K. R. MANGALAM UNIVERSITY

THE COMPLETE WORLD OF EDUCATION

School of Medical and Allied Sciences

Bachelor of Pharmacy
(B. Pharm.)
Program Code: 12

(2018-2022)

Approved in the 17th Meeting of Academic Council Held on 29 June 2018

Academic Council
Member Secretary
K.R. Mangalam University

Registrar
K.R. Mangalam University
Sohna Road, Gurugram, (Haryana)

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PREFACE

The KRMU envisions all its programs in the best interest of their students and in this endeavour it offers a new vision to all its courses. Through its programs it aims to provide a focused, student-centric syllabus with an agenda to structure the teaching-learning experiences experientially.

The curriculum strengthens students' experiences and prepare the students for both, academia and employability, sustainability and life-long learning.

Each program reflects the promise to accomplish the learning outcomes by studying the courses. The graduate attributes encompass values related to well-being, emotional stability, critical thinking, social justice and also skills for entrepreneurship.

The K.R. Mangalam University hopes the curriculum will help students in making an informed decision at the time of working in the field of pharmacy.

ACKNOWLEDGEMENT

The development of the curriculum for Undergraduate degree courses in the School of Medical and Allied Sciences is a result of thoughtful deliberations at various stages of dedicated and specialized experts. This curriculum has been framed to meet the expectations of an academically challenging environment, develop problem-solving skills by students and align with current standards and to enrich the students to make them self-enablers and/or match job requirements on successful completion of their degrees.

I wish to acknowledge all our experts who have been involved in the process of developing this curriculum for B. Pharmacy. I am greatly gratified Ms. Manvi Arora for her supervision contribution, guidance, and support throughout the development of this curriculum. Special thanks and gratitude to Prof. Aditya Mallik Vice Chancellor, K.R. Mangalam University who have been instrumental and encouraging throughout the process of developing this curriculum. Last, but not the least, I also sincerely thanks to all faculty members for preparation of this handbook for B. Pharmacy program.

Dean

School of Medical and Allied Sciences

List of Contents

1. Introduction

The K.R. Mangalam Group has made a name for itself in the field of education. The K.R. Mangalam story goes back to the chain of schools that offered an alternative option of world-class education, pitching itself against the established elite schools, which had enjoyed a position of monopoly till then. Having blazed a new trail in school education, the focus of the group was aimed at higher education.

K.R. Mangalam University is the fastest-growing higher education institute in Gurugram, India. K. R. Mangalam University was established under the Haryana Private University Act 2006, received the approval of Haryana Legislature vide Amendment Act # 36 of 2013 and consent of the Hon'ble Governor of Haryana on 11th April 2013, which was published in the Gazette notification vide Leg. No.10/2013, dated 3rd May 2013.

Since its inception in 2013, the University has been striving to fulfil its prime objective of transforming young lives through ground-breaking pedagogy, global collaborations, and world-class infrastructure. Resources at K.R Mangalam University have been continuously upgraded to optimize opportunities for the students. Our students are groomed in a truly interdisciplinary environment where they grow up with integrative skills through interaction with students from engineering, social sciences, management and other study streams.

1.1 K. R. Mangalam University is unique because of its

I. Enduring legacy of providing education to high achievers who demonstrate leadership in diverse fields.

II. Protective and nurturing environment for teaching, research, creativity, scholarship, social and economic justice.

1.2 Objectives

1. To impart undergraduate, post-graduate and Doctoral education in identified areas of higher education.
2. To undertake research programs with industrial interface.
3. To integrate its growth with the global needs and expectations of the major stake holders through teaching, research, exchange & collaborative programs with foreign, Indian Universities/Institutions and MNCs.
4. To act as a nodal center for transfer of technology to the industry.

To provide job oriented professional education to the student community with particular focus on Haryana

2. About School

School of Medical and Allied Sciences mainly focused on training to students for various subjects and practical aspects related to drug formulation and testing along with co-curricular development. School offers Diploma, undergraduate, post graduate courses in pharmacy and Bachelor degree in physiotherapy post. We provide an extra edge to our students by teaching and training by leading Pharma industry experts to facilitate industry academia interaction, participation in conferences / workshops / skill development programs, carrier guidance, coaching for GPAT and other competitive examinations. We encourage students to participate in various health camps organized by department to make general awareness amongst people regarding various diseases like diabetes, hypertension, communicable and non-communicable diseases. We provide placement assistance to students for getting jobs in various government and private laboratories. We have tie up with various pharmaceutical industries like Dabur Research Foundation, Sun Pharma, Arbo Pharma, Indian Pharmacopeial Commission, Catalyst Clinical Services, Suraksha Pharma, Medicamen Biotech , Mankind Pharma etc. which provide various carrier opportunities in pharmaceutical production, pharmaceutical quality control, quality assurance, pharmaceutical sales & distribution, drug information services, health insurance, medical coding, supply chain management, forensic sciences, pharmacovigilance, product management team, clinical trials, clinical data management and in Indian Pharmacopeia Commission.

3. School Vision

To contribute towards healthcare needs of the society by producing a skilled, motivated and accessible workforce dedicated towards achieving health for all.

4. School Mission

M1: To produce self-motivated, self-reliant and socially sensitive young healthcare professionals catering to the needs of academia, industry and research.

M2: To create a centre of excellence for learning and research in the field of pharmaceutical and allied health sciences with inter-disciplinary approach in emerging area of science and technology with focus on industry-academia interaction.

M3: To nurture transformational research for the benefit of the society.

M4: To interlink pharmaceutical and allied health sciences with interdisciplinary life sciences.

5. Programs offered by the school

School offers diploma, undergraduate, post-graduate and doctoral Programme in Pharmacy all these programs are designed to impart scientific knowledge to the students and will provide theoretical as well as practical training in their respective fields. The programs offered by the school are approved by Pharmacy Council of India, New Delhi.

5.1 B. Pharmacy

School of Medical and Allied Sciences offers B. Pharmacy degree course which is duly approved by the Pharmacy Council of India (F.No.01.109/2020-PCI, minutes of 109thcentral council meeting on 08-09April,2020, Item No. HR-17 /2020-2021). The curriculum has been specifically designed so as to impart latest knowledge and skills relevant to Pharmaceutical Sciences including Industrial Visits / Training / Guest Lectures of Experts from Industry and Academia.

5.2 Eligibility Criteria:

5.2.1 First year B. Pharm:

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

5.2.2 B. Pharm lateral entry (to third semester):

A pass in D. Pharmacy course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

4.2.3 Course Outline:

Inorganic chemistry / Organic chemistry / Pharmaceutics / Analysis / Environmental Sciences / Biochemistry /Pharmaceutical Chemistry / Pharmacology/ Pharmacognosy.

4.2.4 Career Options:

Opportunities exist in Drug Inspector Drug Analyst Research & Development of Drugs, Cosmetics, Diagnostics and Vaccines, Drug Patents, Medical Writing, Quality Control, Clinical Research, Hospital Pharmacy, Community Pharmacy/Pharmaceutical Marketing, pharmaceutical industries, regulatory education and forensic drug laboratories.

4.2.5 Program Duration

The course of study for B. Pharmacy shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curriculum and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4.2.6 Class Timings

The classes will be held from Monday to Friday from 09:10 am to 04:00 pm.

5.2.7 Syllabus

The syllabus of B. Pharmacy programs offered by SMAS is as per the norms of Pharmacy Council of India, New Delhi as mentioned below Programme Duration: - 4 Years the maximum period for the completion of the B. Pharmacy Programme offered by the University shall be four years.

