionofdisinfectantsFactorsinfluencingdisinfection,antisepticsandtheirevaluation.Forbacteriostati candbactericidalactionsEvaluationofbactericidal&Bacteriostatic.Sterilitytestingofproducts(solids,liq uids,ophthalmicandothersterileproducts)accordingtoIP,BPandUSP.

UnitIV

Designingofasepticarea,laminarflowequipments;study ofdifferentsources of contamination inan aseptic area and methodsof prevention,cleanareaclassification.

Principles and methods of different microbiological assay. Methods forstandardizationofantibiotics,vitaminsandaminoacids.Assessmentofanewantibiotic.

UnitV

Typesofspoilage,factorsaffectingthemicrobialspoilageofpharmaceuticalproducts,sourcesandtypesofmic robialcontaminants,assessmentofmicrobialcontaminationandspoilage.Preservationofpharmaceuticalpro ductsusingantimicrobialagents,evaluation ofmicrobialstabilityofformulations.

Growthofanimalcellsinculture,generalprocedureforcellculture,Primary,established andtransformedcellcultures.

Application ofcellcultures inpharmaceutical industryandresearch.

RecommendedBooks(Latestedition)

1. W.B.HugoandA.D.Russel:PharmaceuticalMicrobiology,BlackwellScientificpubli cations,OxfordLondon.
2. PrescottandDunn.,IndustrialMicrobiology, 4th edition,CBSPublishers&Distributors,Delhi.
3. Pelczar,ChanKreig,Microbiology,TataMcGrawHilledn.
4. MalcolmHarris, BalliereTindallandCox:PharmaceuticalMicrobiology.
5. Rose:IndustrialMicrobiology.
6. Probisher,Hinsdilletal:FundamentalsofMicrobiology,9thed.Japan
7. CooperandGunn's:TutorialPharmacy,CBSPublisherandDistribution.
8. Peppler:MicrobialTechnology.

COURSE OUTCOME :

After Completion of the course the student able to

1. To acquire knowledge on HVAC systems, layout designs, GMP standards sanitation personal hygiene in sterile product manufacturing facilities.
2. To know the various types of sterile products with their formulation in large scale industries.
3. To develop skill for lab scale manufacture of few SVPs, LVPs, ophthalmic products with labelling and quality control.
4. To develop skill for microbiological assays
5. To get the knowledge of Pharmaceutical Spoilage

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	2	1	2	1	1	1	2	2	1
CO2	3	1	1	2	1	2	1	2	2	2	3	1
CO3	3	1	2	1	1	3	2	3	3	2	2	2
CO4	3	2	3	3	1	3	3	3	3	2	2	2
CO5	3	2	3	3	1	3	3	3	3	2	2	2

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP 304 T	Pharmaceutical Engineering (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives: Upon completionofthecoursestudentshallbeable:

1. Toknowvariousunit operationsusedin Pharmaceuticalindustries.
2. Tounderstandthematerialhandlingtechniques.
3. Toperformvariousprocessesinvolvedinpharmaceuticalmanufacturingprocess.
4. Tocarryoutvarioustesttopreventenvironmentalpollution.
5. Toappreciateandcomprehendsignificanceofplantlayoutdesignforoptimumuseofresources.
6. Toappreciatethevariouspreventivemethodsusedforcorrosioncontrolin Pharmaceutical industries.

Coursecontent:

UNIT-I

- **Flowoffluids:** Typesof manometers,Reynoldsnumber anditssignificance,Bernoulli'stheoremanditsapplications,Energylosses,Orificemeter, Venturimeter,Pitot tubeandRotometer.
- **SizeReduction:**Objectives,Mechanisms&Lawsgoverningsizereduction,factors affecting size reduction, principles, construction, working, uses, merits anddemerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & endrunnermill.
- **SizeSeparation:**Objectives,applications&mechanismofsizeseparation,officialstandardsofpowders,sieves,sizeseparationPrinciples,construction,working,uses,meritsandd

emeritsofSieveshaker,cycloneseparator,Airseparator,Bagfilter&elutriationtank.

UNIT-II

- **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier'slaw, Heat transfer by conduction, convection & radiation. Heat interchangers &heatexchangers.

- **Evaporation:**Objectives,applicationsandfactorsinfluencingevaporation,differences between evaporation and other heat process. principles, construction,working,uses,meritsanddemeritsofSteamjacketedkettle,horizontaltubeevaporator,climbingfilmevaporator,forcedcirculationevaporator,multipleeffect evaporator&Economyofmultipleeffect evaporator.

- **Distillation:**BasicPrinciplesandmethodologyofsimpledistillation,flashdistillation,fractionaldistillation,distillationunderreducedpressure,steamdistillation&moleculardistillation

UNIT-III

- **Drying:** Objectives, applications & mechanismof drying process, measurements& applications of Equilibrium Moisture content, rate of drying curve. principles,construction, working, uses, merits and demerits of Tray dryer, drum dryer spraydryer,fluidizedbeddryer,vacuum dryer,freezedryer.

- **Mixing:** Objectives, applications & factors affecting mixing, Difference betweensolidandliquidmixing,mechanismofsolidmixing,liquidsmixingandsemisolidsmixing.Principles,Construction,Working,uses,MeritsandDemeritsof Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer,planetarymixers, Propellers, Turbines, Paddles& SilversonEmulsifier,

UNIT-IV

- **Filtration:**Objectives,applications,Theories&Factorsinfluencingfiltration,filteraids, filtermedias.Principle,Construction,Working,Uses,Meritsanddemeritsofplate&framefilter,filterleaf,rotary drumfilter,Metafilter&Cartridgefilter,membranefiltersandSeidtzfilter.
- **Centrifugation:**Objectives,principle&applicationsofCentrifugation,principles, construction, working, uses, merits and demerits of Perforated basketcentrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & supercentrifuge.

UNIT-V

- **Materialsofpharmaceuticalplantconstruction,Corrosionanditsprevention:** Factors affecting during materials selected for Pharmaceutical plantconstruction,Theoriesofcorrosion,typesofcorrosionandthereprevention.Ferrous andnonferrousmetals,inorganicandorganicnonmetals,basicofmaterialhandlingsystems.

Recommended Books:(LatestEditions)

1. Introductiontochemicalengineering–WalterLBadger&JuliusBanchero,Latestedition.
2. Solidphaseextraction,Principles,techniquesandapplicationsbyNigelJ.K.Simpson-Latestedition.
3. Unitoperationofchemicalengineering–McabeSmith,Latestedition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latestedition.
5. Remingtonpracticeofpharmacy-Martin,Latestedition.
6. Theoryand practiceof industrial pharmacybyLachmann.,Latest edition.
7. Physicalpharmaceutics-C.V.SSubrahmanyametal.,Latestedition.
8. CooperandGunn'sTutorialpharmacy,S.J.Carter,Latestedition.

COURSE OUTCOME :

1. To know various unit operations involved in manufacturing of pharmaceuticals.
2. To understand the concepts of flow of fluids, size reduction and size separation.
3 To perform different mechanisms of heat transfer.
4 To compare and contrast different types of evaporation and distillation process.
5 To determine the factors influencing mixing, filtration and centrifugation.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	3	1	1	1	2	2	3	3	3
CO2	3	1	1	3	1	1	1	2	2	3	3	3
CO3	3	1	2	3	1	1	1	2	3	3	2	3
CO4	3	1	3	3	1	1	1	2	3	2	2	3
CO5	3	1	3	3	1	1	1	2	3	2	1	3

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP 305 P	Pharmaceutical organic chemistry II (Practical)	04	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

OBJECTIVES :

1. To impart practical knowledge on various fundamental tests for the identification of some elements and compounds of pharmaceutical importance.

2.To create awareness on basic techniques practiced in the organic synthesis.

3.Allow to gain insight into the construction of molecular models and their significance.

I Experimentsinvolvinglaboratorytechniques

- Recrystallization
- Steamdistillation

II Determinationoffollowingoilvalues(includingstandardizationofreagents)

- Acidvalue
- Saponificationvalue
- Iodinevalue

III Preparationofcompounds

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline byacylationreaction.
- 2,4,6-Tribromoaniline/ParabromoacetanilidefromAniline/
- Acetanilide byhalogenation(Bromination)reaction.
- 5-Nitrosalicylicacid/MetadinitrobenzenefromSalicylicacid/Nitro benzenebynitrationreaction.
- Benzoic acidfromBenzyl chloride byoxidationreaction.
- Benzoicacid/Salicylicacidfromalkylbenzoate/ alkylsalicylatebyhydrolysisreaction.
- 1-Phenylazo-2-naptholfromAnilinebydiazotizationandcouplingreactions.
- BenzilfromBenzoinbyoxidationreaction.
- DibenzalacetonefromBenzaldehydebyClaisonSchmidt reaction
- Cinnammic acidfromBenzaldehydebyPerkinreaction
- *P*-Iodobenzoicacidfrom *P*-aminobenzoicacid

Recommended Books(LatestEditions)

1.OrganicChemistrybyMorrison andBoyd
8. OrganicChemistrybyI.L.Finar, Volume-I
9. Textbook of OrganicChemistrybyB.S.Bahl&ArunBahl.
10. Organic ChemistrybyP.L.Soni

11. Practical OrganicChemistrybyMannand Saunders.
12. Vogel'stextbookofPracticalOrganicChemistry
13. AdvancedPracticalorganicchemistrybyN.K.Vishnoi.
14. Introduction toOrganicLaboratorytechniquesbyPavia,LampmanandKriz.

COURSE OUTCOME :

1.Assess the identity in terms of the physico-chemical properties of the compounds of specified chemical classes.

2.Get hands- on- experience in basic techniques of organic synthesis.

3. Infer the chemical nature of the compounds on the basis of qualitative chemical tests.
4. Understand the significance of certain electronic effects with respect to the reactivity/ stability of organic compounds specified.
5. Understand and gain insight into the organic reactions by analyzing their fair reaction mechanisms.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO18	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	1	1	2	1	1	11
CO2	3	3	2	3	1	1	1	1	2	1	1	1
CO3	3	3	3	3	1	1	1	1	2	1	1	1
CO4	3	3	3	3	1	1	1	1	2	1	1	1
CO5	3	3	3	3	1	1	1	1	2	1	1	1

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP 306 P	Physical Pharmaceutics I (Practical)	04	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

OBJECTIVES :

1. To analyse the solubility of various drugs and excipients

2. Experiment on partition coefficient of different compounds and various solubility systems,

To examine the surface tension, HLB number of a various surfactant

3. Evaluate stability constant of complex compound.

2. the solubilityof drugatroomtemperature. Determination of pKa value by Half Neutralization/ Henderson Hasselbalchequation.
3. DeterminationofPartitionco-efficientofbenzoicacidinbenzeneandwater
4. DeterminationofPartitionco-efficientofIodineinCCl$_4$andwater
5. Determination of% composition of NaCl in a solution using phenol-water system byCSTmethod
6. Determination ofsurfacetensionofgiven liquidsbydropcount and dropweightmethod
7. DeterminationofHLBnumberofasurfactantbysaponificationmethod
8. DeterminationofFreundlichandLangmuirconstantsusingactivatedcharcoal
9. Determinationofcriticalmicellarconcentrationofsurfactants
10. Determinationofstabilityconstant anddonoracceptorratioofPABA-Caffeinecomplexbysolubilitymethod
11. DeterminationofstabilityconstantanddonoracceptorratioofCupric-GlycinecomplexbypHtitrationmethod

Recommended Books:(LatestEditions)

1. PhysicalPharmacybyAlfredMartin
2. ExperimentalPharmaceuticsbyEugene,Parott.
3. TutorialPharmacybyCooper and Gunn.
4. StocklosamJ.PharmaceuticalCalculations,Lea &Febiger,Philadelphia.
5. LibermanH.A,LachmanC.,PharmaceuticalDosageforms,Tablets, Volume-1to3,MarcelDekkarInc.
6. LibermanH.A,LachmanC,PharmaceuticalDosageforms.Dispersesystems,volume1,2,3.Marcel DekkarInc.
7. Physical PharmaceuticsbyRamasamyCandManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J.Thimmasettee
9. PhysicalPharmaceuticsbyC.V.S.Subramanyam
10. TestbookofPhysicalPhramacy,byGauravJain&RoopK.Khar

COURSE OUTCOME :

1. This course helps to compare and evaluate the solubility of various combination compound modify for better solubility approaches by use different level of methods
2. recognize the formulation aspects of different dosage forms;
3. formulate different types of dosage forms;

4. appreciate the importance of good formulation for effectiveness.
5. do different pharmaceutical calculation involved in formulation;

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	1	1	1	2	1	1	1
CO2	3	3	2	3	1	1	1	1	2	1	1	1
CO3	3	3	3	3	1	1	1	1	2	1	1	1
CO4	3	3	3	3	1	1	1	1	2	1	1	1
CO5	3	3	3	3	1	1	1	1	2	1	1	1

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP 307 P	Pharmaceutical Microbiology (Practical)	04	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

OBJECTIVES :

1. To know about the specialities and specifications of sterile products along with applications, routes of administration, general requirements, manufacture, quality control and packaging materials to differentiate these with non-sterile formulations.
2. To understand the classification of sterile products on various basis conventional, ophthalmic and novel sterile with their formulations and large scale manufacture.
3. To know about the GMP standards, layout design, sanitation, personal hygiene and training in sterile manufacture products.

Course content :

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator,laminarflow,aseptichood,autoclave,hotairsterilizer,deepfreezer,refrigerator,microscopesusedin experimental microbiology.
2. Sterilizationofglassware,preparationandsterilizationofmedia.
3. Subculturingofbacteriaandfungus.Nutrientstabsandslantspreparations.
4. Staining methods-Simple,Gramsstainingandacidfaststaining(Demonstrationwithpractical).
5. Isolationofpureculture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.

9. Bacteriologicalanalysisofwater
10. Biochemicaltest.

RecommendedBooks(Latestedition)

1. W.B.HugoandA.D.Russel:PharmaceuticalMicrobiology,BlackwellScientificpublications,OxfordLondon.
2. PrescottandDunn.,IndustrialMicrobiology, 4thedition,CBSPublishers&Distributors,Delhi.
3. Pelczar,ChanKreig,Microbiology,TataMcGrawHilledn.
4. MalcolmHarris, BalliereTindallandCox:PharmaceuticalMicrobiology.
5. Rose:IndustrialMicrobiology.
6. Probisher,Hinsdilletal:FundamentalsofMicrobiology,9thed.Japan
7. CooperandGunn's:TutorialPharmacy,CBSPublisherandDistribution.
8. Peppler:MicrobialTechnology.
9. I.P.,B.P.,U.S.P.-latesteditions.
10. Ananthnarayan:TextBookofMicrobiology,Orient-Longman,Chennai
11. Edward:FundamentalsofMicrobiology.
12. N.K.Jain:PharmaceuticalMicrobiology,VallabhPrakashan,Delhi
13. Bergeysmanualofsystematicbacteriology,WilliamsandWilkins-AWaverlycompany.

COURSE OUTCOME :

After Completion of the course the student able to

1. Learners gain knowledge on some sterile marketed products.
2. Learners gain knowledge on blood products which are not possible in laboratory and large scale manufacture.
3. To know the skills of aseptic techniques principles of sterilization and validation of aseptic areas.
4. Knowledge on blood products and surgical dressing with their formulation details.
5. Production of asceptic products and quality control.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	1	1	2	8	3	1	3	1
CO2	3	2	1	3	1	1	2	2	3	1	2	1
CO3	3	1	2	3	1	2	1	2	2	2	2	2
CO4	3	2	2	3	1	2	2	1	1	2	2	2
CO5	3	2	3	3	1	3	2	1	1	2	2	2

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP 308 P	Pharmaceutical Engineering (Practical)	04	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

OBJECTIVES :

To know various unit operations used in Pharmaceutical industries.

2. To understand the material handling techniques.

3. To perform various processes involved in pharmaceutical manufacturing process.

4. To carry out various test to prevent environmental pollution.

5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.