5. Syllabus and Scheme of Studies of B. Pharmacy Programme

6.1 Four year B. Pharmacy Programme at a glance

	Semester I	**Semester II**	**Semester III**	**Semester IV**	**Semester V**	**Semester V I**	**Semester VII**	**Semester VIII**	**Total**
Courses	12	10	8	9	9	9	11	6	74
Credits	30	29	24	28	25	22	27	23	208

Semester-I					
Course code	**Course Title**	**L**	**T**	**P**	**C**
BP101T	Human Anatomy and Physiology I– Theory	3	1		4
BP102T	Pharmaceutical Analysis I – Theory	3	1		4
BP103T	Pharmaceutics I – Theory	3	1		4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1		4

BP105T	Communication skills – Theory *	2	-		2
BP106RBT/ BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-		2
BP107P	Human Anatomy and Physiology – Practical		-	4	2
BP108P	Pharmaceutical Analysis I – Practical		-	4	2
BP109P	Pharmaceutics I – Practical		-	4	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical		-	4	2
BP111P	Communication skills – Practical*		-	2	1
BP112RBP	Remedial Biology – Practical*		-	2	1
	Total	**16**	**4**	**20**	**30**

Semester-II					
Course code	**Course Title**	**L**	**T**	**P**	**C**
BP201T	Human Anatomy and Physiology II – Theory	3	1		4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1		4
BP203T	Biochemistry – Theory	3	1		4
BP204T	Pathophysiology – Theory	3	1		4
BP205T	Computer Applications in Pharmacy – Theory *	3	-		3
BP206T	Environmental sciences – Theory *	3	-		3
BP207P	Human Anatomy and Physiology II –Practical		-	4	2
BP208P	Pharmaceutical Organic Chemistry I– Practical		-	4	2
BP209P	Biochemistry – Practical		-	4	2
BP210P	Computer Applications in Pharmacy – Practical*		-	2	1
Total		**32**	**4**	14	**29**

Semester-III					
Course code	**Course Title**	**L**	**T**	**P**	**C**
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1		4
BP302T	Physical Pharmaceutics I – Theory	3	1		4

BP303T	Pharmaceutical Microbiology – Theory	3	1		4
BP304T	Pharmaceutical Engineering – Theory	3	1		4
BP305P	Pharmaceutical Organic Chemistry II – Practical		-	4	2
BP306P	Physical Pharmaceutics I – Practical		-	4	2
BP307P	Pharmaceutical Microbiology – Practical		-	4	2
BP 308P	Pharmaceutical Engineering –Practical		-	4	2
Total		**12**	**4**	**16**	**24**

Semester-IV					
Course code	**Course Title**	**L**	**T**	**P**	**C**
BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1		4
BP402T	Medicinal Chemistry I – Theory	3	1		4
BP403T	Physical Pharmaceutics II – Theory	3	1		4
BP404T	Pharmacology I – Theory	3	1		4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1		4
BP406P	Medicinal Chemistry I – Practical		-	4	2
BP407P	Physical Pharmaceutics II – Practical			4	2
BP408P	Pharmacology I – Practical		-	4	2
BP409P	Pharmacognosy and Phytochemistry I – Practical		-	4	2
Total		15	5	16	28

Semester-V					
Course code	**Course Title**	**L**	**T**	**P**	**C**
BP501T	Medicinal Chemistry II – Theory	3	1		4

BP502T	Industrial PharmacyI– Theory	3	1		4
BP503T	Pharmacology II – Theory	3	1		4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1		4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1		4
BP506P	Industrial PharmacyI – Practical		0	4	2
BP507P	Pharmacology II – Practical		0	4	2
BP508P	Pharmacognosy and Phytochemistry II – Practical		0	4	2
Total		15	5	12	26

Semester-VI					
Course code	**Course Title**	**L**	**T**	**P**	**C**
BP601T	Medicinal Chemistry III – Theory	3	1		4
BP602T	Pharmacology III – Theory	3	1		4
BP603T	Herbal Drug Technology – Theory	3	1		4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1		4
BP605T	Pharmaceutical Biotechnology – Theory	3	1		4
BP606T	Quality Assurance –Theory	3	1		4
BP607P	Medicinal chemistry III – Practical		0	4	2
BP608P	Pharmacology III – Practical		0	4	2
BP609P	Herbal Drug Technology – Practical		0	4	2
Total		18	5	12	30

Semester-VII					
Course code	**Course Title**	**L**	**T**	**P**	**C**
BP701T	Instrumental Methods of Analysis – Theory	3	1		4

BP702T	Industrial PharmacyII – Theory	3	1		4
BP703T	Pharmacy Practice – Theory	3	1		4
BP704T	Novel Drug Delivery System – Theory	3	1		4
BP705P	Instrumental Methods of Analysis – Practical	4	0		2
BP706PS	Practice School		0	12	6
Total		16	4	12	24

Semester-VIII					
Course code	**Course Title**	**L**	**T**	**P**	**C**
BP801T	Biostatistics and Research Methodology	3	1		4
BP802T	Social and Preventive Pharmacy	3	1		4
BP803ET	Pharma Marketing Management				
BP804ET	Pharmaceutical Regulatory Science				
BP805ET	Pharmacovigilance				
BP806ET	Quality Control and Standardization of Herbals				
BP807ET	Computer Aided Drug Design				
BP808ET	Cell and Molecular Biology				
BP809ET	Cosmetic Science				
BP810ET	Experimental Pharmacology				
BP811ET	Advanced Instrumentation Techniques				
BP812ET	Dietary Supplements and Nutraceuticals				
BP813PW	Project Work		-	12	6
Total			**4**	**12**	**22**

Course code	Course Title	L	T	P	C
BP101T	Human Anatomy and Physiology-I (Theory)	3	1	0	4

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

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Course Syllabus:

Unit I 10 Hours

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 10 Hours

Integumentary system

Structure and functions of skin

Skeletal system

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

Joints

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

Unit III 10 Hours

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 8 Hours

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 7 Hours

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

Text book [TB]:

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

Reference book(s) [RB]:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,
2. Riverview, MI USA.
3. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH,
4. U.S.A.
5. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers Kolkata.

Evaluation Scheme:

	Evaluation Component	**Duration**	**Weightage (%)**	**Date, Time & Venue**
1	Continuous mode	-	10	
2	Sessional exams	1 h	15	
3	End-Term Examination	3 h	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**

BP 102T	Pharmaceutical Analysis I – Theory	3	1	0	4

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

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

Course Syllabus:

UNIT-I 10 Hours

(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 10 Hours

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 10 Hours

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 08 Hours

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 07 Hours

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 book [TB]:

1. Pharmaceutical Analysis Volume – I by Kasture A.V., Nirali Prakashan, Pune, India.
2. Text Book of Quantitative Inorganic analysis by Vogel A.I., John Wiley and Sons, New York.
3. Pharmaceutical and Inorganic Medicinal Chemistry by Rao P.G., Vallabh Prakashan, New Delhi.
4. Indian Pharmacopoeia.
5. A textbook of Pharmaceutical Analysis by Sathiyasundar R., SIA Publishers and Distributers Pvt. Ltd., Hyderabad, India.

Reference book(s) [RB]:

1. Bentley and Driver's Texbook of Pharmaceutical Chemistry. Revised by L.M. Atherden, Oxford Publishers

2. Analytical Chemistry Principles by Kennedy J.H., Pearson Education Publishers, USA.

3. United States Pharmacopoeia.

Evaluation Scheme:

S. No	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1 h	15	
3	End-Term Examination	3 h	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP103T	Pharmaceutics-I (Theory)	3	1	0	4

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

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

Course Syllabus:

UNIT – I 10 Hours

Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.

Dosage forms: Introduction to dosage forms, classification and definitions

Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription.

Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT – II 10 Hours

Pharmaceutical calculations: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.

Powders: Definition, classification, advantages and disadvantages,Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

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

UNIT – III 10 Hours

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

Biphasic liquids:

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

Emulsions: Definition, classification, emulsifying agent, test for the identification of type ofEmulsion, Methods of preparation & stability problems and methods to overcome.

UNIT – IV 08 Hours

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

Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

UNIV – V 07 Hours

Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosage form

Text book [TB]:

1. R. M. Mehta, Pharmaceutics-II, Vallabh Prakashan publishers, 2003, 286.

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. Lachmann. Theory and Practice of Industrial Pharmacy, Lea&Febiger Publisher, The University of Michigan.

5. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.

6. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.

7. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.

8. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.

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

10. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

11. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.