6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

I. Determinationofradiationconstantofbrass,iron,unpaintedandpainted glass.
II. Steamdistillation –Tocalculatetheefficiencyofsteam distillation.
III. To determine theoverallheattransfercoefficientbyheatexchanger.
IV. Constructionofdryingcurves(forcalciumcarbonateandstarch).
V. Determinationofmoisturecontentandlossondrying.
VI. Determination of humidity of air – i) From wet and dry bulb temperatures –use ofDewpointmethod.
VII. DescriptionofConstructionworkingandapplicationofPharmaceuticalMachinery such as rotary tablet machine, fluidized bed coater, fluid energy mill,dehumidifier.
VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmeticandlogarithmicprobabilityplots.
IX. Sizereduction:ToverifythelawsofsizereductionusingballmillanddeterminingKicks,Rittinger's,Bond'scoefficients,powerrequirementandcriticalspeed ofBall Mill.
X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryerandsuchothermajorequipment.
XI. FactorsaffectingRateofFiltrationandEvaporation(Surfacearea,ConcentrationandThickness/ viscosity
XII. TostudytheeffectoftimeontheRateofCrystallization.
XIII. To calculate the uniformity Index for given sample by using Double ConeBlender.

COURSE OUTCOME

1. To understand the basic principles involved in unit operations such as size reduction, size separation, distillation and drying.
2. To demonstrate and explain about the construction, working and applications of pharmaceutical equipment's such as colloid mill, planetary mixer, fluidized bed dryer and freeze dryer.
3. To experiment with the process variables of filtration, evaporation and infer the same.
4. To determine radiation constant of brass, iron, unpainted and painted glass.
5. To determine overall heat transfer coefficient by heat exchanger and calculate the efficiency of steam distillation.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	1	1	2	2	2	3	3	2
CO2	3	2	1	3	1	1	2	2	2	3	3	2
CO3	3	3	1	3	2	1	2	2	2	3	3	2
CO4	3	1	2	3	2	1	2	2	2	3	3	2
CO5	3	1	2	3	3	1	2	2	2	3	3	2

3- High, 2- Medium, 1-Low

SEMESTER IV

Course Code	Course Title	No of Hours Per week	No of Credits
BP 401 T	Pharmaceutical organic chemistry III (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives:

1. To enlighten on various aspects of stereoisomerism.
2. To create awareness on the nomenclature of heterocyclic compounds, their reactivity, and chemical reactions.
3. To highlight the importance of above heterocyclic compounds with respect to some of the drug classes that bear them as structural scaffolds.
4. To emphasize some of the named reactions and their applications with respect to pharmacy.

CourseContent:

Note:Toemphasizeondefinition,types,mechanisms,examples,uses/

applicationsUNIT-I

Stereoisomerism

Opticalisomerism–

Opticalactivity,enantiomerism,diastereoisomerism,mesocompoundsElementsofsy

mmetry,chiral andachiralmolecules

DLsystemofnomenclatureofopticalisomers,sequencerules,RSsystemofnomenclatureofoptical isomers

Reactionsofchiralmolecules

Racemicmodificationandresolutionofracemicmixture.Asymmetricsynthe

sis: partialandabsolute

UNIT-II

Geometricalisomerism

Nomenclatureofgeometricalisomers(CisTrans,EZ,SynAntisystems)
Methodsofdeterminationofconfigurationofgeometricalisomers. ConformationalisomerisminEthane,n-ButaneandCyclohexane.

Stereoisomerisminbiphenylcompounds(Atropisomerism)andconditionsforopticalactivity.
Stereospecificandstereoselectivereactions

UNIT-III

Heterocycliccompounds:

Nomenclatureandclassification

Synthesis,reactionsandmedicinalusesoffollowingcompounds/

derivativesPyrrole,Furan,andThiopheneRelativearomaticityandreactivityofPyrrole,Furan

andThiophene

UNIT-IV

Synthesis,reactionsandmedicinalusesoffollowingcompounds/

derivativesPyrazole,Imidazole,OxazoleandThiazole.Pyridine, Quinoline,Isoquinoline,

AcridineandIndole.BasicityofpyridineSynthesisandmedicinalusesofPyrimidine,Purine,azepinesan

dtheirderivatives

UNIT-V

Reactionsofsyntheticimportance

Metalhydridereduction($NaBH_4$and$LiAlH_4$),Clemmensenreduction,Birchreduction,WolffKishnerreduction.Oppenauer-oxidationandDakinreaction. Beckmanns rearrangement and Schmidt rearrangement.Claisen-Schmidtcondensation

RecommendedBooks(LatestEditions)

1. OrganicchemistrybyI.L.Finar,Volume-I&II.
2. A textbook oforganicchemistry–Arun Bahl,B.S.Bahl.
3. HeterocyclicChemistrybyRajK.Bansal
4. Organic ChemistrybyMorrisonandBoyd
5. HeterocyclicChemistrybyT.L.Gilchrist

COURSE OUTCOME :

After Completion of this course, the student could be able to:

1. Guess and writethestructure according to the stereochemical specifications.
2. Fairly understand the aspects of heterocyclic chemistry in terms of naming and reactivity.
3. Assess and understand the pharmaceutical applications.
4. Importance of the specified named reactions.
5. Synthesis of different pharmaceutical products.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	3	1	1	1	2	1	3	3	3
CO2	3	1	2	3	1	1	1	2	1	3	3	3
CO3	3	1	2	3	1	1	1	1	1	3	3	2
CO4	3	1	2	3	1	1	1	1	1	3	3	2
CO5	3	1	2	3	1	1	1	1	1	3	3	2

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP 402 T	Medicinal chemistry I (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives:1. Understand the chemistry of drugs and its pharmacological activity.

2. Understand the drug metabolic pathways, adverse effects and therapeutic value of drugs.

3. Know the Structural Activity Relationship (SAR) of different class of drugs.

4. Chemical synthesis of drugs.

CourseContent:

Study of the development of the following classes of drugs, Classification, mechanism ofaction, uses of drugs mentioned in the course, Structure activity relationship of selectiveclassofdrugsas specified in thecourseand synthesisofdrugssuperscripted (*)

UNIT-I

IntroductiontoMedicinalChemistry

History and development of medicinal chemistryPhysicochemicalpropertiesinrelationtobiologicalaction

Ionization,Solubility,PartitionCoefficient,Hydrogenbonding,Proteinbinding,Chelation,Bioisosterism, OpticalandGeometricalisomerism.

Drugmetabolism

Drugmetabolismprinciples-PhaseIandPhaseII.

Factorsaffectingdrugmetabolism includingstereochemicalaspects.

UNIT-II

DrugsactingonAutonomicNervousSystemAdrenergicNe

urotransmitters:

Biosynthesisandcatabolismofcatecholamine. Adrenergicreceptors (Alpha&Beta)andtheirdistribution.

Sympathomimeticagents:SARofSympathomimeticagents

Directacting:Nor-epinephrine,Epinephrine,Phenylephrine*,Dopamine,

Methyldopa,Clonidine,Dobutamine,Isoproterenol,Terbutaline,Salbutamol*,Bitolterol,Nap hazoline,OxymetazolineandXylometazoline.

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine,Propylhexedrine.

- Agentswithmixedmechanism:Ephedrine,Metaraminol.

AdrenergicAntagonists:

Alphaadrenergicblockers: Tolazoline*,Phentolamine,Phenoxybenzamine,Prazosin,Dihydroergotamine,Methysergide.

Betaadrenergicblockers:SARofbetablockers,Propranolol*,Metibranolol,Atenolol,Betazolol,Bisoprolol,Esmolol,Metoprolol,Labetolol,Carvedilol.

UNIT-III

Cholinergicneurotransmitters:

Biosynthesisandcatabolismofacetylcholine.

Cholinergicreceptors(Muscarinic&Nicotinic)andtheirdistribution.

Parasympathomimeticagents:SARofParasympathomimeticagents

Directactingagents: Acetylcholine,Carbachol*,Bethanechol,Methacholine,Pilocarpine.

Indirectacting/Cholinesterase inhibitors(Reversible & Irreversible): Physostigmine,Neostigmine*,Pyridostigmine,Edrophoniumchloride,Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophateiodide,Parathione,Malathion.

Cholinesterasereactivator: Pralidoximechloride.

CholinergicBlockingagents:SARofcholinolyticagents

Solanaceousalkaloidsandanalogues: Atropinesulphate,Hyoscyaminesulphate,Scopolaminehydrobromide,Homatropinehydrobromide,Ipratropiumbromide*.

Syntheticcholinergicblockingagents: Tropicamide,Cyclopentolatehydrochloride,Clidiniumbromide,Dicyclominehydrochloride*,Glycopyrrolate,Methanthelinebromide,Propanthelinebromide,Benztropinemesylate,Orphenadrinecitrate,Biperidinehydrochloride,Procyclidinehydrochloride*, Tridihexethylchloride,Isopropamide iodide,Ethopropazinehydrochloride.

UNIT-IV **0**

DrugsactingonCentralNervousSystem

A. SedativesandHypnotics:

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

Barbiturtes:SARofbarbiturates,Barbital*,Phenobarbital,Mephobarbital,Amobarbital,Butabarbital, Pentobarbital,Secobarbital

Miscelleneous:

Amides&imides:Glutethmide.

Alcohol&theircarbamatederivatives:Meprobomate,Ethchlorvynol.Aldehyde&theirderivatives:Triclofossodium,Paraldehyde.

B. Antipsychotics

Phenothiazeines:SARofPhenothiazeines-Promazinehydrochloride,Chlorpromazinehydrochloride*,Triflupromazine,Thioridazinehydrochloride,Piperacetazinehydrochloride,Prochlorperazinemaleate,Trifluoperazinehydrochloride.

RingAnaloguesofPhenothiazeines: Chlorprothixene,Thiothixene,Loxapinesuccinate,Clozapine.

Flurobuterophenones: Haloperidol,Droperidol,Risperidone.

Betaaminoketones: Molindonehydrochloride.

Benzamides: Sulpieride.

Anticonvulsants: SAR of Anticonvulsants**,** mechanism of anticonvulsantaction

Barbiturates:Phenobarbitone,Methabarbital.

Hydantoins: Phenytoin*,Mephenytoin,Ethotoin

Oxazolidinediones: Trimethadione,Paramethadione

Succinimides: Phensuximide, Methsuximide, Ethosuximide*

Urea andmonoacylureas: Phenacemide, Carbamazepine*

Benzodiazepines:Clonazepam

Miscellaneous: Primidone,Valproicacid,Gabapentin,Felbamate

UNIT– V

DrugsactingonCentralNervousSystem

Generalanesthetics:

Inhalationanesthetics: Halothane*,Methoxyflurane,Enflurane,Sevoflurane,Isoflurane,Desflurane.

Ultrashortactingbarbitutrates: Methohexitalsodium*,Thiamylalsodium,Thiopental sodium.

Dissociativeanesthetics: Ketaminehydrochloride.

Narcoticandnon-narcoticanalgesics

Morphineandrelateddrugs:SARofMorphineanalogues,Morphinesulphate,Codeine,Meperidinehydrochloride,Anilerdinehydrochloride,Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*,Methadonehydrochloride*,Propoxyphenehydrochloride,Pentazocine,Levorphanol tartarate.

Narcoticantagonists: Nalorphinehydrochloride,Levallorphantartarate,Naloxonehydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*,Meclofenamate, Indomethacin, Sulindac, Tolmetin,Zomepriac, Diclofenac,Ketorolac,Ibuprofen*,Naproxen, Piroxicam, Phenacetin, Acetaminophen,Antipyrine,Phenylbutazone.

RecommendedBooks(LatestEditions)

1. WilsonandGiswold'sOrganicmedicinalandPharmaceuticalChemistry.
2. Foye'sPrinciplesofMedicinalChemistry.
3. Burger'sMedicinalChemistry,VolItoIV.
4. Introductiontoprinciplesofdrugdesign-SmithandWilliams.
5. Remington'sPharmaceuticalSciences.
6. Martindale'sextrapharmacopoeia.
7. Organic ChemistrybyI.L.Finar, Vol.II.
8. The OrganicChemistryofDrugSynthesis byLednicer, Vol. 1-5.

COURSE OUTCOME

This subject is designed to impart

1. Fundamental knowledge on the structure, chemistry..
2. Therapeutic value of drugs.
3. Understand the Structural Activity Relationship (SAR) of drugs.
4. Importance of physicochemical properties and metabolism of drugs.
5. Chemical synthesis of important drugs under each class.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	3	1	1	3	1	1	1	2	2	1	2	2
CO2	3	1	1	3	1	1	1	2	2	1	2	2
CO3	3	1	1	3	1	1	1	2	2	1	2	1
CO4	3	1	1	3	1	1	1	2	2	1	2	1
CO5	3	1	1	3	1	1	1	2	2	1	2	1

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP 403 T	Physical Pharmaceutics II (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives: Uponthecompletionofthecoursestudentshallbeableto

1. Understandvariousphysicochemicalpropertiesofdrugmoleculesinthedesigningthedosageforms
2. Knowtheprinciplesofchemicalkinetics&tousethem forstabilitytestingnaddeterminationofexpirydateofformulations
3. Demonstrate use of physicochemical properties in the formulationdevelopmentandevaluationofdosageforms.

CourseContent:

UNIT-I

Colloidaldispersions: Classificationofdispersedsystems&theirgeneralcharacteristics,size&shapes ofcolloidalparticles,classificationofcolloids&comparative account of their general properties. Optical, kinetic & electrical properties.Effectof electrolytes,coacervation,peptization&protectiveaction.

UNIT-II

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature,non-Newtoniansystems,pseudoplastic,dilatant,plastic,thixotropy,thixotropyinformulation,determinationofviscosity,capillary,fallingSphere,rotationalviscometers

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain,ElasticModulus

UNIT-III

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling insuspensions, formulation of flocculated and deflocculatedsuspensions. Emulsions andtheories of emulsification, microemulsion and multiple emulsions; Stability of emulsions,preservation of emulsions,rheologicalpropertiesofemulsions andemulsionformulation byHLBmethod.

UNIT-IV

Micromeretics: Particle size and distribution, mean particle size, number and weightdistribution,particlenumber,methodsfordeterminingparticlesizebydifferentmethods, counting and separation method, particle shape, specific surface, methods fordeterminingsurfacearea,permeability,adsorption,derivedpropertiesofpowders,porosity,packing arrangement,densities,bulkiness&flowproperties.

UNIT-V

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basicrate constants, determination of reaction order. Physical and chemical factors influencingthe chemical degradation of pharmaceutical product: temperature, solvent, ionic strength,dielectric constant, specific & general acid base catalysis, Simple numerical problems.Stabilization of medicinal agents against common reactions like hydrolysis & oxidation.Acceleratedstabilitytestinginexpirationdatingofpharmaceuticaldosageforms.Photolyticd egradation andits prevention.

1. PhysicalPharmacybyAlfredMartin,Sixthedition
2. ExperimentalpharmaceuticsbyEugene,Parott.
3. Tutorial pharmacybyCooper andGunn.
4. StocklosamJ.Pharmaceuticalcalculations,Lea&Febiger,Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3,MarcelDekkarInc.
6. LibermanH.A,LachmanC,Pharmaceuticaldosageforms.Dispersesystems,volume1,2,3.M arcel DekkarInc.

COURSE OUTCOME :

1. The course deals with the various physical and physicochemical properties
2. Principles involved in dosage forms/formulations.
3. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development.
4. Stability studies of pharmaceutical dosage forms
5. Better knowledge on the different properties of ingredients

403T PH PHA II

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	1	2	2	1	1	1	2	3
CO2	3	2	3	3	1	2	2	1	1	1	2	2

CO3	3	2	3	3	1	1	1	2	1	1	2	2
CO4	3	2	3	3	1	1	1	2	2	1	2	2
CO5	3	2	3	3	1	2	2	3	2	1	2	2

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP 404 T	Pharmacology I (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives:

Upon completionofthiscoursethestudentshouldbeableto

1. Understandthepharmacological actionsofdifferentcategoriesofdrugs
2. Explainthemechanismofdrugactionatorgansystem/subcellular/ macromolecularlevels.
3. Apply the basic pharmacological knowledge in the prevention and treatment ofvariousdiseases.
4. Observetheeffect ofdrugs on animals bysimulated experiments
5. Appreciate correlation ofpharmacologywithotherbiomedicalsciences

CourseContent:

UNIT-I **0**

1. GeneralPharmacology

a. IntroductiontoPharmacology- Definition,historicallandmarksandscopeofpharmacology,natureandsourceofdrugs,essentialdrugsconceptandroutesofdrug administration, Agonists, antagonists(competitive and non competitive), sparereceptors,addiction,tolerance,dependence,tachyphylaxis,idiosyncrasy,allergy.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism andexcretionofdrugs.Enzymeinduction,enzymeinhibition,kineticsof elimination

UNIT-II **12Hours**

GeneralPharmacology

a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theoriesand classification of receptors, regulation of receptors. drug receptors interactionssignaltransductionmechanisms,G-protein–coupledreceptors,ionchannelreceptor,transmembrane enzyme linked receptors, transmembrane JAK-STAT bindingreceptorand receptors that regulate transcription factors, dose responserelationship, therapeutic index, combined effects of drugs and

factors modifyingdrugaction.

b. Adversedrugreactions.

c. Druginteractions(pharmacokineticandpharmacodynamic)

d. Drugdiscoveryandclinicalevaluation ofnew drugs-
Drugdiscoveryphase,preclinical evaluation phase, clinical trial phase, phases of clinical trials andpharmacovigilance.

UNIT-III

2. Pharmacologyofdrugsactingonperipheralnervoussystem

a. OrganizationandfunctionofANS.

b.Neurohumoraltransmission,co-transmissionandclassificationofneurotransmitters.

c. Parasympathomimetics,Parasympatholytics,Sympathomimetics,sympatholytics.

d. Neuromuscularblockingagentsandskeletalmusclerelaxants(peripheral).

e. Localanestheticagents.

f. Drugsusedinmyastheniagravisandglaucoma

UNIT-IV **0**

3. Pharmacologyofdrugsactingoncentralnervoussystem

a. NeurohumoraltransmissionintheC.N.S.specialemphasisonimportanceofvariousneuro transmitterslikewithGABA,Glutamate,Glycine,serotonin,dopamine.

b. Generalanestheticsandpre-anesthetics**.**

c. Sedatives,hypnoticsandcentrallyactingmuscle relaxants.

d. Anti-epileptics

e. Alcoholsanddisulfiram

UNIT-V

3. Pharmacologyofdrugsactingoncentralnervoussystem

a. Psychopharmacologicalagents:Antipsychotics,antidepressants,anti-anxietyagents,anti-manicsandhallucinogens.

b. DrugsusedinParkinsonsdiseaseandAlzheimer'sdisease.

c. CNSstimulantsandnootropics.

d. Opioidanalgesicsand antagonists

e. Drugaddiction,drugabuse,toleranceanddependence.

RecommendedBooks(LatestEditions)

1. RangH.P., DaleM.M.,RitterJ.M., FlowerR. J.,RangandDale'sPharmacology,.ChurchilLivingstoneElsevier
2. KatzungB.G.,Masters S.B.,TrevorA.J.,Basicandclinicalpharmacology, TataMcGraw-Hill

3. GoodmanandGilman's,ThePharmacologicalBasisofTherapeutics

4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point LippincottWilliams &Wilkins

5. MycekM.J,GelnetS.BandPerperM.M.Lippincott'sIllustratedReviews-Pharmacology

6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers MedicalPublishers(P)Ltd, NewDelhi.

7. SharmaH.L.,SharmaK.K.,Principlesof Pharmacology,Parasmedicalpublisher Modern Pharmacologywithclinical Applications,byCharles R.Craig&Robert

COURSE OUTCOME :

1. The subject is to impart knowledge about the action of the drug, different routes of drug administration, toxic effects etc.
2. Students would have understood the pharmacological actions of different categories of drugs.
3. Mechanism of drug action at organ system, sub cellular and macromolecular levels have been studied.
4. They have understood the application of basic pharmacological knowledge in the prevention and treatment of different diseases.
5. Signal transduction mechanism of various receptors have been understood.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	2	1	1	1	2	2	1	2	1
CO2	3	1	1	2	1	1	1	2	2	1	2	1
CO3	2	2	2	3	1	2	3	2	1	2	3	2
CO4	2	2	2	3	2	2	1	2	1	2	1	2
CO5	1	3	2	3	2	2	1	1	2	1	1	2

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP 405 T	**PharmacognosyAndPhytochemistry I** (Theory)	03+ 01 (Tutorial)	04
Sessional Marks : 25		**End Semester Examination Marks : 75**	

Objectives:

1. Students should know about the techniques involved in cultivation and production of crude drugs

2. Study about crude drugs, their uses and chemical nature of drugs

3.Familiar with the evaluation techniques for herbal drugs

4. Evaluate the microscopic and macroscopic characteristics of the crude drugs

CourseContent:

UNIT-I

IntroductiontoPharmacognosy:

(a) Definition,history,scopeanddevelopmentofPharmacognosy

(b) SourcesofDrugs–Plants,Animals,Marine&Tissueculture

(c) Organizeddrugs,unorganizeddrugs(driedlatex,driedjuices,driedextracts,gumsandmucilages,oleoresinsandoleo- gum -resins).

Classificationofdrugs:

Alphabetical,morphological,taxonomical,chemical,pharmacological,chemoandserotaxonomicalclassificationofdrugs

Qualitycontrolof Drugsof NaturalOrigin:

Adulterationofdrugsofnaturalorigin.Evaluationbyorganoleptic,microscopic,physical,chemicaland biologicalmethodsandproperties.

Quantitativemicroscopyofcrudedrugsincludinglycopodiumsporemethod,leafconstants,cameralucidaanddiagramsofmicroscopic objectstoscale withcameralucida.

UNIT-II

Cultivation,Collection,Processingandstorageofdrugsofnaturalorigin:

CultivationandCollectionofdrugsofnaturaloriginFactors influencing cultivation of medicinal plants.Planthormonesand theirapplications.

Polyploidy,mutationandhybridizationwithreferencetomedicinalplants

Conservationofmedicinalplants

UNIT-III

Planttissueculture:

Historicaldevelopmentofplanttissueculture,typesofcultures,Nutritionalrequirements,growth and theirmaintenance.

Applicationsofplanttissueculture inpharmacognosy.Edible vaccines

UNITIV

Pharmacognosyinvarioussystemsofmedicine:

RoleofPharmacognosy inallopathyandtraditionalsystemsofmedicinenamely,Ayurveda,Unani,Siddha,Homeopathya nd Chinesesystemsof medicine.

Introductiontosecondarymetabolites:

Definition,classification,propertiesandtestforidentificationofAlkaloids,Glycosides,Flavonoi ds,Tannins, Volatileoiland Resins

UNITV

Studyofbiologicalsource,chemicalnatureandusesofdrugsofnaturalorigincontainingfollowing drugs

PlantProducts:

Fibers-Cotton,Jute,Hemp

Hallucinogens,Teratogens,Naturalallergens

Primarymetabolites:

Generalintroduction,detailedstudywithrespecttochemistry,sources,preparation,evaluation, preservation, storage, therapeutic used and commercial utility as PharmaceuticalAids and/orMedicines forthefollowingPrimarymetabolites:

Carbohydrates: Acacia,Agar,Tragacanth,Honey

ProteinsandEnzymes: Gelatin,casein,proteolyticenzymes(Papain,bromelain,serratiopepti dase,urokinase, streptokinase,pepsin).

Lipids(Waxes,fats,fixedoils):Castoroil,Chaulmoograoil,WoolFat,BeesWax

MarineDrugs:

Novelmedicinalagentsfrommarinesources

RecommendedBooks(LatestEditions)

1. WilsonandGiswold'sOrganicmedicinalandPharmaceuticalChemistry.
2. Foye'sPrinciplesofMedicinalChemistry.
3. Burger'sMedicinalChemistry,VolItoIV.
4. Introductiontoprinciplesofdrugdesign-SmithandWilliams.
5. Remington'sPharmaceuticalSciences.
6. Martindale'sextrapharmacopoeia.

7. Organic ChemistrybyI.L.Finar, Vol.II.
8. The OrganicChemistryofDrugSynthesis byLednicer, Vol. 1-5.
9. IndianPharmacopoeia.
10. Textbookofpracticalorganicchemistry-A.I.Vogel.

COURSE OUTCOME :

After Completion of the course the student able to

1. This subject is intended to impart students about the fundamental knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially, involved in the study of producing plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine.
2. Significance of pharmacognostic parameters & study of crude drugs.
3. Understand the underlying reason of evolutionary significance of secondary metabolites production in plants & other organisms & deduce their significance as medicinal molecules.
4. How these primary metabolites are used comprehensively as a source to develop Pharmaceutical & industrial applications.
5. Study about the source, name, chemical structures, methods of extraction, qualitative & quantitative analysis of glycosides & tannin.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	3	2	1	2	2	3	2
CO2	3	2	2	1	1	3	3	1	2	3	2	2
CO3	2	2	1	2	2	2	3	2	2	3	2	1
CO4	2	1	1	2	3	2	2	2	2	2	1	1
CO5	2	1	2	3	3	1	1	2	1	1	1	1

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP 406 P	Medicinal chemistry I (Practical)	04	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

OBJECTIVE :

Know about the structure, & physico chemical properties of drugs

2. Understand the procedures for the preparation of drugs.

3. standardize procedures for the assay preparations

4. Determine the partition coefficient for any two drugs

5. Know the steps involved in the synthesis of drugs in each class.

Preparationofdrugs/intermediates

1,3-pyrazole

1,3-oxazole

Benzimidazole

Benztriazole

2,3-diphenyl quinoxaline

Benzocaine

Phenytoin

Phenothiazine

Barbiturate

Assayofdrugs

Chlorpromazine

Phenobarbitone

Atropine

Ibuprofen

Aspirin

Furosemide

DeterminationofPartition coefficientforanytwodrugs

RecommendedBooks(LatestEditions)

1. WilsonandGiswold'sOrganicmedicinalandPharmaceuticalChemistry.

2. Foye'sPrinciplesofMedicinalChemistry.
3. Burger'sMedicinalChemistry,VolItoIV.
4. Introductiontoprinciplesofdrugdesign-SmithandWilliams.
5. Remington'sPharmaceuticalSciences.
6. Martindale'sextrapharmacopoeia.
7. Organic ChemistrybyI.L.Finar, Vol.II.
8. The OrganicChemistryofDrugSynthesis byLednicer, Vol. 1-5.
9. IndianPharmacopoeia.
10. Textbookofpracticalorganicchemistry-A.I.Vogel.

COURSE OUTCOME :

This subject is to inculcate the students will able to know

1. Basic knowledge on scope of Medicinal chemistry and interlinked subjects

2. Handling the glassware and Preparations of the synthetic drugs and how to calibrate the chemicals.

3. Perform the synthesis of the drugs with their chemical structures.

4. Compare the test drug with that of the standard drug by assay methods.

5. Understand the partition coefficient of any two drugs.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	3	2	1	1	1	1	1	1	1
CO2	3	1	2	3	2	1	2	1	1	1	1	1
CO3	2	2	1	2	1	1	2	2	2	1	2	2
CO4	2	2	1	1	1	2	2	2	2	1	2	2
CO5	1	1	1	1	3	2	2	2	2	1	2	3

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits

BP 407 P	Physical pharmaceutics II (Practical)	04	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

OBJECTIVES :

To analyse the solubility of various drugs and excipients

2. Experiment on partition coefficient of different compounds and various solubility systems,

To examine the surface tension, HLB number of a various surfactant

3. Evaluate stability constant of complex compound.

1. Determinationofparticlesize,particlesizedistributionusingsievingmethod
2. Determinationofparticlesize,particlesizedistributionusingMicroscopicmethod
3. Determinationofbulkdensity,truedensityandporosity
4. Determinetheangleofreposeandinfluenceoflubricantonangleofrepose

5. DeterminationofviscosityofliquidusingOstwald'sviscometer
6. Determinationsedimentationvolumewitheffectofdifferentsuspendingagent
7. Determinationsedimentationvolumewitheffectofdifferentconcentrationofsinglesusp endingagent
8. Determination of viscosityof semisolidbyusingBrookfield viscometer
9. Determinationofreactionrateconstantfirstorder.
10. Determinationofreactionrateconstantsecondorder
11. Accelerated stabilitystudies

RecommendedBooks:(LatestEditions)

7. PhysicalPharmacybyAlfredMartin,Sixthedition
8. ExperimentalpharmaceuticsbyEugene,Parott.
9. Tutorial pharmacybyCooper andGunn.
10. StocklosamJ.Pharmaceuticalcalculations,Lea&Febiger,Philadelphia.
11. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkarInc.
12. LibermanH.A,LachmanC,Pharmaceuticaldosageforms.Dispersesystems,volume1,2,3.M arcel DekkarInc.
13. Physical PharmaceuticsbyRamasamyC, andManavalan R.

COURSE OUTCOME :

1. This course helps to compare and evaluate the solubility of various combination compound modify for better solubility approaches by use different level of methods.
2. recognize the formulation aspects of different dosage forms;
3. formulate different types of dosage forms;

4. appreciate the importance of good formulation for effectiveness.
5. do different pharmaceutical calculation involved in formulation;

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	2	1	1	2	2	3	3	3
CO2	2	1	2	2	2	1	2	2	2	3	3	3
CO3	3	1	3	2	1	1	2	2	1	3	3	2
CO4	3	1	3	1	1	1	2	1	1	2	2	2
CO5	3	1	2	1	1	1	1	1	1	2	2	2

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP 408 P	Pharmacology I (Practical)	04	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

OBJECTIVES

1. To understand the handling of different equipments used in experimental pharmacology.
2. Knowledge on miotics and mydriasis, locomotor movements.
3. All the simulation techniques has been demonstrated by using software as animal dissection has been banned for UG studies.

1. Introductiontoexperimentalpharmacology.
2. Commonlyused instruments in experimental pharmacology.
3. Studyofcommonlaboratoryanimals.
4. MaintenanceoflaboratoryanimalsasperCPCSEAguidelines.
5. Commonlaboratorytechniques.Bloodwithdrawal,serumandplasmaseparation,anestheticsand euthanasiaused foranimal studies.
6. Studyof differentroutesof drugsadministrationin mice/rats.
7. Studyofeffectofhepaticmicrosomalenzymeinducersonthephenobarbitonesleepingtimeinmice.
8. Effectof drugsonciliarymotilityoffrogoesophagus
9. Effectofdrugsonrabbiteye.
10. Effectsofskeletalmusclerelaxantsusingrota-rodapparatus.
11. Effect of drugsonlocomotoractivityusingactophotometer.
12. AnticonvulsanteffectofdrugsbyMESandPTZmethod.