Reference book(s) [RB]:

1. Indian Pharmacopoeia
2. British Pharmacopoeia

Evaluation Scheme:

	Evaluation Component	**Duration**	**Weightage (%)**	**Date, Time & Venue**
1	Continuous mode	-	10	
2	Sessional exams	1 hr	15	
3	End-Term Examination	3 hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**

BP104T	Inorganic Chemistry (Theory)	3	1	0	4

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

1. To Know the history of Pharmacopoeia
2. To know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
3. Understand the medicinal and pharmaceutical importance of inorganic compounds
4. Preparation of various radiopharmaceutical dosage

Course Syllabus:

UNIT I
10 Hours

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 10 Hours

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 10 Hours

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 08 Hours

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 07 Hours

Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I^{131}, Storage conditions, precautions & pharmaceutical application of radioactive substances.

Text book [TB]:

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

Reference book(s) [RB]:

1. Indian Pharmacopoeia

2. British Pharmacopoeia
3. USP

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1 h	15	
3	End-Term Examination	3 h	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP105T	Communication Skills (Theory)	2	0	0	2

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

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

Course Syllabus:

UNIT – I 10 Hours

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 – II 10 Hours

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 10 Hours

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 Lines, Put the Main Point First, Know Your Audience, Organization of the Message

UNIT – IV 08 Hours

· 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 07 Hours

· Group Discussion: Introduction, Communication skills in group discussion, Do's and

Dont's of group discussion

Text book [TB]:

Kumar, Sanjay and Pushplata.Communication Skills.Oxford University Press, 2015.A.I.

Reference book(s) [RB]:

1 Mitra, Barun K. Personality Development and Soft Skills. Oxford University Press, 2012.

2 Tickoo, M.L., A. E. Subramanian and P. R. Subramaniam. Intermediate Grammar, Us age and Composition. Orient Blackswan, 1976.

3 Basic Business Communication By Lesikar&Flatley, Publisher Tata McGraw Hills

Body Language By Allan Pease, Publisher SheldonPress

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	05	
2	Sessional exams	1 h	10	
3	End-Term Examination	1.5 h	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP106RBT	Remedial Biology (Theory)	2	0	0	2

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

1. Know the classification and salient features of five kingdoms of life
2. Understand the basic components of anatomy & physiology of plant
3. Understand the basic components of anatomy & physiology with special reference to human

Course Syllabus:

UNIT I

Living world

Definition and characters of living organisms, Diversity in the living world, Binomial

nomenclature, Five kingdoms of life and basis of classification. Salient features of Monera,

Potista, 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 & Dicotylidones.

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, Rennin 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 micronutrients, 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 book [TB]:

1. Text book of Biology by S. B. Gokhale
2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference book(s) [RB]:

1. A Text book of Biology by B.V. Sreenivasa Naidu
2. A Text book of Biology by Naidu and Murthy

3. Botany for Degree students By A.C.Dutta.
4. Outlines of Zoology byM. Ekambaranatha ayyer and T. N. Ananthakrishnan.
5. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	05	
2	Sessional exams	1 h	10	
3	End-Term Examination	1.5 h	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 106 RMT	Remedial Mathematics (Theory)	2	0	0	2

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

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

Course Syllabus:

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 of a function (∈ - δ n n definition)

$$\lim_{x\to a}\frac{x^n - a^n}{x-a} = na^{n-1}, \qquad \lim_{\theta\to 0}\frac{\sin\theta}{\theta} = 1,$$

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, Application of 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 x n w.r.tx,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 for a function to be a maximum or a minimum at a point. Application

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 book [TB]:

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan

Reference book(s) [RB]:

1. Higher Engineering Mathematics by Dr. B.S. Grewal.
2. Remedial Mathematics by Bathul Shahnaz.
3. Remedial Mathematics by Bais V.K., Kumar D. and Goyal P.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	05	
2	Mid-term exams	1h	10	
3	End-Term Examination	1.5	35	
		Total	50	

Course code	Course Title	L	T	P	C
BP107P	Human Anatomy and Physiology (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. Compare and learn all the physiological processes discussed in theory classes with the help of experiments in the laboratory.
2. Develop an insight into human anatomy and physiology.
3. Identify different types of cells and tissues.
4. Identify different types of bones and learn accordingly.
5. Perform different blood related experiments and diseases.
6. Measure blood pressure and heart rate

Course Syllabus:

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 book [TB]:

1. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
2. Practical workbook of Human Physiology by K. Srinageswari and Rajeev

Sharma, Jaypee brother's medical publishers, New Delhi.

Reference book(s) [RB]:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,
2. Riverview, MI USA.
3. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH,
4. U.S.A.
5. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers Kolkata.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	05	
2	Sessional exams	4hrs	10	
3	End-Term Examination	4hrs	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP108 P	Pharmaceutical Analysis I (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. Understand the principles of volumetric and electrochemical analysis.
2. Carry out various volumetric and electrochemical titrations.
3. Develop analytical skills.

Course Syllabus:

Limit Test of the following

(1) Chloride

(2) Sulphate

(3) Iron

(4) Arsenic

Preparation and standardization of

(1) Sodium hydroxide

(2) Sulphuric acid

(3) Sodium thiosulfate

(4) Potassium permanganate

(5) Ceric ammonium sulphate

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

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 book [TB]:

1. Pharmaceutical Analysis Volume – I by Kasture A.V., Nirali Prakashan, Pune, India.

2. Text Book of Quantitative Inorganic analysis by Vogel A.I., John Wiley and Sons, New York.

3. Pharmaceutical and Inorganic Medicinal Chemistry by Rao P.G., Vallabh Prakashan, New Delhi.

3. Indian Pharmacopoeia.

4. A textbook of Pharmaceutical Analysis by Sathiyasundar R., SIA Publishers and Distributers Pvt. Ltd., Hyderabad, India.

Reference book(s) [RB]:

1. Bentley and Driver's Texbook of Pharmaceutical Chemistry. Revised by L.M. Atherden, Oxford Publishers
2. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
3. Analytical Chemistry Principles by Kennedy J.H., Pearson Education Publishers, USA.
4. United States Pharmacopoeia.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	5	
2	Sessional exams	4hrs	10	
3	End-Term Examination	4hrs	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP109P	Pharmaceutics-I(Practical)	0	0	4	2

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

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

Course Syllabus:

1 Syrups

Syrup IP'66

Compound syrup of Ferrous Phosphate BPC'68

2. Elixirs

Piperazine citrate elixir

Paracetamol pediatric elixir

3.Linctus

Terpin Hydrate Linctus IP'66

4. Solutions

Iodine Throat Paint

Mandles Paint

Strong solution of ammonium acetate

Cresol with soap solution

Lugol's solution

5. Suspensions

Calamine lotion

Magnesium Hydroxide mixture

Aluminimum Hydroxide gel

6. Emulsions a

Turpentine Liniment

Liquid paraffin emulsion

7. Powders and Granules

ORS powder (WHO)

Effervescent granules

Dusting powder

Divded powders

8. Suppositories

Glycero gelatin suppository

Coca butter suppository

Zinc Oxide suppository

9. Semisolids

Sulphur ointment

Non staining-iodine ointment with methyl salicylate

Carbopal gel

10. Gargles and Mouthwashes

Iodine gargle

Chlorhexidine mouthwash

Text book [TB]:

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.

2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.

3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.

4. Lachmann. Theory and Practice of Industrial Pharmacy,Lea&Febiger Publisher, The University of Michigan.

5. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.

6. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.

7. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.

8. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.