13. Studyof stereotypeand anti-catatonic activityofdrugs onrats/mice.
14. Studyofanxiolyticactivityofdrugsusingrats/mice.
15. Studyoflocalanestheticsbydifferentmethods

Note: All laboratory techniques and animal experiments are demonstrated by simulatedexperimentsbysoftwares andvideos

RecommendedBooks(LatestEditions)

1. RangH.P., DaleM.M.,RitterJ.M., FlowerR. J.,RangandDale'sPharmacology,.ChurchilLivingstoneElsevier
2. KatzungB.G.,Masters S.B.,TrevorA.J.,Basicandclinicalpharmacology, TataMcGraw-Hill
3. GoodmanandGilman's,ThePharmacologicalBasisofTherapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point LippincottWilliams &Wilkins
5. MycekM.J,GelnetS.BandPerperM.M.Lippincott'sIllustratedReviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers MedicalPublishers(P)Ltd, NewDelhi.
7. SharmaH.L.,SharmaK.K.,Principlesof Pharmacology,Parasmedicalpublisher
8. Modern Pharmacologywithclinical Applications,byCharles R.Craig&Robert,
9. GhoshMN.FundamentalsofExperimentalPharmacology.Hilton&Company,Kolkata.
10. KulkarniSK.Handbookofexperimentalpharmacology.VallabhPrakashan,

COURSE OUTCOME :

After successful completion of this course, students will be able to:

1. Handling of different instruments used in Experimental Pharmacology.
2. Know about the different routes of drug administration, blood withdrawal etc.,
3. Evaluate the different activities on animals.
4. Demonstration of different simulation methods.
5. Knowledge on the activities of various drugs

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	3	2	1	2	2	3	2
CO2	3	2	2	1	1	3	3	1	2	3	2	2
CO3	2	2	1	2	2	2	3	2	2	3	2	1
CO4	2	1	1	2	3	2	2	2	2	2	1	1

CO5	2	1	2	3	3	1	1	2	1	1	1	1

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BP 409 P	Pharmacognosy and Phytochemistry (Practical)	04	02
Sessional Marks : 15		**End Semester Examination Marks : 35**	

OBJECTIVES :

- Remembering different morphological and microscopical characteristic features of crude drugs.
- Attaining knowledge about how the cellular structures of crude drugs are formed
- Qualitative and Quantitative evaluation should be done to know about the quality and purity of drug constituents present
- Physical and chemical evaluation methods should be performed to identify that the drug is in ure form or adulterated

1. Analysisofcrudedrugsbychemicaltests:
   (i)Tragaccanth(ii)Acacia(iii)Agar(iv)Gelatin(v)starch(vi) Honey(vii) Castor oil
2. Determinationofstomatalnumberandindex
3. Determinationofveinisletnumber,veinisletterminationandpalisideratio.
4. Determinationofsizeofstarchgrains,calciumoxalatecrystalsbyeyepiecemicrometer
5. DeterminationofFiberlengthandwidth
6. DeterminationofnumberofstarchgrainsbyLycopodiumsporemethod
7. DeterminationofAshvalue
8. DeterminationofExtractivevaluesofcrudedrugs
9. Determinationofmoisturecontentofcrudedrugs
10. Determinationofswellingindexandfoaming

RecommendedBooks:(LatestEditions)

1. W.C.Evans,TreaseandEvansPharmacognosy,16thedition,W.B.Sounders&Co.,L ondon,2009.
2. Tyler,V.E.,Brady,L.R.andRobbers,J.E.,Pharmacognosy,9thEdn., LeaandFebiger,Philadelphia,1988.
3. Text BookofPharmacognosybyT.E.Wallis
4. MohammadAli.PharmacognosyandPhytochemistry,CBSPublishers& Distribution,NewDelhi.
5. TextbookofPharmacognosybyC.K.Kokate,Purohit,Gokhlae(2007),37thEdition,Ni raliPrakashan, NewDelhi.
6. HerbaldrugindustrybyR.D.Choudhary(1996),IstEdn,Eastern Publisher,NewDelhi.
7. EssentialsofPharmacognosy,Dr.SH.Ansari,IIndedition,Birlapublications,NewD

elhi, 2007
8. PracticalPharmacognosy:C.K.Kokate,Purohit,Gokhlae
9. AnatomyofCrudeDrugsbyM.A. Iyengar

COURSE OUTCOME :

After successful completion of this course, students will be able to:

1. Demonstrate chemical tests to identify unorganized crude drugs
2. Evaluate the quality and purity of crude drugs
3. Perform linear measurements for crude drug identification
4. The main purpose of subject is to impart the students the knowledge of how thesecondary metabolites is produced in the crude drugs, how to isolate and identify andproduce them industrially.
5. Also, this subject involves the study of producing the plants andphytochemicals through plant tissue culture, drug interactions and basic principles oftraditional system of medicine

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	1	2	2	1	1	1	2	3
CO2	3	2	2	3	1	2	2	1	1	1	2	2
CO3	2	2	2	2	1	1	1	2	1	1	1	2
CO4	2	2	1	3	1	1	1	2	2	1	2	2
CO5	3	2	3	3	1	2	2	3	2	1	2	2

3- High, 2- Medium, 1-Low

SEMISTER V

Course Code	Course Title	No of Hours Per week	No of Credits
BP501T.	**MEDICINAL CHEMISTRY – II- Theory**	03+01 (Tutorial)	04
Sessional Marks: 25	**End Semester Examination Marks : 75**		

Objectives: 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 ofdrugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

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 (*)

Course Content

UNIT- I

Antihistaminic agents: Histamine, receptors and their distribution in thehumanbodyH1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizinehydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidinehydrochloride*, Phenidaminetartarate, Promethazine hydrochloride*,Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate,Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodiumH2-antagonists: Cimetidine*, Famotidine, Ranitidin.Gastric Proton pump inhibitors: Omeprazole,Lansoprazole, Rabeprazole,PantoprazoleAnti-neoplastic agents:Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan,Chlorambucil, Busulfan, ThiotepaAntimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, AzathioprineAntibiotics: Dactinomycin, Daunorubicin, Doxorubicin, BleomycinPlant products: Etoposide, Vinblastin sulphate, Vincristin sulphateMiscellaneous: Cisplatin, Mitotane.

UNIT – II

Anti-anginal:

Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbidedinitrite*, Dipyridamole. Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazemhydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. Diuretics:Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide,Dichlorphenamide.Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide,Cyclothiazide,Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid.Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.Osmotic Diuretics: MannitolAnti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazeprilhydrochloride, Quinapril hydrochloride, Methyldopatehydrochloride,* Clonidinehydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodiumnitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT- III

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramidephosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride,Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine andCholestipolCoagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*,Anisindione, clopidogrelDrugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide,Bosentan, Tezosentan.

UNIT- IV

Drugs acting on Endocrine systemNomenclature, Stereochemistry and metabolism ofsteroidsSex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol,Oestrione, Diethyl stilbestrol.Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, Norgestril, LevonorgestrolCorticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone,DexamethasoneThyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil,Methimazole.

UNIT – V

Antidiabetic agents:Insulin and its preparationsSulfonyl ureas: Tolbutamide*,Chlorpropamide, Glipizide, Glimepiride.Biguanides: Metformin.Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide.Glucosidase inhibitors: Acrabose, Voglibose.Local Anesthetics: SAR of Local anestheticsBenzoic 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, Diperodon, Dibucaine.*

Recommended Books (Latest Editions)

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. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

Course Outcome:

1. This subject is designed to impart fundamental knowledge on the structure, chemistry
2. To acquire knowledge of therapeutic value of drugs.
3. The subject emphasizes on structure activityrelationships of drugs, importance of physicochemical properties and metabolism ofdrugs.
4. The syllabus also emphasizes on chemical synthesis of important drugs under each class.
5. To understand the drug development of chemical moieties

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	4	2	3	2	3	2	5	1	2	1	2	1
CO2	4	2	3	2	3	2	5	1	2	1	2	1
CO3	4	2	3	2	3	2	4	1	2	1	2	1
CO4	4	2	3	2	3	2	4	1	2	1	2	1
CO5	4	2	3	2	3	2	5	1	2	1	2	1

Course Code	Course Title	No of Hours Per week	No of Credits
BP502T.	**Industrial Pharmacy-I-Theory**	**03+01 (Tutorial)**	**04**

Sessional Marks: 25	End Semester Examination Marks: 75

Objectives:

Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturingtechniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for theirquality

Course content:

UNIT-I

Preformulation Studies: Introduction to preformulation, goals and objectives, study ofphysicochemical characteristics of drug substances.

a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flowproperties, solubility profile (pKa, pH, partition coefficient), polymorphism

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerizationBCS classification of drugs & its significantApplication of preformulation considerations in thedevelopment of solid, liquid oral andparenteral dosage forms and its impact on stability of dosage forms.

UNIT-II

Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients,Formulation of tablets, granulation methods, compression and processing problems.Equipment's and tablet tooling.

b. Tablet coating: Types of coating, coating materials, formulation of coatingcomposition, methods of coating, equipment employed and defects incoating.

c. Quality control tests: In process and finished product tests

Liquid orals: Formulation and manufacturing consideration of syrups and elixirssuspensions and emulsions; Filling and packaging; evaluation of liquid oralsofficial inpharmacopoeia

UNIT-III

Capsules:

a. Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. Sizeofcapsules, Filling, finishing and special techniques of formulation of hard gelatincapsules,manufacturing defects. In process and final product quality control testsfor capsules.

b. Soft gelatin capsules: Nature of shell and capsule content, size ofcapsules,importance of base adsorption and minim/gram factors, production, inprocess and final product quality control tests. Packing, storage and stability testingof soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments formanufacture of pellets

UNIT-IV

Parenteral Products:

a. Definition, types, advantages and limitations. Preformulation factors and essentialrequirements, vehicles, additives, importance of isotonicity

b. Production procedure, production facilities and controls,aseptic processing
c. Formulation of injections, sterile powders, large volume parenterals andlyophilized products.
d. Containers and closures selection, filling and sealing of ampoules, vials and infusionfluids. Quality control tests of parenteral products.
Ophthalmic Preparations: Introduction, formulation considerations; formulation of eyedrops, eye ointments and eye lotions; methods of preparation; labeling, containers;evaluation of ophthalmic preparations

UNIT-V

Cosmetics: Formulation and preparation of the following cosmetic preparations:lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes andsunscreens.Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol
systems; formulation and manufacture of aerosols; Evaluation of aerosols; Qualitycontrol and stability studies.
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.

Course Outcome:

1. To understand the formulation of solid dosage form
2. To acqire knowledge on opharmaceutical additives and various pharmaceutical dosage forms on the performance ofthe drug product.
3. To understand of the capsule formulation and characterization
4. To understand the formulation of injection and capacitation of sterile product
5. To understand the preparation of cosmetics and evaluation studies

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	5	3	4	3	5	5	2	1	1	2	3	3
CO2	4	3	4	3	5	4	2	1	1	2	3	3
CO3	5	3	3	4	4	4	2	1	1	2	3	3
CO4	4	3	4	5	4	4	2	1	1	2	3	3
CO5	4	3	4	4	4	4	2	1	1	2	3	3

Course Code	Course Title	No of Hours Per week	No of Credits

BP503T.	PHARMACOLOGY-II- Theory	03+01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives: Upon completion of this course the student should be able to

1. Understand the mechanism of drug action and its relevance in the treatment ofdifferent diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals bysimulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Course Content:

UNIT-I

1. Pharmacology of drugs acting on cardio vascular system
a. Introduction to hemodynamic and electrophysiology of heart.
b. Drugs used in congestive heart failure
c. Anti-hypertensive drugs.
d. Anti-anginal drugs.
e. Anti-arrhythmic drugs.
f. Anti-hyperlipidemic drugs.

UNIT-II

1. Pharmacology of drugs acting on cardio vascular system
a. Drug used in the therapy of shock.
b. Hematinics, coagulants and anticoagulants.
c. Fibrinolytics and anti-platelet drugs
d. Plasma volume expanders
2. Pharmacology of drugs acting on urinary system
a. Diuretics
b. Anti-diuretics.

UNIT-III

3. Autocoids and related drugs
a. Introduction to autacoids and classification
b. Histamine, 5-HT and their antagonists.
c. Prostaglandins, Thromboxanes and Leukotrienes.
d. Angiotensin, Bradykinin and Substance P. e. Non-steroidal anti-inflammatory agents
f. Anti-gout drugs
g. Antirheumatic drugs

UNIT-IV

5. Pharmacology of drugs acting on endocrine system

a. Basic concepts in endocrine pharmacology. b. Anterior Pituitary hormones- analogues andtheir inhibitors.

c. Thyroid hormones- analogues and their inhibitors.

d. Hormones regulating plasma calcium level- Parathormone, Calcitonin andVitamin-D.

d. Insulin, Oral Hypoglycemic agents and glucagon.

e. ACTH and corticosteroids.

UNIT-V

5. Pharmacology of drugs acting on endocrine system

a. Androgens and Anabolic steroids.

b. Estrogens, progesterone and oral contraceptives.

c. Drugs acting on the uterus.

6. Bioassay

a. Principles and applications of bioassay. b.Types of bioassay

c. Bioassay of insulin, oxytocin, vasopressin, ACTH,d-tubocurarine,digitalis, histamineand 5-HT

Course Outcome:

1. This subject is intended to impart the fundamental knowledge of drug pharmacology
2. To understand the various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body
3. To understand of general pharmacology of Non-steroidal anti-inflammatory agents
4. To understand ofPharmacology of drugs acting on endocrine system
5. To understand of emphasis on the basic concepts of bioassay

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	5	4	2	4	5	5	1	2	1	2	2	2
CO2	5	4	3	4	5	5	1	2	1	2	2	3
CO3	5	4	4	4	5	5	1	2	1	2	2	3
CO4	4	4	3	4	5	5	1	2	1	2	2	3
CO5	5	4	3	3	5	5	1	2	1	2	2	3

Course Code	Course Title	No of Hours Per week	No of Credits
BP504T.	**PHARMACOGNOSY AND PHYTOCHEMISTRY II- Theory**	**03+01**	**04**

		(Tutorial)	
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

Upon completion of the course, the student shall be able

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbal formulation.
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents

Course Content:

UNIT-I

Metabolic pathways in higher plants and their determination

a) Brief study of basic metabolic pathways and formation of different secondary metabolitesthrough these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

UNIT-II

General introduction, composition, chemistry & chemical classes, biosources, therapeuticuses and commercial applications of followingsecondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,Phenylpropanoids and Flavonoids: Lignans,Tea, RutaSteroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis

Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,

Tannins: Catechu, Pterocarpus

Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony

Glycosides: Senna, Aloes, Bitter AlmondIridoids, Other terpenoids &Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

UNIT-III

Isolation, Identification and Analysis of Phytoconstituents

a) Terpenoids: Menthol, Citral, Artemisin

b) Glycosides: Glycyrhetinic acid &Rutin

c) Alkaloids: Atropine,Quinine,Reserpine,Caffeine

d) Resins: Podophyllotoxin, Curcumin

UNIT-IV

Industrial production, estimation and utilization of the following phytoconstituents:Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

UNIT V

Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy,chromatography and electrophoresis in the isolation, purification and identification of crudedrugs.

Course Outcome:

1. The main purpose of subject is to impart the students the knowledge of how thesecondary metabolites is produced in the crude drugs,
2. To understand of how to isolate and identify andproduce them industrially.
3. The study of producing the plants andphytochemicals through plant tissue culture,
4. To understand the drug interactions and basic principles oftraditional system of medicine
5. To understand the basic photochemistry of isolation and purification of crude drugs

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	5	4	2	4	5	5	1	2	1	2	2	1
CO2	5	4	3	4	5	5	1	2	1	2	2	1
CO3	5	4	4	4	5	5	1	2	1	2	2	1
CO4	4	4	3	4	5	5	1	2	1	2	2	1
CO5	5	4	3	3	5	5	1	2	1	2	2	1

Course Code	Course Title	No of Hours Per week	No of Credits
BP505T.	**PHARMACEUTICAL JURISPRUDENCE-Theory**	**03+01 (Tutorial)**	**04**
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development andmarketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale ofpharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT-I

Drugs and Cosmetics Act, 1940 and its rules 1945:
Objectives, Definitions, Legal definitions of schedules to the Act andRules
Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties. Manufacture of drugs – Prohibition of manufactureand sale of certain drugs,Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture ofnew drug, loanlicense and repacking license.

UNIT-II

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 penaltiesLabeling& Packing of drugs- General labeling requirements and specimen labels fordrugs and cosmetics, List of permitted colors. Offences and penalties.
Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugsLaboratory, Drugs Consultative Committee, Government drug analysts, Licensingauthorities, controlling authorities, Drugs Inspectors

UNIT-III

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; itsconstitution and functions, Education Regulations, State and Joint state pharmacycouncils; constitution and functions, Registration of Pharmacists, Offences andPenalties

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.

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 DrugAbuse, Prohibition, Control and Regulation, opium poppy cultivation and productionof poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV

Study of Salient Features of Drugs and Magic Remedies Act and itsrules: Objectives, Definitions, Prohibition of certain advertisements, Classes of
Exempted advertisements, Offences and Penalties
Prevention of Cruelty to animals Act1960: Objectives, Definitions, InstitutionalAnimal Ethics Committee, CPCSEA guidelines for Breeding and Stocking ofAnimals, Performance of Experiments, Transfer and acquisition of animals forexperiment, Records, Power to suspend or revoke registration, Offences and Penalties

National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)- 2013.Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations,Retail price andceiling price of scheduled formulations, National List of EssentialMedicines (NLEM)

UNIT-V

Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquirycommittee, Health survey and development committee, Hathi committee andMudaliar committee

Code of Pharmaceutical ethics D definition, Pharmacist in relation to his job, trade, medicalprofession and his profession, Pharmacist's oath

Medical Termination of Pregnancy Act

Right to Information Act

Introduction to Intellectual Property Rights (IPR)

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9.Bare Acts of the said laws published by Government. Reference books (Theory)

Course Outcome:

1. This course is designed to impart basic knowledge on importantlegislations related to the profession of pharmacy in India.
2. To recall the pharmaceutical legislations, ethics, right to information, medical termination of pregnancy and intellectual property rights.
3. To relate the significance of Drugs and cosmetics act 1940 and its rules 1945 in relation to import and manufacture of drugs.
4. To apply the knowledge on schedules pertaining to Drugs and cosmetics act 1940 and its rules 1945 and also administration of the act and rules.
5. To understand the functions of pharmacy councils and implementation of education regulations in pharmacy.To appraise the importance of medicinal and toilet preparations act and narcotic drugs and psychotropic substances act and rules.