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

10. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

Reference book(s) [RB]:

1. Indian Pharmacopoeia
2. British Pharmacopoeia

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	05	
2	Sessional exams	4 hrs	10	
3	End-Term Examination	4 hrs	35	
		Total	50	

Course code	Course Title	L	T	P	C

BP110P	Inorganic Chemistry (Practical)	0	0	4	2

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

1. To Know the history of Pharmacopoeia
2. To know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
3. Understand the medicinal and pharmaceutical importance of inorganic compounds
4. Preparation of various radiopharmaceutical dosage

Course Syllabus:

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 Heavymetals

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 book [TB]:

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

Reference book(s) [RB]:

1. Indian Pharmacopoeia
2. British Pharmacopoeia
3. USP

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	
2	Sessional exams	4 hrs	10	
3	End-Term Examination	4 hrs	35	
		Total	50	

Course code	Course Title	L	T	P	C
BP111P	Communication skills (Practical)	0	0	2	1

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

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills 5. Develop Leadership qualities and essentials

Course Syllabus:

UNIT I

Basic communication covering the following topics

Meeting People

Asking Questions

Making Friends

What did you do?

Do's and Dont's

UNIT II

Pronunciations covering the following topics

Pronunciation (Consonant Sounds)

Pronunciation and Nouns Pronunciation (Vowel Sounds)

UNIT III

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 book [TB]:

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

Reference book(s) [RB]:

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	5	
2	Sessional exams	2 h	5	
3	End-Term Examination	2 h	15	
		Total	25	

Course code	Course Title	L	T	P	C
BP112RBP	Remedial Biology (Practical)	0	0	2	1

Course Objectives: On completion of the syllabus, the students will be able to:

1. Compare and learn all the physiological processes discussed in theory classes with the help of experiments in the laboratory.
2. Develop an insight into human anatomy and physiology.
3. Identify different types of cells and tissues
4. Perform all the practicals mentioned in the syllabus an implement the same in life according to the need

Course Syllabus:

1. Introduction to experiments in biology
2. Study of Microscope
3. Section cutting techniques
4. Mounting and staining
5. Permanent slide preparation
6. Study of cell and its inclusions
7. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
8. Detailed study of frog by using computer models

9. Microscopic study and identification of tissues pertinent to Stem, Root
10. Leaf, seed, fruit and flower
11. Identification of bones
12. Determination of blood group
13. Determination of blood pressure
14. Determination of tidal volume

Text book [TB]

1. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

Reference book(s) [RB]:

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	05	
2	Sessional exams	2h	05	
3	End-Term Examination	2 h	15	
		Total	25	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP201T	Human Anatomy and Physiology (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

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

body.

2. Describe the various homeostatic mechanisms and their imbalances.
3. Describe the nervous system, reproductive system, urinary system, digestive system, endocrine system and respiratory system.
4. 4. Appreciate coordinated working pattern of different organs of each system.

Course Syllabus:

UNIT I (Lectures- 10)

Nervous system

Organization of nervous system, neurons, 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 (Lectures- 6)

Digestive system

Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

Energetics

Formation and role of ATP, Creatinine Phosphate and BMR.

UNIT III (Lectures- 10)

Respiratory system

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration.

Lung Volumes and capacities transport of respiratory gases, artificial respiration and

resuscitation methods.

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 (Lectures- 6)

Endocrine system

Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

UNIT V (Lecture -9)

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 book [TB]:

1. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
2. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
3. Textbook of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
4. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA

Reference book(s) [RB]:

1. Tortora GJ, & Anagnodokos NP ―Principles of Anatomy & Physiology‖, Harper & Row,
2. Guyton AC, Hall JE., Text book of Medical Physiology‖, WB Saunders Company
3. Ross & Wilson, Anatomy & Physiology in Health & Illness‖, Churchill Livingstone

Evaluation Scheme:				
	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3 hrs	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP202T	Pharmaceutical Organic Chemistry-I (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

1. Write the structure, name and the type of isomerism of the organic compound
2. Write the reaction, name the reaction and orientation of reactions
3. Account for reactivity/stability of compounds,
4. Identify/confirm the identification of organic compound

Course Syllabus:

UNIT-I 10 Hours

Classification, nomenclature and isomerism

Classification of Organic Compounds

Common and IUPAC systems of nomenclature of organic compounds

(up to 10 Carbons open chain and carbocyclic compounds)

Structural isomerism's in organic compounds

UNIT-II 10 Hours

Alkanes*, Alkenes* and Conjugated dienes* SP3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP2 hybridization in alkenes

E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E1 verses E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT-III 10 Hours

Alkyl halides*

SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and

rearrangement of carbocations.

SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions

Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene,

dichloromethane, tetrachloromethane and iodoform.

Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol,

chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-IV 10 Hours

Carbonyl compounds* (Aldehydes and ketones)

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation,

Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin

condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone,

Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT-V 8 Hours

Carboxylic acids*

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative

tests for carboxylic acids ,amide and ester Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

Aliphatic amines* - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

Text book [TB]:

1. Organic Chemistry byMorrison and Boyd

2. Organic Chemistry by I.L. Finar , Volume-I

3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.

Reference book(s) [RB]:

1.Organic Chemistry by I.L. Finar , Volume-I

2. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.

3. Organic Chemistry by P.L.Soni

4. Practical Organic Chemistry byMann and Saunders.

5. Vogel's text book of Practical Organic Chemistry

6. Advanced Practical organic chemistry by N.K.Vishnoi.

7. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

8. Reaction and reaction mechanism by Ahluwaliah/Chatwal

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	10	

2	Sessional exams	1hr	15	
3	End-Term Examination	3 hrs	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP203T	Biochemistry (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

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 Syllabus:

UNIT I 08 Hours

Biomolecules Introduction, classification, chemical nature and biological role of Bioenergetics

•carbohydrate, lipids, nucleic acids, amino acids and proteins. 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 Carbohydrate metabolism.

UNIT II 10 Hours

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 biological oxidation Hormonal regulation of blood glucose level and Diabetes mellitus Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers level Lipid metabolism.

UNIT III 10 Hours

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, Amino acid metabolism•fatty liver and obesity. General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alkeptonuria, tyrosinemia) Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline Catabolism of heme; hyperbilirubinemia and jaundice Nucleic acid metabolism and genetic information transfer.

UNIT IV 10 Hours

Biosynthesis of purine and pyrimidine nucleotides Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis Genetic code, Translation or Protein synthesis and inhibitors 62 Enzymes.

UNIT V 07 Hours

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 book [TB]:

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.

Reference book(s) [RB]:

1. Textbook of Biochemistry by Deb.

2. Outlines of Biochemistry by Conn and Stump

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3 hrs	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP204T	Pathophysiology (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

1. Describe the etiology and pathogenesis of the selected diseases.

2. Understanding of various types of injuries encountered during life.
3. Know the causatives organism of various diseases.
4. Study about STDs

Course Syllabus:

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 (Hours-10)

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 (Hours-10)

Haematological Diseases: Iron deficiency, megaloblastic anemia (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 (Hours-10)

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 (Hours-10)

Infectious diseases: Meningitis,Typhoid, Leprosy, Tuberculosis

Urinary tract infections

Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea

Text book [TB]:

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. Sharma Suresh C: Understanding of human diseases; BSA, Prakshan, New Delhi, Ist Edt

Reference book(s) [RB]:

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

2. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6 th edition; Philadelphia; WB Saunders Company; 1997.

3. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3 rd edition; London; Churchill Livingstone publication; 2003.

4. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3 hrs	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP205T	Computer Applications In Pharmacy (Theory)	3	0	0	3

Course Objectives: On completion of the syllabus, the students will be able to

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 Syllabus:

UNIT – I 06 hours

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 : Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

UNIT –II 06 hours

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 06 hours

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 06 hours

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

UNIT-V 06 hours

Computers as data analysis in Preclinical development:

Chromatographic dada analysis(CDS), Laboratory Information management

System (LIMS) and Text Information Management System(TIMS)

Text book [TB]:

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

Reference book(s) [RB]:

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

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1hr	15	
3	End-Term Examination	2 hrs	50	
		Total	75	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP206T	Environmental Sciences (Theory)	3	0	0	3

Course Objectives: On completion of the syllabus, the students will be able to

1. Create the awareness about environmental problems among learners.

2. Impart basic knowledge about the environment and its allied problems.

3. Develop an attitude of concern for the environment.

4. Motivate learner to participate in environment protection and environment improvement.

5. Acquire skills to help the concerned individuals in identifying and solving environmental problems

Course Syllabus:

Unit-I 10 hours

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 10 hours

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 10 hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Text book [TB]:

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

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

3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India,

4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

5. Anubha Kaushik & CP Kaushik,, New Age International Publisher

6. Pawar K.R. and Narkhede S.B. A text book of environmental Science, Nirali Prakashan.

Reference book(s) [RB]:

1. Clark R.S., Marine Pollution, Clanderson Press Oxford

2. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,

3. Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p

4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

5. Down of Earth, Centre for Science and Environment

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	10	
2	Sessional exams	1hr	15	
3	End-Term Examination	2 hrs	50	
		Total	75	

Course code	Course Title	L	T	P	C
BP207P	Human Anatomy and Physiology (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. Practical physiology is complimentary to the theoretical discussions in Physiology.
2. Practical allows the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings.
3. This is helpful for developing an insight into human anatomy and physiology.

Course Syllabus:

1. To study the integumentary and special senses using specimen, models, etc.,

2. To study the nervous system using specimen, models, etc.,

3. To study the endocrine system using specimen, models, etc

4. To demonstrate the general neurological examination

5. To demonstrate the function of olfactory nerve

6. To examine the different types of taste.

7. To demonstrate the visual acuity

8. To demonstrate the reflex activity

9. Recording of body temperature

10. To demonstrate positive and negative feedback mechanism.

11. Determination of tidal volume and vital capacity.

12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.

13. Recording of basal mass index.

14. Study of family planning devices and pregnancy diagnosis test.

15. Demonstration of total blood count by cell analyser.

16. Permanent slides of vital organs and gonads.

Text book [TB]:

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 56.

4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.

5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A. 6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New

Delhi.

7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.

8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference book(s) [RB]:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA

2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.

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

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	05	
2	Sessional exams	4hrs	10	
3	End-Term Examination	4hrs	35	
		Total	50	

Course code	Course Title	L	T	P	C
BP208P	Pharmaceutical Organic Chemistry -I (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. Write the structure, name and the type of isomerism of the organic compound

2. Write the reaction, name the reaction and orientation of reactions

3. Account for reactivity/stability of compounds,

4. Identify/confirm the identification of organic compound

Course Syllabus:

Systematic qualitative analysis of unknown organic compounds like

1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation

and unsaturation, etc.

2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test

3. Solubility test

4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.

5. Melting point/Boiling point of organic compounds

6. Identification of the unknown compound from the literature using melting point/ boiling point.

7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.

8. Minimum 5 unknown organic compounds to be analysed systematically.

9. Preparation of suitable solid derivatives from organic compounds

10. Construction of molecular models

Text book [TB]:

1. Practical Organic Chemistry by Mann and Saunders.

2. Vogel's text book of Practical Organic Chemistry

3. Advanced Practical organic chemistry by N.K.Vishnoi.

4. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

5. Reaction and reaction mechanism by Ahluwaliah/Chatwal

Reference book(s) [RB]:

1. Organic Chemistry by I.L. Finar , Volume-I

2. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.

3. Organic Chemistry by P.L.Soni

4. Practical Organic Chemistry byMann and Saunders.

5. Vogel's text book of Practical Organic Chemistry

6. Advanced Practical organic chemistry by N.K.Vishnoi.

7. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

8. Reaction and reaction mechanism by Ahluwaliah/Chatwal

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	05	
2	Sessional exams	4hrs	10	
3	End-Term Examination	4hrs	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP209P	Biochemistry (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. Physical, chemical properties and qualitative tests of lipids, carbohydrates, proteins,
2. amino acids
3. Analysis of normal and abnormal constituents of blood and urine
4. Microscopic examination of sputum and faecus
5. Enzyme activity

Course Syllabus:

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 book [TB]:

1. Essentials of Biochemistry by U. Satyanarayana, Books and Allied (P) Ltd.

2. A Textbook of Biochemistry by A.V.S.S. Rama Rao, UBS Publishers' Distributors Pvt. Ltd.

Reference book(s) [RB]:

1. Essentials of Biochemistry by U. Satyanarayana, Books and Allied (P) Ltd.

2. A Textbook of Biochemistry by A.V.S.S. Rama Rao, UBS Publishers' Distributors Pvt. Ltd.

3. Practical Biochemistry by R.C. Gupta and S. Bhargava.

4. Laboratory manual of Biochemistry by Pattabiraman and Sitaram Acharya

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	
1	Continuous mode	-	05	
2	Sessional exams	4hrs	10	
3	End-Term Examination	4hrs	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP210P	Computer Applications In Pharmacy (Practical)	0	0	2	1

Course Objectives: On completion of the syllabus, the students will be able to

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 Syllabus:

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 book [TB]:

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)

Reference book(s) [RB]:

1. 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

Evaluation Scheme:

	Evaluation Component	Duration	Weightage	

			(%)	
1	Continuous mode	-	05	
2	Sessional exams	2hr	05	
3	End-Term Examination	2 hr	15	
		Total	25	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 301T	Pharmaceutical Organic Chemistry-II (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

1. Write the structure, name and the type of isomerism of the organic compound
2. Write the reaction, name the reaction and orientation of reactions
3. Account for reactivity/stability of compounds,
4. Prepare organic compounds

Course Syllabus:

UNIT I (10 Hours)

Benzene and its derivatives

Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule

Reactions of benzene - nitration, sulphonation, halogenations reactivity, Friedel crafts alkylation- reactivity, limitations, Friedel crafts acylation.

Substituents, effect of substituents on reactivity and orientation of mono substitute benzene compounds towards electrophilic substitution reaction

Structure and uses of DDT, Saccharin, BHC and Chloramine

UNIT II (10 Hours)

Phenols - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols

Aromatic Amines -Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts

Aromatic Acids – Acidity, effect of substituents on acidity and important reactions of benzoic acid.

UNIT III (10 Hours)

Fats and Oils

Fatty acids – reactions
Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
Analytical constants – Acid value, Saponification value, Ester value,
Iodine value, Acetyl value, Reichert Meissl (RM) value -significance and principle involved in their determination.

UNIT IV (08 hours)

Polynuclear hydrocarbons:

Synthesis, reactions, Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives Special senses Structure and functions of eye, ear, nose and tongue and their disorders.

UNIT V (07 hours)

Cyclo alkanes

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only.

Text book [TB]:

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. 6. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz

Reference book(s) [RB]:

1. Advanced Organic Chemistry by Francis A. Carey, Richard J. Sundberg.
2. March's Advanced Organic Chemistry: Reactions, Mechanisms by Smith, Michael B., March, Jerry, Sixth Volume.

Evaluation Scheme:

S. No	**Evaluation Component**	**Duration**	**Weightage (%)**	**Date, Time & Venue**
1	Continuous mode	-	10	
2	Sessional exams	1 Hour	15	
3	End-Term Examination	3 Hour	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 302T	Physical Pharmaceutics (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Syllabus:

Unit I (10 Hours)

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing

solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications.

Unit II (10 Hours)

States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications.

Unit III (08 Hours)

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubalisation, detergency, adsorption at solid interface.

Unit IV (08 Hours)

Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

Unit V (07 Hours)

PH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

Text book [TB]:

1. Physical Pharmaceutics by C.V.S. Subramanyam
2. Text book of Physical Phramacy, by Gaurav Jain & Roop K. Khar

Reference book(s) [RB]:

1. Physical Pharmacy by Alfred Martin
2. Tutorial Pharmacy by Cooper and Gunn.
3. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.

4. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.

Evaluation Scheme:

S. No	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1 Hour	15	
3	End-Term Examination	3 Hour	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 303T	Pharmaceutical Microbiology (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

1. Understand methods of identification, cultivation, and preservation of various microorganisms
2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Course Syllabus:

UNIT I 10 Hours

Introduction, history of microbiology, its branches, scope and its importance. Introduction to

Prokaryotes and Eukaryotes Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy.

UNIT II 10 Hours

Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization.

UNIT III 10 Hours

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

UNIT IV 08 hours

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.