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	3	5	3	5	2	1	4	1	4	5	4
CO2	1	3	5	3	5	2	1	4	1	4	5	4
CO3	1	3	4	3	5	2	1	4	1	4	5	4
CO4	1	3	3	3	5	2	1	4	1	4	5	4

CO5	1	3	4	3	5	2	1	4	1	4	5	4

Course Code	Course Title	No of Hours Per week	No of Credits
BP506P.	**Industrial Pharmacy-I-Practical**	**04**	**02**
Sessional Marks: 15		**End Semester Examination Marks:35**	

Objectives:

Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality
4. This course to knowledge on formulation and evaluation of different types of tablets and capsules, injection, ointments, creams

Course content

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman

&J.B.Schwartz

2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman &Lachman

3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman

4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition

5. Remington: The Science and Practice of Pharmacy, 20th edition PharmaceuticalScience (RPS)

6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman

7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchilllivingstone, Latest edition

8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger,Philadelphia, 5thedition, 2005

9. Drug stability - Principles and practice by Cartensen& C.J. Rhodes, 3rd Edition,Marcel Dekker Series, Vol 107.

Course outcome:

1. This is help to understand the basic information of formulation process and how to optimise quality control solid, semisolid and parenteral dosage forms
2. Course enables the student to understand and appreciate the influence ofpharmaceutical manufacture of
3. Understand the various pharmaceutical dosage forms
4. Performance ofthe drugproduct by used of specific technology
5. Pharmaceutical product process development

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	4	4	5	3	5	2	1	4	5	4	3	3
CO2	4	3	5	3	5	2	1	4	5	4	3	3
CO3	4	3	4	3	5	2	1	4	5	4	3	3
CO4	4	4	3	3	5	2	1	4	5	4	3	3
CO5	4	3	4	3	5	2	1	4	5	4	3	3

CourseCode	CourseTitle	NoofHoursPerweek	NoofCredits
BP507P.	**PHARMACOLOGY-II- Practical**	**04**	**02**

SessionalMarks:15	EndSemesterExaminationMarks: 35

Objectives:

1.To understand the handling of different equipments used in experimental pharmacology.2.Toknowaboutthepreparationandpurposeofdifferentphysiologicalsaltsolutionsusedintheexperimental pharmacology.

3.Knowledgeonmioticsandmydriasis,locomotormovements.

4.All the simulationtechniques hasbeendemonstrated byusingsoftwareasanimaldissectionhasbeen banned for UGstudies.

Coursecontent

1. Introductiontoin-vitropharmacologyandphysiologicalsaltsolutions.
2. Effectofdrugsonisolatedfrogheart.
3. Effectofdrugsonbloodpressureandheartrateofdog.4.Studyofdiureticactivityofdrugsusingrats/mice. 5. DRCof acetylcholineusingfrog rectus abdominismuscle.

. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominismuscleandratileumrespectively.7.Bioassayofhistamineusingguineapigileumbymatchingmethod.

8. Bioassayofoxytocin usingrat uterinehornby interpolationmethod.
9. Bioassayofserotoninusing ratfundusstripby threepointbioassay.
10. Bioassayof acetylcholineusing ratileum/colonby fourpoint bioassay.
11. Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plotmethod).
12. DeterminationofPD2value usingguineapigileum.
13. Effectofspasmogensandspasmolyticsusingrabbitjejunum.
14. Anti-inflammatoryactivityofdrugsusingcarrageenaninducedpaw-edemamodel.
15. Analgesicactivityofdrugusingcentralandperipheralmethods

Note: All laboratory techniques and animal experiments are demonstrated by simulatedexperimentsby softwaresand videos

RecommendedBooks(LatestEditions)

1. RangH.P.,DaleM.M.,RitterJ.M.,FlowerR.J.,RangandDale'sPharmacology,ChurchilLivingstoneElsevier
2. KatzungB.G.,MastersS.B.,TrevorA.J.,Basicandclinicalpharmacology,TataMcGraw-Hill.
3. GoodmanandGilman's,ThePharmacologicalBasisofTherapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K.,BradleyR.W.,AppliedTherapeutics,TheClinicaluseofDrugs,ThePointLippincottWilliams& Wilkins.
5. MycekM.J,GelnetS.BandPerperM.M.Lippincott'sIllustratedReviews-Pharmacology.
6. K.D.Tripathi. Essentials ofMedical Pharmacology, , JAYPEE BrothersMedicalPublishers (P)Ltd, NewDelhi.
7. SharmaH.L.,SharmaK.K.,PrinciplesofPharmacology,Parasmedicalpublisher
8. ModernPharmacologywithclinicalApplications,byCharlesR.Craig&Robert.
9. GhoshMN.FundamentalsofExperimentalPharmacology.Hilton&Company,Kolkata.
10. KulkarniSK.Handbookofexperimentalpharmacology.VallabhPrakashan.

CourseOutcome:

After successful completion of this course, students will be able to

1. HandlingofdifferentinstrumentsusedinExperimentalPharmacology.
2. Knowaboutthedifferentroutesofdrugadministration,bloodwithdrawaletc.,
3. Evaluatethe differentactivities on animals.
4. Demonstrationofdifferentsimulationmethods.
5. Theywouldhavefinallylearnttoapplytheknowledgeofdrugspracticallyusingsimulatedpharmacologicalexperiments.

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	4	5	3	5	2	1	4	5	4	3	3
CO2	3	3	5	3	5	2	1	4	5	4	3	3
CO3	3	3	4	3	5	2	1	4	5	4	3	3
CO4	3	4	3	3	5	2	1	4	5	4	3	3
CO5	3	3	4	3	5	2	1	4	5	4	3	3

Course Code	Course Title	No of Hours Per week	No of Credits
BP508P.	**PHARMACOGNOSY AND PHYTOCHEMISTRY II- Practical**	**04**	**02**
Sessional Marks: 15		**End Semester Examination Marks: 35**	

Objectives:

To identify Morphology, histology and powder characteristics & extraction & detectionof:Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander

2. Exercise involving isolation & detection of active principles

a. Caffeine - from tea dust.

b. Diosgenin from Dioscorea

c. Atropine from Belladonna

d. Sennosides from Senna

3. Separation of sugars by Paper chromatography

4. TLC of herbal extract of different compounds

Course content

1. Morphology, histology and powder characteristics & extraction & detection of:
Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
a. Caffeine - from tea dust.
b. Diosgenin from Dioscorea
c. Atropine from Belladonna
d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstitutents by TLC
6. Analysis of crude drugs by chemical tests: (i) Asafoetida (ii) Benzoin (iii)
Colophony (iv) Aloes (v) Myrrh

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co.,London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers &Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition,NiraliPrakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), IstEdn, Eastern Publisher, New Delhi.

5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, NewDelhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi,2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy &Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours. 11. Remington'sPharmaceutical sciences. 12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

Course Outcome:

1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents by use chromatographic technique
2. The main purpose of subject is to impart the students the knowledge of how thesecondary metabolites is produced in the crude drugs,
3. To understand of how to isolate and identify andproduce them industrially.
4. The study of producing the plants andphytochemicals through plant tissue culture,
5. To understand the drug interactions and basic principles oftraditional system of medicine

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	4	5	3	5	2	1	4	5	4	3	3
CO2	3	3	5	3	5	2	1	4	5	4	3	3
CO3	3	3	4	3	5	2	1	4	5	4	3	3
CO4	3	4	3	3	5	2	1	4	5	4	3	3
CO5	3	3	4	3	5	2	1	4	5	4	3	3

SEMESTER VI

Course Code	Course Title	No of Hours Per week	No of Credits
BP601T.	**MEDICINAL CHEMISTRY – III-Theory**	**03+01 (Tutorial)**	**04**
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

Upon completion of the course student shall be able to
1. Understand the importance of drug design and different techniques of drugdesign.
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.

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 by (*)

Course Content:

UNIT – I

Antibiotics
Historical background, Nomenclature, Stereochemistry, Structure activityrelationship, Chemical degradation classification and important products ofthe following classes.
β-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors,Monobactams
Aminoglycosides: Streptomycin, Neomycin, Kanamycin
Tetracyclines: Tetracycline,Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT – II

Antibiotics
Historical background, Nomenclature, Stereochemistry, Structure activityrelationship,Chemical degradation classification and important products ofthe following classes.
Macrolide: Erythromycin Clarithromycin, Azithromycin.
Miscellaneous: Chloramphenicol*, Clindamycin.
Prodrugs: Basic concepts and application of prodrugs design.
Antimalarials: Etiology of malaria. Quinolines: SAR, Quinine sulphate, Chloroquine*,Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine. Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.
Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.

UNIT – III

Anti-tubercular Agents
Synthetic anti-tubercular agents: Isoniozid*, Ethionamide, Ethambutol,Pyrazinamide, Paraamino salicylic acid.*
Anti-tubercular antibiotics: Rifampicin, Rifabutin, CycloserineStreptomycine, Capreomycinsulphate.Urinary tract anti-infective agents
Quinolones: SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin,Ciprofloxacin*,Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin,Moxifloxacin
Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine. Antiviral agents:Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridinetrifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine,Lamivudine, Loviride, Delavirding, Ribavirin,Saquinavir, Indinavir,Ritonavir.

UNIT – IV

Antifungal agents:
Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole,Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole,Itraconazole, Fluconazole, Naftifinehydrochloride, Tolnaftate*. Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole,Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*,Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.Sulphonamides and SulfonesHistorical development, chemistry, classification and SAR of Sulfonamides:Sulphamethizole,Sulfisoxazole, Sulphamethizine, Sulfacetamide*,Sulphapyridine, Sulfamethoxaole*,Sulphadiazine, Mefenide acetate, Sulfasalazine.Folate reductase inhibitors: Trimethoprim*,Cotrimoxazole.Sulfones: Dapsone*.

UNIT – V

Introduction to Drug DesignVarious approaches used in drug design.Physicochemical parameters used in quantitative structure activityrelationship (QSAR) such as partitioncoefficient, Hammet's electronicparameter, Tafts steric parameter and Hanschanalysis.Pharmacophoremodeling and docking techniques. Combinatorial Chemistry: Concept and applications
chemistry: solid phase and solution phase synthesis.of combinatorial

Course Outcome:

1. This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs.
2. The subject emphasis on modern techniques ofrational drug design like quantitative structure activity relationship (QSAR),
3. To understand the Prodrugconcept, combinatorial chemistry and Computer aided drug design (CADD).
4. To understand the emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR),
5. To understand the therapeutic uses and synthesis of importantdrugs.

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	4	2	3	2	3	2	5	1	2	1	2	1
CO2	4	2	3	2	3	2	5	1	2	1	2	1
CO3	4	2	3	2	3	2	4	1	2	1	2	1
CO4	4	2	3	2	3	2	4	1	2	1	2	1
CO5	4	2	3	2	3	2	5	1	2	1	2	1

Course Code	Course Title	No of Hours Per week	No of Credits
BP602T.	**PHARMACOLOGY-III- Theory**	**03+01 (Tutorial)**	**04**
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

Upon completion of this course the student should be able to:

1. understand the mechanism of drug action and its relevance in the treatment ofdifferent infectious diseases
2. comprehend the principles of toxicology and treatment of various poisoningsand
3. appreciate correlation of pharmacology with related medical sciences.

Course Content:

UNIT-I

1. Pharmacology of drugs acting on Respiratory system

a. Anti -asthmatic drugs

b. Drugs used in the management of COPD

c. Expectorants and antitussives

d. Nasal decongestants
e. Respiratory stimulants
2. Pharmacology of drugs acting on the Gastrointestinal Tract
a. Antiulcer agents.
b. Drugs for constipation and diarrhoea. c. Appetite stimulants and suppressants.
d. Digestants and carminatives.
e. Emetics and anti-emetics.

UNIT-II

3. Chemotherapy
a. General principles of chemotherapy. b. Sulfonamides and cotrimoxazole.
c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides,quinolones and fluoroquinolins, tetracycline and aminoglycosides

UNIT-III

3. Chemotherapy
a. Antitubercular agents
b. Antileprotic agents
c. Antifungal agents
d. Antiviral drugs
e.Anthelmintics
f. Antimalarial drugs
g. Antiamoebic agents

UNIT-IV

Chemotherapy
l. Urinary tract infections and sexually transmitted diseases.
Chemotherapy of malignancy.
4. Immunopharmacology
a. Immunostimulants
b. Immunosuppressant
Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

UNIT-V

5. Principles of toxicology
a. Definition and basic knowledge of acute, subacute and chronic toxicity.
b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicityand mutagenicity
c. General principles of treatment of poisoning
d. Clinical symptoms and management of barbiturates, morphine, organophosphosphoruscompound and lead, mercury and arsenic poisoning.
6. Chronopharmacology
a. Definition of rhythm and cycles.
b. biological clock and their significance leading to chronotherapy.

Course Outcome:

1. To understand the basic pharmacology of various drugs impart the fundamental knowledge on various aspects

2. To understand (classification, mechanism of action, therapeutic effects, clinical uses, side effects
3. To understand contraindications) of drugs acting on respiratory and gastrointestinal system, infectious
4. To understand diseases, immuno-pharmacology and in addition,
5. To understand emphasis on the principles of toxicology and chrono pharmacology.

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	5	4	2	4	5	5	1	2	1	2	2	1
CO2	5	4	3	4	5	5	1	2	1	2	2	1
CO3	5	4	4	4	5	5	1	2	1	2	2	1
CO4	4	4	3	4	5	5	1	2	1	2	2	1
CO5	5	4	3	3	5	5	1	2	1	2	2	1

Course Code	Course Title	No of Hours Per week	No of Credits
BP603T.	**HERBAL DRUG TECHNOLOGY- Theory**	**03+01 (Tutorial)**	**04**
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

Upon completion of this course the student should be able to:
1. understand raw material as source of herbal drugs from cultivation to herbal drugproduct
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP.

Course content:

UNIT-I

Herbs as raw materials
Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparationSource of HerbsSelection, identification and authentication of herbal materialsProcessing of herbal raw materialBiodynamic AgricultureGood agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides. Indian Systems of Medicine

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika,Churna, Lehya and Bhasma.

UNIT-II

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Healthbenefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritablebowel syndrome and various Gastro intestinal diseases. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, SpirulinaHerbal-Drug and Herb-Food Interactions: General introduction to interaction and
classification.

Study of following drugs and their possible side effects and interactions:Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-III

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gumscolours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin
care, hair care and oral hygiene products.

Herbal excipients:

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors& perfumes. Herbal formulations:

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage formslike phytosomes

UNIT- IV

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugsStability testing of herbal drugs. Patenting and Regulatory requirements of natural products:

a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and
Biopiracy

b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma
& Neem.Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of
manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

UNIT-V

General Introduction to Herbal Industry

Herbal drugs industry: Present scope and future prospects. A brief account of plant-basedindustries and institutions involved in work on medicinal andaromatic plants in India. Schedule T – Good Manufacturing Practice of Indian systems of medicineComponents of GMP (Schedule – T) and its objectivesInfrastructural requirements, working space, storage area, machinery and equipment,standard operating procedures, health and hygiene, documentation and records.

Course Outcome:

1. To basic understanding of herbal drugindustry,
2. To understanding the quality of raw material, guidelines for quality of herbal drugs,
3. To understanding herbal cosmetics,natural sweeteners, nutraceutical etc.
4. To understanding the subject also emphasizes on Good ManufacturingPractices (GMP),
5. To understanding patenting and regulatory issues of herbal drugs

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	5	4	2	4	5	5	1	2	1	2	2	1
CO2	5	4	3	4	5	5	1	2	1	2	2	1
CO3	5	4	4	4	5	5	1	2	1	2	2	1
CO4	4	4	3	4	5	5	1	2	1	2	2	1
CO5	5	4	3	3	5	5	1	2	1	2	2	1

Course Code	Course Title	No of Hours Per week	No of Credits
BP604T.	**BIOPHARMACEUTICS AND PHARMACOKINETICS- Theory**	**03+01 (Tutorial)**	**04**
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

Upon completion of the course student shall be ableto:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics andtheir significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokineticparameters to describe the kinetics of drug absorption, distribution,metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drugproducts and their significance.
4. Understand various pharmacokinetic parameters, their significance &applications.