UNIT V 07 hours

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

Text book [TB]:

1. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
2. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
3. Peppler: Microbial Technology.

4. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
5. Edward: Fundamentals of Microbiology.
6. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
7. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
8. I.P., B.P., U.S.P.- latest editions.

Reference book(s) [RB]:

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4 edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill Edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.

Evaluation Scheme:

S. No	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1 Hour	15	
3	End-Term Examination	3 Hour	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP 304T	Pharmaceutical Engineering (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.

3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course syllabus:

UNIT-I 10 Hours

Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

UNIT- II 10 Hours

Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.

Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT-III 08 Hours

Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid

mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier.

UNIT- IV 08 Hours

Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.

Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT- V 07 Hours

Materials of pharmaceutical plant construction, Corrosion, and its prevention: Factors affecting during materials selected for pharmaceutical plant construction, Theories of corrosion, types of corrosion and their prevention. Ferrous and nonferrous metals, inorganic and organic non-metals, basic of material handling systems. Narcotic and non-narcotic analgesics.

Text book [TB]:

1. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
2. Remington practice of pharmacy- Martin, Latest edition.
3. Theory and practice of industrial pharmacy by Lachman., Latest edition.
4. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

Reference book(s) [RB]:

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition

Evaluation Scheme:

S. No	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1 Hour	15	

3	End-Term Examination	3 Hour	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP 305P	Pharmaceutical Organic Chemistry -II (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. Write the structure, name and the type of isomerism of the organic compound
2. Write the reaction, name the reaction and orientation of reactions
3. Account for reactivity/stability of compounds,
4. Prepare organic compounds

Course syllabus:

Course Content 4 Hours/Week

I. Experiments involving laboratory techniques
- Recrystallization
- Steam distillation.

II. Determination of following oil values (including standardization of reagents)
- Acid value
- Saponification value
- Iodine value

III. Preparation of compounds

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.

- 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/
- Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction
- Cinnammic acid from Benzaldehyde by Perkin reaction
- P-Iodo benzoic acid from P-amino benzoic acid

Text book [TB]:

1. Organic Chemistry byMorrison and Boyd.
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry byMann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.75
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kri

Reference book(s) [RB]:

1. Practical Organic Chemistry byMann and Saunders.
2. Vogel's text book of Practical Organic Chemistry
3. Advanced Practical organic chemistry by N.K.Vishnoi.75
4. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

Evaluation Scheme:

S. No	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	
2	Sessional exams	4 hours	10	

3	End-Term Examination	4 hours	35	
		Total	50	

Course code	Course Title	L	T	P	C
BP 306P	Physical Pharmaceutics I (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. Perform record and analyze the results of Physiocochemical properties of drug molecules in the designing the dosage forms
2. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms

Course Syllabus:

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

Text book [TB]:

1. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee

Reference book(s) [RB]:

1. Experimental Pharmaceutics by Eugene, Parott

Evaluation Scheme:

S. No	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	
2	Sessional exams	4 hours	10	
3	End-Term Examination	4 hours	35	
Total			50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 307P	Pharmaceutical Microbiology (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. Understand the various unit operations used in pharmaceutical industries.
2. Understand the material handling techniques.
3. Understand the various processes involved in pharmaceutical manufacturing process.
4. To appreciate and comprehend significance of plant lay out design for optimum use of resources.

Course Syllabus:

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Text book [TB]:

1. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
2. Remington practice of pharmacy- Martin, Latest edition.
3. Theory and practice of industrial pharmacy by Lachman., Latest edition.
4. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

Reference book(s) [RB]:

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	
2	Sessional exams	4 hours	10	
3	End-Term Examination	4 hours	35	
Total			50	

Course code	Course Title	L	T	P	C
BP 308P	Pharmaceutical Engineering (Practical)	0	0	4	2

Course Objectives: On completion of the syllabus, the students will be able to

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries

Course Syllabus:

1. Determination of radiation constant of brass, iron, unpainted and painted glass.
2. Steam distillation – To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger.
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.
6. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of varioussize frequency curves including arithmetic andlogarithmic probability plots.
9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such othermajor equipment.
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity

12. To study the effect of time on the Rate of Crystallization.

To calculate the uniformity Index for given sample by using Double Cone Blender

Text book [TB]:

1. Laboratory Manual of Pharmaceutical Engineering C.V.S. Subramanyam, J. Thimma settee

Reference book(s) [RB]:

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	
2	Sessional exams	4 hours	10	
3	End-Term Examination	4 hours	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP401T	Pharmaceutical Organic Chemistry –III (Theory)	3	1	0	4

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

1. To understand the methods of preparation and properties of organic compounds
2. To understand the stereo chemical aspects of organic compounds and stereo chemical reactions

3. To know the medicinal uses and other applications of organic compounds

Course Syllabus:

Unit-1 10 Hours

Stereo isomerism Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers Reactions of chiral molecules Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute.

Unit-II 10 Hours

Geometrical isomerism: Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereo selective reactions.

Unit-III 10 Hours

Heterocyclic compounds: Nomenclature and classification Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene.

Unit-IV 8 Hours

Synthesis, reactions and medicinal uses of following compounds/derivatives: Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives.

Unit-V 07 Hours

Reactions of synthetic importance Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation.

Text book [TB]:

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl

Reference book(s) [RB]:

1. Heterocyclic Chemistry by Raj K. Bansal
2. Organic Chemistry by Morrison and Boyd
3. Heterocyclic Chemistry by T.L. Gilchrist

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	--	10	
2	Sessional exams	1 hour	15	
3	End-Term Examination	3 hours	75	
	Total		100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP402T	Medicinal Chemistry -I	3	1	0	1

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

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship (SAR) of different class of drugs.
4. Write the chemical synthesis of some drugs

Course Syllabus:

UNIT- I 10 Hours

Introduction to Medicinal Chemistry

History and development of medicinal chemistry Physicochemical properties in relation to biological action Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein

binding, Chelation, Bioisosterism, Optical and Geometrical isomerism. Drug metabolism. Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.

UNIT- II 10 Hours

Drugs acting on Autonomic Nervous System: Adrenergic Neurotransmitters: Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution. Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.

Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists: Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide. Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III 10 Hours

Cholinergic neurotransmitters: Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution. Parasympathomimetic agents: SAR of Parasympathomimetic agents Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine

hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

UNIT- IV 08 Hours

Drugs acting on Central Nervous System

Sedatives and Hypnotics:

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

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital

Miscelleneous: Amides & imides: Glutethmide. Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

Antipsychotics: Phenothiazeines: SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Trifluprомazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazeines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital. Hydantoins:

Phenytoin*, Mephenytoin, Ethotoin Oxazolidine diones:

Trimethadione, Paramethadione Succinimides:

Phensuximide, Methsuximide, Ethosuximide* Urea and monoacylureas: Phenacemide, Carbamazepine* Benzodiazepines: Clonazepam

Miscellaneous: Primidone, Valproic acid , Gabapentin, Felbamate

UNIT – V 07 Hours

Drugs acting on Central Nervous System General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

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

Text book [TB]:

1. Harkishan Singh and Kapoor, Medicinal Chemistry.
2. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
3. Foye's Principles of Medicinal Chemistry.

Reference book(s) [RB]:

1. Burger's Medicinal Chemistry, Vol I to IV.
2. Introduction to principles of drug design- Smith and Williams.
3. Remington's Pharmaceutical Sciences.
4. Martindale's extra pharmacopoeia.
5. Organic Chemistry by I.L. Finar, Vol. II.
6. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
7. Indian Pharmacopoeia.
8. Text book of practical organic chemistry- A.I.Vogel.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	--	10	
2	Sessional exams	1 hour	15	

3	End-Term Examination	3 hours	75	
	Total		100	

Course code	Course Title	L	T	P	C
BP403T	Physical Pharmaceutics II (Theory)	3	1	0	4

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

1. To Understand various physicochemical properties of drug molecules in the designing the dosage forms

2. To Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations

3. To Understand the use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course syllabus:

UNIT-I 10 Hours

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.