Course Content:

UNIT-I

Introduction

BiopharmaceuticstoAbsorption; Mechanisms of drug absorption through GIT, factors influencing drugabsorption though GIT, absorption of drug from Non per oral extra-vasculararroutes, Distribution Tissue permeability of drugs, binding of drugs, apparent, volume

of drug distribution, plasma and tissue protein binding of drugs, factors affectingprotein-drug binding. Kinetics of protein binding, Clinical significance of proteinbinding of drugs

UNIT- II

Elimination: Drug metabolism and basic understanding metabolic pathways renalexcretion of drugs, factors affecting renal excretion of drugs, renal clearance, non-renalroutes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, in-vitro drugdissolution models, in-vitro-in-vivo correlations, bioequivalence studies, methods toenhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- III

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartmentmodels, non-compartment models, physiological models, One compartment openmodel.

(a). Intravenous Injection (Bolus)

(b). Intravenous infusion and

(c) Extravascular administrations. Pharmacokinetics parameters - KE, t1/2, Vd, AUC,Ka, Clt andCLR-definitions methods of eliminations, understanding of their significance and application

UNIT- IV

Multicompartment models: Two compartment open model. IV bolusKinetics of multiple dosing, steady state drug levels, calculation of loading andmaintenance doses and their significance in clinical settins.

UNIT- V

Nonlinear Pharmacokinetics:

a. Introduction,

b. Factors causing non-linearity.

c. Michaelis-menton method of estimating parameters, Explanation with example ofdrugs.

Recommended Books: (Latest Editions)

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 Inernationaledition.USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and
Sunil B.Jaiswal,VallabhPrakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc. 6. Hand Book ofClinical
Pharmacokinetics, By Milo Gibaldi and Laurie Prescott byADIS 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, Pennsylvnia

Course Outcome:

1. To understand of basic knowledge and skills of Biopharmaceutics
2. To understand the basic process of drug in body
3. To understand pharmacokinetics models to understand ADME Studies
4. To understand compartmental models to drug Pharmacokinetics their applications
5. To understand the pharmaceutical dosage form as per in pharmaceutical development

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	5	4	4	3	5	5	5	3	3	3	3	4
CO2	5	4	4	3	5	4	5	3	3	3	3	4
CO3	5	4	3	4	4	4	5	3	4	3	3	4
CO4	5	4	4	5	4	4	5	3	5	3	3	4
CO5	5	4	4	4	4	4	5	3	4	3	3	4

Course Code	Course Title	No of Hours Per week	No of Credits
BP605T.	**PHARMACEUTICAL BIOTECHNOLOGY - Theory**	**03+01 (Tutorial)**	**04**
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

Upon completion of the subject student shall be able to;
1. Understanding the importance of Immobilized enzymes in PharmaceuticalIndustries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries

4. Appreciate the use of microorganisms in fermentation technology

Course Content

Unit I

a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
d) Brief introduction to Protein Engineering. e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase. f) Basic principles of genetic engineering.

Unit II

a) Study of cloning vectors, restriction endonucleases and DNA ligase.
b) Recombinant DNA technology. Application of genetic engineering in medicine.
c) Application of r DNA technology and genetic engineering in the production of:
i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.
d) Brief introduction to PCR

Unit III

Types of immunity- humoral immunity, cellular immunity
a) Structure of Immunoglobulins
b) Structure and Function of MHC
c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. e) Storage conditions and stability of official vaccines
f) Hybridoma technology- Production, Purification and Applications
g) Blood products and Plasma Substituties.

Unit IV

a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
b) Genetic organization of Eukaryotes and Prokaryotes
c) Microbial genetics including transformation, transduction, conjugation, plasmids andtransposons.
d) Introduction to Microbial biotransformation and applications.
e) Mutation: Types of mutation/mutants.

Unit V

a) Fermentation methods and general requirements, study of media, equipments,
sterilization methods, aeration process, stirring.
b) large scale production fermenter design and its various controls.
c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,
d) Blood Products: Collection, Processing and Storage of whole human blood, dried
human plasma, plasma Substituties.

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applicationsof RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., :Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by RoyalSociety of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell ScientificPublication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

Course Outcome:

1. To understand the Biotechnology has a long promise to revolutionize the biological sciences andtechnology.
2. To understand the Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
3. To understand the Biotechnology is leading to new biological revolutions in diagnosis, preventionand cure of diseases, new and cheaper pharmaceutical drugs.
4. To understand the Biotechnology has already produced transgenic crops and animals and
5. To understand the futurepromises lot more. It is basically a research-based subject.

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	4	3	2	3	2	3	3	2	3	2	2	3
CO2	4	3	3	3	2	3	3	2	3	2	2	3
CO3	4	3	4	3	2	3	3	2	3	2	2	3
CO4	4	3	3	3	2	3	3	2	3	2	2	3
CO5	4	3	3	3	2	3	3	2	3	2	2	3

Course Code	Course Title	No of Hours Per week	No of Credits
BP606T.	**PHARMACEUTICAL QUALITY ASSURANCE- Theory**	**03+01 (Tutorial)**	**04**
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives: Upon completion of the course student shall be able to:

1.understand the cGMP aspects in a pharmaceutical industry
2.appreciate the importance of documentation
3.understand the scope of quality certifications applicable to pharmaceuticalindustries

understand the responsibilities of QA & QC departments

Course content:

UNIT – I

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMPTotal Quality Management (TQM): Definition, elements, philosophiesICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM,with special emphasis on Q-series guidelines, ICH stability testing guidelinesQuality by design (QbD): Definition, overview, elements of QbD program, toolsISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registrationNABL accreditation : Principles and procedures

UNIT - II

Organization and personnel: Personnel responsibilities, training, hygiene and personal records.
Premises: Design, construction and plant layout, maintenance, sanitation, environmentalcontrol, utilities and maintenance of sterile areas, control of contamination.Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

UNIT – III

Quality Control: Quality control test for containers, rubber closures and secondary packingmaterials.Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities,Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of aNonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

UNIT – IV

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.Document maintenance in pharmaceutical industry: Batch Formula Record, Master FormulaRecord, SOP, Quality audit, Quality Review and Quality documentation, Reports anddocuments, distribution records.

UNIT – V

Calibration and Validation: Introduction, definition and general principles of calibration,qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.Warehousing: Good warehousing practice,materials management

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Relatedmaterials 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 Analysisand Quality specification for Pharmaceutical Substances, Excipients and Dosageforms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

Course Outcome:

1. To understand the various aspects of quality control
2. To understand the and qualityassurance aspects of pharmaceutical industries.
3. To understand the deals with the important aspects likes GMP, QC tests,
4. To understand the documentation, quality certifications
5. To understand the regulatory affairs.

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	4	3	2	3	2	3	3	2	3	2	2	3
CO2	4	3	3	3	2	3	3	2	3	2	2	3
CO3	4	3	4	3	2	3	3	2	3	2	2	3
CO4	4	3	3	3	2	3	3	2	3	2	2	3
CO5	4	3	3	3	2	3	3	2	3	2	2	3

Course Code	Course Title	No of Hours Per week	No of Credits
BP607P.	**MEDICINAL CHEMISTRY- III- Practical**	**04**	**02**
Sessional Marks: 15		**End Semester Examination Marks: 35**	

Objectives:

To understand to synthesis of selected molecules
To understand the binary and ternary mixture analysis to identification of compounds

Course content

I Preparation of drugs and intermediates
1 Sulphanilamide
2 7-Hydroxy, 4-methyl coumarin
3 Chlorobutanol
4 Triphenyl imidazole
5 Tolbutamide
6 Hexamine
II Assay of drugs

1 Isonicotinic acid hydrazide
2 Chloroquine
3 Metronidazole
4 Dapsone
5 Chlorpheniramine maleate
6 Benzyl penicillin
III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique
IV Drawing structures and reactions using chem draw®
V Determination of physicochemical properties such as logP, clogP, MR, Molecularweight, Hydrogen bond donors and acceptors for class of drugs course contentusing drug design software Drug likeliness screening (Lipinskies RO5)

Recommended Books (Latest Editions)

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 byLednicer, Vol. 1-5.
9. Indian Pharmacopoeia. 10. Text book of practical organic chemistry- A.I.Vogel.

Course Outcome:

This course helps to how to separation and identification compound given unknown mixture.

It imparts take it knowledge on crude separation and identification technique

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	4	4	5	3	5	2	1	4	5	4	3	3
CO2	4	3	5	3	5	2	1	4	5	4	3	3
CO3	4	3	4	3	5	2	1	4	5	4	3	3
CO4	4	4	3	3	5	2	1	4	5	4	3	3
CO5	4	3	4	3	5	2	1	4	5	4	3	3

Course Code	Course Title	No of Hours Per week	No of Credits

BP608 P.	PHARMACOLOGY-III- Practical	04	02
Sessional Marks: 15		End Semester Examination Marks: 35	

Objectives:

1.To understand the handling of different equipments used in experimental pharmacology.

2.To know about the preparation and purpose of different physiological salt solutions used in the experimental pharmacology.

3.Knowledge on miotics and mydriasis, locomotor movements.

4.All the simulation techniques has been demonstrated by using software as animal dissection has been banned for UG studies.

Course Content

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
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
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)

*Experiments are demonstrated by simulated experiments/videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point LippincottWilliams & Wilkins

5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers MedicalPublishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisherModern 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.

Course Outcome:

After successful completion of this course, students will be able to:

1. Handling of different instruments used in Experimental Pharmacology.
2. Know about the different routes of drug administration, blood withdrawal etc.,
3. Evaluate the different activities on animals.
4. Demonstration of different simulation methods.
5. They would have finally learnt to apply the knowledge of drugs practically using simulated pharmacological experiments

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	4	4	5	3	5	2	1	4	5	4	3	3
CO2	4	3	5	3	5	2	1	4	5	4	3	3
CO3	4	3	4	3	5	2	1	4	5	4	3	3
CO4	4	4	3	3	5	2	1	4	5	4	3	3
CO5	4	3	4	3	5	2	1	4	5	4	3	3

Course Code	Course Title	No of Hours Per week	No of Credits
BP609P.	**HERBAL DRUG TECHNOLOGY-- Practical**	**04**	**02**
Sessional Marks: 15		**End Semester Examination Marks: 35**	

Objectives:

1.To perform preliminary phytochemical screening of crude drugs.

2.To prepare and standardized of extract in cosmetic formulations semisolid dosage form

3. To Determination of Aldehyde content, phenol content, total alkaloid

Course Content

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

9. Determination of total alkaloids

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease& Evans.

2. Textbook of Pharmacognosy by Tyler, Brady & Robber.

3. Pharmacognosy by Kokate, Purohit and Gokhale

4. Essential of Pharmacognosy by Dr.S.H.Ansari

5. Pharmacognosy & Phytochemistry by V.D.Rangari

6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in

Indian Medicine & Homeopathy)

7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of

Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

Course Outcome:

1. To understand the of phytochemical screening of crude drugs

2. To understand thedetermination of herbal content
3. To understand the various types of Evaluation of excipients
4. To understand theAyurvedic Formulation
5. To understand the various Quality Control of Herbal Drugs

CO-PO Mapping

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	4	4	5	3	5	2	1	4	5	4	3	3
CO2	4	3	5	3	5	2	1	4	5	4	3	3
CO3	4	3	4	3	5	2	1	4	5	4	3	3
CO4	4	4	3	3	5	2	1	4	5	4	3	3
CO5	4	3	4	3	5	2	1	4	5	4	3	3

SEMESTER VII

Course Code	Course Title	No of Hours Per week	No of Credits
BP701T	Instrumental Methods of Analysis (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25End Semester Examination Marks: 75			

Objectives:

1)Elaborate various principles, theory and instruments employed for the characterization and analysis of drugs.

2) Elaborate various principles, theory and instruments employed for the characterization and analysis of drugs.

3) Studying the basic concepts, types and principles of various volumetric methods.

4) Studying the basic concepts, principles of gravimetric method of analysis

5) Understanding basic concepts types and principles of various electrochemical methods of analysis.

Course Contents:

UNIT - I

UV Visible spectroscopy: Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations. Instrumentation -

Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode. Applications - Spectrophotometric titrations, Single component and multi component analysis Fluorimetry Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

UNIT –II

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

Flame Photometry-Principle, interferences, instrumentation and applications

Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications **Nepheloturbidometry-** Principle, instrumentation and applications

UNIT –III

Introduction to chromatography:

Adsorption and partition column chromatography-Methodology, advantages, disadvantages and applications.

Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.

Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications

Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

UNIT –IV

Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.

UNIT –V

Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications

Gel chromatography- Introduction, theory, instrumentation and applications Affinity chromatography- Introduction, theory, instrumentation and applications

Text Books:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

Course Outcomes:

After Completion of the course the student able to

1) To understand selected instrumental analytical techniques (spectroscopic and chromatographic methods) and differentiate with volumetric analysis.
2) To gain knowledge on interaction of EMR with matter and to build the analytical understanding at the level of atom, group and molecular structure of organic and inorganic compounds with different functional groups and their applications in pharmacy.
3) To maximize knowledge on characterization and estimation of ions by spectroscopical techniques
4) To simplify affinity of matter with stationary phase and mobile phase, physical and chemical. This subject is intended to impart students about the fundamental knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially, involved in the study of producing plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine.
5) To maximize knowledge on Ion exchange chromatography and Gel chromatography along with their pharmaceutical applications.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	3	2	2	2	3	3	3
CO2	3	2	2	2	2	2	2	2	2	3	3	3

CO3	3	2	2	2	2	3	2	2	2	3	3	3
CO4	3	2	2	2	2	2	2	2	2	3	3	3
CO5	3	2	2	2	2	2	2	2	2	3	3	3

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP702T	Industrial Pharmacy II (Theory)	03+ 01 (Tutorial)	04
Sessional Marks:25		**End Semester Examination Marks:75**	

Objectives:

1. The scheduled activities in a pharmaceutical firm.
2. The pre formulation studies of pilot batches of pharmaceutical industry.
3. The significance of dissolution and product stability
4. Manage the scale up process in pharmaceutical industry.
5. Assist in technology transfer.
6. To establish safety guidelines, which prevent industrial hazards

Course Content:

UNIT-I

Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

UNIT-II

Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, 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 equipment, qualification and validation, quality control, analytical method transfer, 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

UNIT-III

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, 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, 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.

UNIT-IV

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

UNIT-V

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Text Books:

(Latest Editions) 1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_ Affairs.

2. International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php

3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.

4. Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.

Course Outcomes:

After successful completion of this course, students will be able to:

1. This course is designed to impart knowledge and skills necessary to train the students to be on par with the routine of Industrial activities in Production.
2. On completion of this course, it is expected that students will be able to understand various concepts of Technology development and transfer.
3. Handle the scheduled activities in a pharmaceutical firm. Manage the production of large batches of pharmaceutical formulations.
4. Understand the concepts and applicatyion Quality management systemsin pharmaceutical industry.
5. Understand the concepts of Indian Regulatory requirements and approval procedures for New Drugs and their application in pharmaceutical industry.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	3	2	2	2	3	3	3
CO2	3	3	3	3	3	3	2	2	2	3	3	3
CO3	3	3	2	2	2	2	2	2	2	3	3	3
CO4	3	3	3	3	3	3	2	2	2	3	3	3
CO5	3	3	2	2	2	2	2	2	2	3	3	3

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP703T	Pharmacy Practice (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks : 75**	

Objectives:

1. Know various drug distribution methods in a hospital
2. Appreciate the pharmacy stores management and inventory control
3. Monitor drug therapy of patient through medication chart review and clinical review
4. Obtain medication history interview and counsel the patients

5. Identify drug related problems

Course Content:

UNIT I:

a) Hospital and its organization- Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and medical staffs involved in the hospital and their functions.

b) Hospital pharmacy and its organization- Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

c) Adverse drug reaction 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 149 drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

d) Community Pharmacy- Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

UNIT II:

a) Drug distribution system in a hospital Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, dispensing of drugs to ambulatory patients, and dispensing of controlled drugs.

b) Hospital formulary Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

c) Therapeutic drug monitoring Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

d) Medication adherence Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

e) Patient medication history interview Need for the patient medication history interview, medication interview forms.

f) Community pharmacy management Financial, materials, staff, and infrastructure requirements.

UNIT III:

a) Pharmacy and therapeutic committee Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

b) Drug information services Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

c) Patient counselling Definition of patient counselling; steps involved in patient counselling, and Special cases that require the pharmacist

d) Education and training program in the hospital Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.

e) Prescribed medication order and communication skills Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

UNIT IV

a) Budget preparation and implementation Budget preparation and implementation

b) Clinical Pharmacy Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

c) Over the counter (OTC) sales Introduction and sale of over the counter, and Rational use of common over the counter medications.

UNIT V

a) Drug store management and inventory control Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase

order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

b) Investigational use of drugs Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

c) Interpretation of Clinical Laboratory Tests Blood chemistry, haematology, and urinalysis

Text Books:

1. Merchant S.H. and Dr.J.S.Quadry. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.

2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice-essential concepts and skills, 1 st ed. Chennai: Orient Longman Private Limited; 2004.

3. William E. Hassan. Hospital pharmacy, 5th ed. Philadelphia: Lea &Febiger; 1986.

4. Tipnis Bajaj. Hospital Pharmacy, 1st ed. Maharashtra: Career Publications; 2008.

5. Scott LT. Basic skills in interpreting laboratory data, 4thed. American Society of Health System Pharmacists Inc; 2009.

6. Parmar N.S. Health Education and Community Pharmacy, 18th ed. India: CBS Publishers & Distributers; 2008.

Journals:

1. Therapeutic drug monitoring. ISSN: 0163-4356

2. Journal of pharmacy practice. ISSN : 0974-8326

3. American journal of health system pharmacy. ISSN: 1535-2900 (online)

4. Pharmacy times (Monthly magazine)

Course Outcomes:

1. Understand the elements of pharmaceutical care and provide comprehensive patient care services
2. Interpret the laboratory results to aid the clinical diagnosis of various disorders.

3. Provide integrated, critically analysed medicine and poison information to enable healthcare professionals in the efficient patient management.
4. Monitor drug therapy of patient through medication chart review and clinical review.
5. Obtain medication history interview and counsel the patients. Identify drug related problems

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	2	2	3	3	3
CO2	3	3	3	3	2	3	3	2	2	3	3	3
CO3	3	3	3	3	2	3	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	2	2	3	3	3

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP704T	Novel Drug Delivery System (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. The various approaches for development of novel drug delivery systems.
2. The criteria for selection of drugs and polymers for the development of NTDS
3. The formulation and evaluation of novel drug delivery systems
4. The need, concept, design and evaluation of various customized, sustained and controlled release dosage forms.
5. To formulate and evaluate various novel drug delivery systems

Course Contents:

UNIT-I

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

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

UNIT-II

Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump

UNIT-III

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

Gastro-retentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications **Naso-pulmonary drug delivery system**: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

UNIT-IV

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

UNIT-V

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome – Preliminary study, ocular formulations and ocuserts

Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

Text Books:

1. Y W. Chien, Novel Drug Delivery Systems, 2 nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.

2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.

3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim

4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).

5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, VallabhPrakashan, New Delhi, First edition 2002.

Journals

1. Indian Journal of Pharmaceutical Sciences (IPA)

2. Indian Drugs (IDMA)

3. Journal of Controlled Release (Elsevier Sciences)

4. Drug Development and Industrial Pharmacy (Marcel & Decker) 5. International Journal of Pharmaceutics (Elsevier Sciences)

Course Outcomes:

1. This subject is designed to impart basic knowledge on the area of novel drug delivery systems.
2. To understand various approaches for development of novel drug delivery systems and technologies.
3. To understand the criteria for selection of drugs and polymers for the development of Transdermal Drug Delivery Systems and Gastro-retentive drug delivery systems, their formulation and evaluation.
4. Understand the formulation and evaluation of targeted drug delivery systems using novel techniques.

5. To understand the need, concept, design and evaluation of various customized, sustained and controlled release dosage forms.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	3	2	2	3	2	3	2
CO2	3	2	2	2	3	3	2	2	3	2	3	2
CO3	3	2	2	2	3	3	2	2	3	2	3	2
CO4	3	2	2	2	3	3	2	2	3	2	3	2
CO5	3	2	2	2	3	3	2	2	3	2	3	2

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP705P	Instrumental Methods of Analysis (Practical)	04	02
Sessional Marks: 15		**End Semester Examination Marks: 35**	

Objectives:

To develop ability to work in pharmaceutical industries on modern analytical methods, instruments like

1. Analytical method development, Validation,
2. Analytical research
3. Achieving global standards.

Course Contents:

1 Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds

2 Estimation of dextrose by colorimetry

3 Estimation of sulphanilamide by colorimetry

4 Simultaneous estimations 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 nepheloturbidometry

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

Practical Books:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

Course Outcomes:

1. Discusses the effect of impurities on the quality of drugs and behavioural pattern of drugs
2. Aids in understanding the SOP and usage of software associated with various analytical instruments
3. Helps in gaining knowledge of interpretation of spectra and of chromatograms.

4. Develop skill in analysing various pharmaceutical dosage forms.
5. Work on various analytical equipments and their application in pharmaceutical industry.

CO-PO Mapping:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	3	2	2	3	2	3	2
CO2	3	2	2	2	3	3	2	2	3	2	3	2
CO3	3	2	2	2	3	3	2	2	3	2	3	2
CO4	3	2	2	2	3	3	2	2	3	2	3	2
CO5	3	2	2	2	3	3	2	2	3	2	3	2

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP706PS	Practice School	12	06
Sessional Marks: 25		**End Semester Examination Marks: 125**	

Objectives:

Every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time. At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college leveland grade point shall be awarded.

Course Outcomes:

After successful completion of this course students will be able to:

1. Work in team and undertake a project in the area of Pharmacy
2. Present, exhibit and document the project work • Develop a project report
3. Apply concepts of pharmaceutical sciences for executing the project
4. Apply appropriate research methodology while formulating a project
5. Define specifications, synthesize, analyse, develop and evaluate a project

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	3	3	2	3	2	3	2
CO2	3	3	3	2	3	3	3	2	3	2	3	2
CO3	3	3	3	2	3	3	3	2	3	2	3	2
CO4	3	3	3	2	3	3	3	2	3	2	3	2
CO5	3	3	3	2	3	3	3	2	3	2	3	2

3=High, 2=Medium, 1=Low.

SEMESTER VIII

Course Code	Course Title	No of Hours Per week	No of Credits
BP801T	Biostatistics and Research Methodology (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. Discuss the various steps involved in conducting research.
2. Defining between the different types of research and list the motivation in research.
3. Recall the basic criteria for a good research problem encountered by researchers in India.
4. Featuring of a good research design and recalling the principles of research design.

Course Contents:

UNIT-I

Introduction: Statistics, Biostatistics, Frequency distribution

Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples

Measures of dispersion: Dispersion, Range, standard deviation, pharmaceutical problems

Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

UNIT-II

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

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

Parametric test: t-test (Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

UNIT-III

Non- Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test

Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph

Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

UNIT-IV

Blocking and confounding system for Two-level factorials

Regression modelling: Hypothesis testing in Simple and Multiple regressionmodels

Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB ®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach.

UNIT-V

Design and Analysis of experiments:

Factorial Design: Definition, Advantage of factorial design

Response Surface methodology: Central composite design, Historical design, Optimization Techniques

Text Books (Latest edition):

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.

2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha

3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,

4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

Course Outcomes:

1. Develop the ability to apply the methods while working on a research project work
2. Describe the appropriate statistical methods required for a particular research design
3. Choose the appropriate research design and develop appropriate research hypothesis for a research project
4. Develop a appropriate framework for research studies.
5. Design and implement the principles of research design.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	3	3	2	3	2	3	2
CO2	3	3	3	2	3	3	3	2	3	2	3	2
CO3	3	3	3	2	3	3	3	2	3	2	3	2
CO4	3	3	3	2	3	3	3	2	3	2	3	2
CO5	3	3	3	2	3	3	3	2	3	2	3	2

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP802T	Social and Preventive Pharmacy (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. The purpose of this course is to introduce to students a number of health issues and their challenges.

2. This course also introduced a number of national health programmes.
3. The roles of the pharmacist in these contexts are also discussed.

Course Contents:

UNIT I:

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.

Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health

Hygiene and health: personal hygiene and health care; avoidable habits.

UNIT II:

Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse.

UNIT III:

National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

UNIT IV:

National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program

UNIT V:

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.

TEXT BOOKS (LATEST EDITION):

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2 nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications

2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy RabindraNath, SahaIndranil, 4 th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications

3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6 th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications

4. Essentials of Community Medicine—A Practical Approach, HiremathLalita D, HiremathDhananjaya A, 2 nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications

5. Park Textbook of Preventive and Social Medicine, K Park, 21 st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.

6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad Recommended **Journals:**

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland

Course Outcomes:

1. After the successful completion of this course, the student shall be able to: 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.
4. The purpose of this course is to introduce the students a number of health issues and their challenges.
5. To introduce the students about the roles of a pharmacist in community services.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	2	3	3	3	2
CO2	3	3	3	3	3	3	3	2	3	3	3	2
CO3	3	3	3	3	3	3	3	2	3	3	3	2
CO4	3	3	3	3	3	3	3	2	3	3	3	2
CO5	3	3	3	3	3	3	3	2	3	3	3	2

3=High, 2=Medium, 1=Low.

Course Code	Course Title	No of Hours Per week	No of Credits
BP803ET	Pharma Marketing Management (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. The course aims to provide an understanding of marketing concepts.
2. Technologies and their applications in the pharmaceutical industry

Course Contents:

UNIT I

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.

Pharmaceutical market: Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation&targeting.Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist.Analyzing the Market role of market research.

UNIT II

Product decision: Classification, product line and product mix decisions, product life cycle,product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labelling decisions, Product management in pharmaceutical industry.

UNIT III

Promotion: Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

UNIT IV

Pharmaceutical marketing channels: Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR): Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

UNIT V

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).

Emerging concepts in marketing: Vertical & Horizontal Marketing; RuralMarketing; Consumerism; Industrial Marketing; Global Marketing.

Text Books: (Latest Editions)

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi

2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.

3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill

4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India

5. RajanSaxena: 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 Delhi

Course Outcomes:

1. Recognise the concepts, need and importance of management and application of the various principles of marketing management.
2. Understanding the concepts of product decision.
3. Evaluate and apply various approaches of promotion in marketing management.
4. Access various pharmaceutical management channels and their applications in the pharmaceutical industry
5. Evaluate and apply concepts of pricing and related regulatory agencies.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	3	2	2	3	3	3
CO2	3	3	3	3	3	2	3	2	2	3	3	3
CO3	3	3	3	3	3	2	3	2	2	3	3	3
CO4	3	3	3	3	3	2	3	2	2	3	3	3
CO5	3	3	3	3	3	2	3	2	2	3	3	3

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP804ET	Pharmaceutical Regulatory Science (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. Explain the stages of drug discovery and discussing preclinical and non-clinical activities in new drug discovery.
2. Describe about clinical studies of drug discovery and importance of generic drugs

3. Concept of generic drugs development and explaining the procedure for the export of pharmaceutical products from India.
4. Discussing the regulatory requirements for drug registration in ASEAN countries.
5. Enlisting the basic requirements of ACTD (ASEAN common technical document) research

Course Contents:

UNIT I

New Drug Discovery and development Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

UNIT II

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.

Regulatory authorities and agencies Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

UNIT III

Registration of Indian drugproduct 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.

UNIT IV

Clinical trials Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials

UNIT V

Regulatory Concepts Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book.

Text Books (Latest edition):

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, NiraliPrakashan.

2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences,Vol.Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and IsaderKaufer, Marcel Dekker series, Vol.143
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene

Course Outcomes:

1. Explain the process of drug discovery, development and generic product development
2. Describe the regulatory approval process and registration procedures for API and drug products.
3. Basic understanding of regulations of India with other global regulated markets
4. Understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
5. Learn the basic understanding the importance of orange book, Federal Register, Code of Federal Regulatory, and purple book.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	3	3	2	2	3	3	3
CO2	3	3	3	2	2	3	3	2	2	3	3	3
CO3	3	3	3	2	2	3	3	2	2	3	3	3
CO4	3	3	3	2	2	3	3	2	2	3	3	3
CO5	3	3	3	2	2	3	3	2	2	3	3	3

3=High, 2=Medium, 1=Low.

Course Code	Course Title	No of Hours Per week	No of Credits
BP805ET	Pharmacovigilance (Theory)	03+01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development, various regulatory filings.
2. To know the chemistry, manufacturing controls and their regulatory.
3. To know the approval process of documents filing process of IND, NDA.
4. Upon completion of the course, it is expected that the students will be able to The Concepts of innovator and generic drugs, drug development understand The Regulatory guidance's and guidelines for filing and approval process.

Course Contents:

UNIT I

Introduction to Pharmacovigilance

- History and development of Pharmacovigilance
- Importance of safety monitoring of Medicine
- WHO international drug monitoring programme
- Pharmacovigilance Program of India(PvPI)

Introduction to adverse drug reactions

- Definitions and classification of ADRs
- Detection and reporting
- Methods in Causality assessment
- Severity and seriousness assessment
- Predictability and preventability assessment

- Management of adverse drug reactions

Basic terminologies used in pharmacovigilance

- Terminologies of adverse medication related events
- Regulatory terminologies

UNIT II

Drug and disease classification

- Anatomical, therapeutic and chemical classification of drugs
- International classification of diseases
- Daily defined doses
- International Non proprietary Names for drugs

Drug dictionaries and coding in pharmacovigilance

- WHO adverse reaction terminologies
- MedDRA and Standardised MedDRA queries
- WHO drug dictionary
- Eudravigilance medicinal product dictionary

Information resources in pharmacovigilance

- Basic drug information resources
- Specialised resources for ADRs

Establishing pharmacovigilance programme

- Establishing in a hospital
- Establishment & operation of drug safety department in industry
- Contract Research Organisations (CROs)
- Establishing a national programme

UNIT III

Vaccine safety surveillance

- Vaccine Pharmacovigilance
- Vaccination failure
- Adverse events following immunization

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

Communication in pharmacovigilance

- Effective communication in Pharmacovigilance
- Communication in Drug Safety Crisis management
- Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media

UNIT IV

Safety data generation

- Pre clinical phase
- Clinical phase
- Post approval phase (PMS)

ICH Guidelines for Pharmacovigilance

- Organization and objectives of ICH
- Expedited reporting
- Individual case safety reports
- Periodic safety update reports
- Post approval expedited reporting
- Pharmacovigilance planning
- Good clinical practice in pharmacovigilance studies

UNIT V

Pharmacogenomics of adverse drug reactions

- Genetics related ADR with example focusing PK parameters.

Drug safety evaluation in special population

- Paediatrics
- Pregnancy and lactation
- Geriatrics

CIOMS

- CIOMS Working Groups
- CIOMS Form

CDSCO (India) and Pharmacovigilance

- D&C Act and Schedule Y
- Differences in Indian and global pharmacovigilance requirements

TEXT BOOKS (LATEST EDITION):

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance:Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller,Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert,Jones& Bartlett Publishers.
7. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy,Wiley Publishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills:G.Parthasarathi, Karin NyfortHansen,Milap C. Nahata
9. National Formulary of India
10. Text Book of Medicine by YashpalMunjal 11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna
11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna

Course Outcomes:

1. Explain the regulatory requirements for conducting clinical trial
2. Describe in detail about various types of clinical trial designs
3. Explain the responsibilities of key players involved in clinical trials
4. Describe the documentational requirements for Clinical trials
5. Explain Adverse drug reaction and its management

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	3	2	3	3	3
CO2	3	3	3	3	2	3	3	3	2	3	3	3
CO3	3	3	3	3	2	3	3	3	2	3	3	3
CO4	3	3	3	3	2	3	3	3	2	3	3	3
CO5	3	3	3	3	2	3	3	3	2	3	3	3

3=High, 2=Medium, 1=Low.

Course Code	Course Title	No of Hours Per week	No of Credits
BP806ET	Quality Control and Standardization of Herbals (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. Explaining method of quality assurance of traditional system of medicine in herbal drug industries.
2. Explaining method of quality assurance of traditional system of medicine in herbal drug industries by following Good Laboratory
3. Good Agricultural Practices (GAP) guidelines in traditional system of medicine for quality assurance in herbal drug industries
4. WHO guidelines on Current Good Manufacturing Practices (cGMP) for herbal medicines
5. Good Agricultural and Collection Practices (GACP) for Medicinal Plants.

Course Contents:

UNIT I

Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use

UNIT II

Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine. WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines WHO Guidelines on GACP for Medicinal Plants.

UNIT III

EU and ICH guidelines for quality control of herbal drugs**.** Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

UNIT IV

Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products. Preparation of documents for new drug application and export registration GMP requirements and Drugs & Cosmetics Act provisions.

UNIT V

Regulatory requirements for herbal medicines. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems Comparison of various Herbal Pharmacopoeias. Role of chemical and biological markers in standardization of herbal products

Text Books: (Latest Editions)

1. Pharmacognosy by Trease and Evans

2. Pharmacognosy by Kokate, Purohit and Gokhale

3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , Carrier Pub., 2006.

4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.

5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,

6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.

8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.

9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.

10. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.

11. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.

12. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

Course Outcomes:

1. Explain basic tests for drugs to obtain dosage form for pharmaceutical substances and medicinal plants
2. Explain methods for evaluation of pharmaceutical substances, medicinal plants and commercial crude drugs.
3. Describe guidelines for cGMP, GAP, GMP and GLP for quality assurance of herbal drugs in industry
4. Describe guidelines for quality control of herbal drugs and evaluation of safety and efficacy of herbal medicines.
5. Explain regulatory approval process and their registration in Indian and international markets.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	3	2	3	2	3	3	3
CO2	3	2	3	2	2	3	2	3	2	3	3	3
CO3	3	2	3	2	2	3	2	3	2	3	3	3
CO4	3	2	3	2	2	3	2	3	2	3	3	3
CO5	3	2	3	2	2	3	2	3	2	3	3	3

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours**	**No of**

		Per week	Credits
BP807ET	Computer Aided Drug Design (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. Discussing the various stages of drug discovery and lead discovery and its identification.
2. Validate the diversity of drug targets the various rational approaches to lead discovery.
3. Design the analogue synthesis using lead molecule.
4. Constructing the different algorithms in De novo drug design
5. Compare the various techniques in Virtual Screening and develop the protocols for Pharmacophore based screening.

Course Contents:

UNIT-I

Introduction to Drug Discovery and Development Stages of drug discovery and development

Lead discovery and Analog Based Drug Design Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

UNIT-II

Quantitative Structure Activity Relationship (QSAR) SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent

constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

UNIT-III

Molecular Modelling and virtual screening techniques

Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening,

Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. De novo drug design.

UNIT-IV

Informatics & Methods in drug design Introduction to Bioinformatics, cheminformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT-V

Molecular Modeling: Introduction to molecular mechanics and quantum mechanics.Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Text Books (Latest Editions)

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.

2. Martin YC. "Quantitative Drug Design" Dekker, New York.

3. Delgado JN, Remers WA eds "Wilson &Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.

4. Foye WO "Principles of Medicinal chemistry 'Lea &Febiger.

5. Koro lkovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.

6. Wolf ME, ed “The Basis of Medicinal Chemistry, Burger’s Medicinal Chemistry” John Wiley & Sons, New York.

7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.

8. Smith HJ, Williams H, eds, “Introduction to the principles of Drug Design” Wright Boston.

9. Silverman R.B. “The organic Chemistry of Drug Design and Drug Action” Academic Press New York.

Course Outcomes:

1. Explain the various stages of drug discovery and learn the concept of bioisosterism.
2. Describe physicochemical Properties and the techniques involved in QSAR
3. Explain various structure-based drug design methods (Molecular docking, Denovo drug design)
4. Learn the concept of pharmacophore and modelling techniques
5. Explain the various techniques in Virtual Screening

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	2	2	3	2	3	3	3
CO2	3	2	2	2	3	2	2	3	2	3	3	3
CO3	3	2	2	2	3	2	2	3	2	3	3	3
CO4	3	2	2	2	3	2	2	3	2	3	3	3
CO5	3	2	2	2	3	2	2	3	2	3	3	3

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**

BP808ET	Cell and Molecular Biology (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. It deals with understanding the molecular aspects of the biology.
2. It majorly emphasizes the concepts of central dogma of molecular biology spanning from DNA Replication till Protein Synthesis and Reverse transcription.
3. It also helps in understanding the concepts of cellular function

Course Content:

UNIT I

a) Cell and Molecular Biology: Definition's theory and basics and Applications.

b) Cell and Molecular Biology: History and Summation.

c) Properties of cells and cell membrane.

d) Prokaryotic versus Eukaryotic

e) Cellular Reproduction

f) Chemical Foundations – an Introduction and Reactions (Types)

UNIT II

a) DNA and the Flow of Molecular Information

b) DNA Functioning

c) DNA and RNA

d) Types of RNA

e) Transcription and Translation

UNIT III

a) Proteins: Defined and Amino Acids

b) Protein Structure

c) Regularities in Protein Pathways

d) Cellular Processes

e) Positive Control and significance of Protein Synthesis

UNIT IV

a) Science of Genetics

b) Transgenics and Genomic Analysis

c) Cell Cycle analysis

d) Mitosis and Meiosis

e) Cellular Activities and Checkpoints

UNIT V

a) Cell Signals: Introduction

b) Receptors for Cell Signals

c) Signaling Pathways: Overview

d) Misregulation of Signaling Pathways

e) Protein-Kinases: Functioning

Text Books (latest edition):

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.

2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.

3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.

4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.

5. Rose: Industrial Microbiology.

6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan

7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.

8. Peppler: Microbial Technology.

9. Edward: Fundamentals of Microbiology.

10. N.K.Jain: Pharmaceutical Microbiology, VallabhPrakashan, Delhi

11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

12. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.

Course Outcomes:

1. It deals with understanding the molecular aspects of the biology.
2. It majorly emphasizes the concepts of central dogma of molecular biology spanning from DNA Replication till Protein Synthesis and Reverse transcription.
3. It also helps in understanding the concepts of cellular function
4. It deals with understanding the molecular aspects of the biology. It majorly emphasizes the concepts of central dogma of molecular biology spanning from DNA Replication till Protein Synthesis and Reverse transcription.
5. It also helps in understanding the concepts of cellular function.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	3	3	2	3	2	3	3
CO2	3	3	2	2	3	3	3	2	3	2	3	3
CO3	3	3	2	2	3	3	3	2	3	2	3	3
CO4	3	3	2	2	3	3	3	2	3	2	3	3
CO5	3	3	2	2	3	3	3	2	3	2	3	3

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BP809ET	Cosmetic Science (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. cosmeceuticals (cosmetics with skin, hair and oral care benefits), Personal care and hygiene products.
2. Provide a multidisciplinary scientific knowledge to gain expertise in the field and to respond the industry challenges effectively.
3. Provide with knowledge on marketing approaches on studying consumer need, need gaps, managing competition and global markets.

4. Provide practical skills in the area of biology, formulation science and analytical techniques required to scientifically design and develop products.
5. Develop your potential to have a career in this fast-growing industry in the area of product development & research, regulatory,

Course Contents:

UNIT I

Classification of cosmetic and cosmeceutical products Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs

Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application

Skin: Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem associated with teeth and gums.

UNIT II

Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmecuticals.

Antiperspants& deodorants- Actives & mechanism of action.

Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils. Chemistry and formulation of Para-phylenediamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

UNIT III

Sun protection, Classification of Sunscreens and SPF. Role of herbs in cosmetics: Skin Care: Aloe and turmeric Hair care: Henna and amla. Oral care: Neem and clove

Analytical cosmetics: BIS specification and analytical methods for shampoo, skin- cream and toothpaste.

UNIT IV

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps,andsyndet bars. Evolution and skin benfits.

UNIT V

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis. Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and Deodorants- Actives and mechanism of action

Text Books:

1) Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.

2) Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4 th Edition, Vandana Publications Pvt. Ltd., Delhi.

3) Text book of cosmelicology by Sanju Nanda &Roop K. Khar, Tata Publishers.

Course Outcomes:

1. Cosmetic Science is an interdisciplinary applied science program providing students with the opportunities to develop professional skills and fundamental concepts driving cosmetic science.
2. Cosmetic Science focuses on the needs of the cosmetic industry and its consumers, in addition to providing students with the critical and evaluative skills to become professional scientists.
3. Cosmetic Science covers a range of sciences, both pure and applied, formulation development and industry operations, all of which give you a broad range of career opportunities.
4. Provide with knowledge on marketing approaches on studying consumer need, need gaps, managing competition and global markets.
5. Provide practical skills in the area of biology, formulation science and analytical techniques required to scientifically design and develop products.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	2	3	3	3	2	3	2
CO2	3	3	3	2	3	2	3	3	3	2	3	2
CO3	3	3	3	2	3	2	3	3	3	2	3	2
CO4	3	3	3	2	3	2	3	3	3	2	3	2
CO5	3	3	3	2	3	2	3	3	3	2	3	2

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**

BP810ET	Experimental Pharmacology (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. Understanding the in vivo and in vitro experiments, use of software for the study of preclinical experiments.
2. Understanding the PA2 and PD2 value of drugs using isolated tissue preparations.
3. Understanding the brief idea about statistics, its applications in experimental pharmacology.
4. Understanding to solve problems using various statistical tests

Course Contents:

UNIT –I

Laboratory Animals: Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.

UNIT –II

Preclinical screening models

a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study.

b. Study of screening animal models for Diuretics, nootropics, anti-Parkinson's,antiasthmatics, **Preclinical screening models:** for CNS activity- analgesic, antipyretic,anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease

UNIT –III

Preclinical screening models: for ANS activity, sympathomimetics, sympatholytic, parasympathomimetic, parasympatholytic, skeletal muscle relaxants, drugs acting on eye, local anaesthetics.

UNIT –IV

Preclinical screening models: for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslepidemic, anti-aggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.

Research methodology and Bio-statistics Selection of research topic, review of literature, research hypothesis and study design Pre-clinical data analysis and interpretation using Students 't' test and One-way ANOVA. Graphical representation of data.

Text Books (latest edition):

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. CPCSEA guidelines for laboratory animal facility.
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

Course Outcomes:

1. Study of commonly used instruments in experimental pharmacology.
2. Introduction to CPCSEA guidelines and OECD guidelines.
3. Introduction to animal physiology with their biochemical reference values in various animal species.
4. Study of methods for collection of blood, body fluids and urine from experimental animals.
5. Record the effect of drug on Concentration Response Curves (CRC) using suitable isolated tissue preparations (Synergism and Antagonism).

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	3	3	3	2	3	2	2	3
CO2	3	3	2	3	3	3	3	2	3	2	2	3
CO3	3	3	2	3	3	3	3	2	3	2	2	3
CO4	3	3	2	3	3	3	3	2	3	2	2	3
CO5	3	3	2	3	3	3	3	2	3	2	2	3

3=High, 2=Medium, 1=Low.

Course Code	Course Title	No of Hours Per week	No of Credits
BP811ET	Advanced Instrumentation Techniques	03+ 01	04

	(Theory)	(Tutorial)	
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. Know various sampling techniques employed in analysis of solid, semisolid and liquids dosage forms
2. Brief knowledge about electromagnetic spectrum and its interaction with matter.
3. Understand the principal, instrumentation and working of different instrumental analytical techniques available for quality control.
4. Study various qualitative and quantitative applications of atomic and molecular spectrophotometric methods.

Course Contents:

UNIT-I

Nuclear Magnetic Resonance Spectroscopy Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

Mass Spectrometry- Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analysers-Time of flight and Quadrupole, instrumentation, applications

UNIT-II

Thermal Methods of Analysis: Principles, instrumentation and applications of ThermogravimetricAnalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, Xray Crystallography, rotating crystal technique, single crystal diffraction,powder diffraction, structural elucidation and applications.

UNIT-III

Calibration and validation-as per ICH and USFDA guidelines

Calibration of following Instruments Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC

UNIT-IV

Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immunoassay

Extraction techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

UNIT-V

Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.

Text Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

Course Outcomes:

1. Apply the analytical techniques to study bulk-drug pharmaceuticals, quality control.
2. Develop in-depth knowledge and critical awareness of the application of modern.
3. Know preparation and standardization of various concentrations of acids and bases.
4. Understand the basic concepts involved in electro-analytical techniques and its types.
5. Understand theory, principle, types and techniques of coulometric titration

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	2	3	2	2	3
CO2	3	3	3	3	3	3	3	2	3	2	2	3
CO3	3	3	3	3	3	3	3	2	3	2	2	3
CO4	3	3	3	3	3	3	3	2	3	2	2	3
CO5	3	3	3	3	3	3	3	2	3	2	2	3

3=High, 2=Medium, 1=Low.

Course Code	Course Title	No of Hours Per week	No of Credits

BP812ET	Dietary Supplements and Nutraceuticals (Theory)	03+ 01 (Tutorial)	04
Sessional Marks: 25		**End Semester Examination Marks: 75**	

Objectives:

1. Know the regulatory Requirements for nutraceuticals
2. Understand the regulation for registration and labelling of nutraceuticals and food supplements in India, USA and Europe.

Course Contents:

UNIT I

a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.

b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.

c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

UNIT II

Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following

a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, leutin

b) Sulfides: Diallylsulfides, Allyl trisulfide.

c) Polyphenolics: Reservetrol

d) Flavonoids- Rutin ,Naringin, Quercitin, Anthocyanidins, catechins, Flavones

e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lactobacillum

f) Phytoestrogens :Isoflavones, daidzein, Geebustin, lignans

g) Tocopherols

h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.

UNIT III

a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.

b) Dietary fibres and complex carbohydrates as functional food ingredients.

UNIT IV

a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.

b) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, α- Lipoic acid, melatonin Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole.

c) Functional foods for chronic disease prevention

UNIT V

a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.

b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.

c) Pharmacopeial Specifications for dietary supplements and nutraceuticals.

Text Books:

1. Dietetics by Sri Lakshmi

2. Role of dietary fibres and nutraceuticals in preventing diseases by K.TAgusti and P.Faizal: BSPunblication.

3. Advanced Nutritional Therapies by Cooper. K.A., (1996).

4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).

5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2 ndEdn., Avery Publishing Group, NY (1997).

6. G. Gibson and C.williams Editors 2000 Functional foods WoodheadPubl.Co.London.

7. Goldberg, I. Functional Foods. 1994. Chapman and Hall, New York.

8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf-Life Testing in Essentials of Functional Foods M.K. Sachmidl and T.P. Labuza eds. Aspen Press.

9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)

10. Shils, ME, Olson, JA, Shike, M. 1994 Modern Nutrition in Health and Disease. Eighth edition. Lea and Febiger

Course Outcomes:

1. Know different Acts and guidelines that regulate Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals industry in India.
2. Understand the approval process and regulatory requirements.
3. Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food& Nutraceuticals.
4. Know various approaches in treating and preventing diseases.
5. Understand the regulation for registration and labelling of nutraceuticals and food supplements in India, USA and Europe.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	2	3	3	2	2	3	3
CO2	3	3	2	2	3	2	3	3	2	2	3	3
CO3	3	3	2	2	3	2	3	3	2	2	3	3
CO4	3	3	2	2	3	2	3	3	2	2	3	3
CO5	3	3	2	2	3	2	3	3	2	2	3	3

3=High, 2=Medium, 1=Low.

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**

BP813PW	Project Work	12	06
Sessional Marks: -		**End Semester Examination Marks: 150**	

Objectives:

1. Final Year Projects represent the culmination of study towards the Bachelor of Pharmaceutical sciences degree. Projects offer the opportunity to apply and extend material learned throughout the program. Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.
2. In contrast to the majority of courses studied elsewhere in the program, projects are undertaken individually or in small groups.
3. This necessarily introduces the dimension of workload management into the program to enable completion of a large, relatively unstructured "assignment" over the course of the semester.

Course Outcomes:

After successful completion of this course students will be able to:

1. Work in team and undertake a project in the area of Pharmacy
2. Apply concepts of pharmaceutical sciences for executing the project
3. Apply appropriate research methodology while formulating a project
4. Define specifications, synthesize, analyse, develop and evaluate a project
5. Present, exhibit and document the project work • Develop a project report

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

3=High, 2=Medium, 1=Low