UNIT-II 10 Hours

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III 10 Hours

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

UNIT-IV 08 Hours

Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT-V 07 Hours

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

Text book [TB]:

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.

Reference book(s) [RB]:

1. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
2. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1 hour	15	
3	End-Term Examination	3 hours	75	

		Total	100	

Course code	Course Title	L	T	P	C
BP404T	Pharmacology –I (Theory)	3	1	0	4

Course Objectives: On completion of the syllabus, the students will be able to

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Course Syllabus:

UNIT-I` 08 hours

1. General Pharmacology
   a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.
   b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT-II 12 Hours

General Pharmacology

a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal

transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.

b. Adverse drug reactions.
c. Drug interactions (pharmacokinetic and pharmacodynamic)
d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT-III 10 Hours

Pharmacology of drugs acting on peripheral nervous system

a. Organization and function of ANS.
b. Neurohumoral transmission,co-transmission and classification of neurotransmitters.
c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.
d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).
e. Local anesthetic agents.
f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV 08 Hours

Pharmacology of drugs acting on central nervous system

a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.
b. General anesthetics and pre-anesthetics.
c. Sedatives, hypnotics and centrally acting muscle relaxants.
d. Anti-epileptics
e. Alcohols and disulfiram

UNIT-V 07 Hours

Pharmacology of drugs acting on central nervous system

a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.
b. Drugs used in Parkinsons disease and Alzheimer's disease.

c. CNS stimulants and nootropics.

d. Opioid analgesics and antagonists

e. Drug addiction, drug abuse, tolerance and dependence.

Text book [TB]:

1. .K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medica Publishers (P) Ltd, New Delhi.
2. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale' Pharmacology,.Churchil Livingstone Elsevier
3. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata M Graw-Hill

Reference book(s) [RB]:

1. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.

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

3. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology

4. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1 hour	15	
3	End-Term Examination	3 hours	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP405T	Pharmacognosy -I (Theory)	3	1	0	4

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

1. To know the techniques in the cultivation and production of crude drugs
2. To know the crude drugs, their uses and chemical nature
3. Know the evaluation techniques for the herbal drugs
4. To carry out the microscopic and morphological evaluation of crude

Course Syllabus:

Unit I 10 Hours

Introduction to Pharmacognosy:

(a) Definition, history, scope and development of Pharmacognosy

(b) Sources of Drugs – Plants, Animals, Marine & Tissue culture

(c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

Unit II 10 Hours

Cultivation, Collection, Processing and storage of drugs of natural origin: Cultivation and Collection of drugs of natural origin

Factors influencing cultivation of medicinal plants. Plant hormones and their applications.

Polyploidy, mutation and hybridization with reference to medicinal plants

Conservation of medicinal plants

Unit III 10 Hours

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy. Edible vaccines

Unit IV 08 Hours

Pharmacognosy in various systems of medicine:

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

Unit V 07 Hours

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey

Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

Text book [TB]:

1. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
2. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
3. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
4. Essentials of Pharmacognosy, Dr. SH. Ansari, IInd edition, Birla publications, New Delhi, 2007

Reference book(s) [RB]:

1. W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	10	
2	Sessional exams	1 hour	15	
3	End-Term Examination	3 hours	75	
		Total		

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP406P	Medicinal Chemistry – I (Practical)	0	0	4	2

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

1. To understand various physicochemical properties of drug molecules in the designing the dosage forms

2. To Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations

3. To understand the use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Syllabus:

I Preparation of drugs/ intermediates

- 1,3-pyrazole
- 1,3-oxazole
- Benzimidazole
- Benztriazole
- 2,3- diphenyl quinoxaline
- Benzocaine
- Phenytoin
- Phenothiazine
- Barbiturate

II Assay of drugs

- Chlorpromazine
- Phenobarbitone
- Atropine
- Ibuprofen
- Aspirin
- Furosemide

III Determination of Partition coefficient for any two drugs

Text book [TB]:

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.

Reference book(s) [RB]:

1. Remington's Pharmaceutical Sciences.
2. Martindale's extra pharmacopoeia.
3. Organic Chemistry by I.L. Finar, Vol. II.
4. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
5. Indian Pharmacopoeia.
6. Text book of practical organic chemistry- A. I. Vogel.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	
2	Sessional exams	4 hrs	10	
3	End-Term Examination	4 hrs	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 407P	Physical Pharmaceutics- II (Practical)	0	0	4	2

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

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms

2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations

3. Demonstrate use of physicochemical properties in the formulation development and

evaluation of dosage forms.

Couse syllabus:

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

Text book [TB]:

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.

Reference book(s) [RB]:

1. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3,Marcel Dekkar Inc.
2. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1,2, 3. Marcel Dekkar Inc.
3. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	
2	Sessional exams	4 hrs	10	
3	End-Term Examination	4 hrs	35	

		Total	50	

Course code	Course Title	L	T	P	C
BP408P	Pharmacology –I (Practical)	0	0	4	2

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

1. Understand the pharmacological actions of different categories of drugs

2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.

3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.

4. Observe the effect of drugs on animals by simulated experiments

5. Appreciate correlation of pharmacology with other bio medical sciences

Course Syllabus:

1. Introduction to experimental pharmacology.

2. Commonly used instruments in experimental pharmacology.

3. Study of common laboratory animals.

4. Maintenance of laboratory animals as per CPCSEA guidelines.

5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.

6. Study of different routes of drugs administration in mice/rats.

7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time

in mice.

8. Effect of drugs on ciliary motility of frog oesophagus

9. Effect of drugs on rabbit eye.

10. Effects of skeletal muscle relaxants using rota-rod apparatus.

11. Effect of drugs on locomotor activity using actophotometer.

12. Anticonvulsant effect of drugs by MES and PTZ method.

13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.

14. Study of anxiolytic activity of drugs using rats/mice. 15. Study of local anesthetics by different methods

Text book [TB]:

1. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
3. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,

Reference book(s) [RB]:

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 Mc Graw-Hill

3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics

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

5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	

2	Sessional exams	4 hrs	10	
3	End-Term Examination	4 hrs	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP409P	Pharmacognosy and Phytochemistry-I (Practical)	0	0	4	2

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

1. Understand the pharmacological actions of different categories of drugs

2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.

3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.

4. Observe the effect of drugs on animals by simulated experiments

5. Appreciate correlation of pharmacology with other bio medical sciences

Course Syllabus:

1. Introduction to experimental pharmacology.

2. Commonly used instruments in experimental pharmacology.

3. Study of common laboratory animals.

4. Maintenance of laboratory animals as per CPCSEA guidelines.

5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.

6. Study of different routes of drugs administration in mice/rats.

7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.

8. Effect of drugs on ciliary motility of frog oesophagus

9. Effect of drugs on rabbit eye.

10. Effects of skeletal muscle relaxants using rota-rod apparatus.

11. Effect of drugs on locomotor activity using actophotometer.

12. Anticonvulsant effect of drugs by MES and PTZ method.

13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.

14. Study of anxiolytic activity of drugs using rats/mice. 15. Study of local anesthetics by different methods

Text book [TB]:

1. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
3. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,

Reference book(s) [RB]:

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 Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	-	5	

2	Sessional exams	4 hours	10	
3	End-Term Examination	4 hours	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP501 T	Medicinal Chemistry – II (Theory)	3	1	0	4

Course 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 of drugs

3. Know the Structural Activity Relationship of different class of drugs

4. Study the chemical synthesis of selected drugs

Course Syllabus:

UNIT- I 10 HOURS

Antihistaminic agents:

Histamine, receptors and their distribution in the humanbody

H1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

H2-antagonists: Cimetidine*, Famotidine, Ranitidin.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan, 107 Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Miscellaneous: Cisplatin, Mitotane.

UNIT – II 10 HOURS

Anti-anginal: Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole. Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. Diuretics: Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide, Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid. Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT- III 10 HOURS

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol 10HOURS

Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

UNIT IV 8HOURS

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol

Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone

Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT – V 7 HOURS

Antidiabetic agents:

Insulin and its preparations

Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone

Repaglinide, Nateglinide

Glucosidase inhibitors: Acrabose, Voglibose.

Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

Miscellaneous: Phenacaine, Diperodon, Dibucaine.*

1. **Text book [TB]:**
2. Organic Chemistry by I.L. Finar, Vol. II.

3. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
4. Indian Pharmacopoeia.
5. Text book of practical organic chemistry- A.I.Vogel.

Reference book(s) [RB]:

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.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	To be announced later
2	Sessional exams	1 Hour	15	To be announced later
3	End-Term Examination	3 Hours	75	To be announced later
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP502T	Industrial Pharmacy-I (Theory)	3	1	0	4

Course Objectives: Upon completion of this course the student should 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

Course Syllabus:

UNIT-I 07Hours

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

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

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemization, polymerization BCS classification of drugs & its significant Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT-II 10 Hours

Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipment and tablet tooling. b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.

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

Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT-III 08Hours Capsules:

Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.

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

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of

pellets

UNIT-IV 10Hours

Parenteral Products:

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

b. Production procedure, production facilities and controls, aseptic processing

c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.

d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-V 10 Hours

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

Text book [TB]:

1. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.
2. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005

Reference book(s) [RB]:

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

5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Lieberman& Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill Livingstone, Latest edition

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 hour	15	
3	End-Term Examination	3 Hours	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP503T	Pharmacology-II (Theory)	3	1	0	4

Course 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 of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory by animals simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Course Syllabus:

UNIT-I 10 Hrs.

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 10 Hrs.

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 10 Hrs.

3. Autocoids and related drugs

a. Introduction to autacoids and classification

b. Histamine, 5-HT and their antagonists.

c. Prostaglandins, Thromboxane's and Leukotriene's.

d. Angiotensin, Bradykinin and Substance P.

e. Non-steroidal anti-inflammatory agents

f. Anti-gout drugs

g. Ant rheumatic drugs

UNIT-IV 08 Hrs.

4. Pharmacology of drugs acting on endocrine system

a. Basic concepts in endocrine pharmacology.

b. Anterior Pituitary hormones- analogues and their inhibitors.

c. Thyroid hormones- analogues and their inhibitors.

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

d. Insulin, Oral Hypoglycemic agents and glucagon.

e. ACTH and corticosteroids.

UNIT-V 07Hrs.

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, histamine and 5-HT

Text book [TB]:

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 Mc Graw-Hill.

3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

Reference book(s) [RB]:

1) Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.

(2) K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

(3) Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

(4) Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 hour	15	
3	End-Term Examination	3 hours	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP504T	Pharmacognosy And Phytochemistry-I	3	1	0	4

	(Theory)				

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

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 Syllabus:

Unit I: 7 Lectures

Metabolic pathways in higher plants and their determination

a) Brief study of basic metabolic pathways and formation of different secondary metabolites through 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: 14 Lectures

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following

secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,

Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta

Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis

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

Tannins: Catechu, Pterocarpus

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

Glycosides: Senna, Aloes, Bitter Almond

Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

Unit III: 6 Lectures

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: 10 Lectures

Industrial production, estimation and utilization of the following phytoconstituents:

Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine,

Taxol, Vincristine and Vinblastine

Unit V: 8 Lectures

Basics of Phytochemistry: Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

Text book [TB]:

1. Pharmacognosy & Phytochemistry by Deore SL, Khadabadi SS, Baviskar BA
2. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition,Nirali Prakashan, New Delhi.

Reference book(s) [RB]:

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,Nirali Prakashan, New Delhi.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 hour	15	
3	End-Term Examination	3 hours	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP505T	Pharmaceutical Jurisprudence (Theory)	3	1	0	4

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

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

Course Syllabus:

UNIT-I 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties.

Manufacture of drugs – Prohibition of manufacture and 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 of new drug, loan license and repacking license.

UNIT-II 10 Hours

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

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

UNIT-III 10 Hours

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties

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 Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV 08 Hours

Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties

Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties

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

UNIT-V 07 Hours

1. Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee.

2. Code of Pharmaceutical ethics D efinition, Pharmacist in relation to his job, trade

medical profession and his profession, Pharmacist's oath

3. Medical Termination of Pregnancy Act

4. Right to Information Act

5. Introduction to Intellectual Property Rights (IPR)

Text book [TB]:

1. Forensic Pharmacy by B. Suresh
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-byM.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain

Reference book(s) [RB]:

1. Drugs and Cosmetics Act/Rules by Govt. of India publications.
2. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
3. Narcotic drugs and psychotropic substances act by Govt. of India publications
4. Drugs and Magic Remedies act by Govt. of India publication.
5. Bare Acts of the said laws published by Government. Reference books (Theory)

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue

1	Continuous mode		10	
2	Sessional exams	1 hour	15	
3	End-Term Examination	3 hours	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 506P	Industrial Pharmacy -I (Practical)	0	0	4	2

Course 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

Course Syllabus:

1. Preformulation studies on paracetamol/aspirin/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. Quality control test of (as per IP) marketed tablets and capsules

9. Preparation of Eye drops/ and Eye ointments

10. Preparation of Creams (cold / vanishing cream)

11. Evaluation of Glass containers (as per IP)

Text book [TB]:

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

Reference book(s) [RB]:

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

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

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

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

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous Mode	-----	05	
2	Sessional Exams	4 hours	10	
3	End Term Examination	4 hours	35	
Total			50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 507P	Pharmacology-II (Practical)	0	0	4	2

Course objectives: Upon completion of the course the student shall be able to

1. Understand the pharmacological actions of different categories of drugs.
2. To explain the mechanism of drug action at organ system/sub cellular/macromolecular levels
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.

Course Syllabus:

1. Introduction to in-vitro pharmacology and physiological salt solutions.

2. Effect of drugs on isolated frog heart.

3. Effect of drugs on blood pressure and heart rate of dog.

4. Study of diuretic activity of drugs using rats/mice.

5. DRC of acetylcholine using frog rectus abdominis muscle.

6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.

7. Bioassay of histamine using guinea pig ileum by matching method.

8. Bioassay of oxytocin using rat uterine horn by interpolation method.

9. Bioassay of serotonin using rat fundus strip by three-point bioassay.

10. Bioassay of acetylcholine using rat ileum/colon by four-point bioassay.

11. Determination of PA2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).

12. Determination of PD2 value using guinea pig ileum.

13. Effect of spasmogens and spasmolytics using rabbit jejunum.

14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.

15. Analgesic activity of drug using central and peripheral methods

Text book [TB]:

1.. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

2. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,.Churchil Livingstone Elsevier

3.. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

4. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.

Reference book(s) [RB]:

1. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

2. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous Mode	-----	05	
2	Sessional Exams	4 hours	10	
3	End Term Examination	4 hours	35	
Total			50	

Course code	Course Title	L	T	P	C
BP508P	Pharmacognosy And Phytochemistry - II (Practical)	0	0	4	2

Course objectives: Upon completion of the course the student shall be able to

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 Syllabus:

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

Text book [TB]:

1. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

2. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,.Churchil Livingstone Elsevier

3. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

4. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.

Reference book(s) [RB]:

1. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

2. Modern Pharmacology with clinical Applications, by Charles R.Craig & Robert.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous Mode	-----	05	
2	Sessional Exams	4 hours	10	
3	End Term Examination	4 hours	35	
Total			50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP601T	Medicinal Chemistry – III (Theory)	3	1	0	4

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

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

Course Syllabus:

UNIT – I 10 Hours

Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

β-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin Tetracyclines

Tetracycline,Oxytetracycline, Chlortetracycline, Minocycline, Doxycyclin

UNIT – II 10 Hours

Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the 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 10 Hours

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

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

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

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine. Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

UNIT – IV 08 Hours

Antifungal agents: Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin. 127 Sulphonamides and Sulfones

Historical 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 07 Hours

Introduction to Drug Design Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications chemistry: solid phase and solution phase synthesis.

Text book [TB]:

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

Reference book(s) [RB]:

1. Introduction to principles of drug design- Smith and Williams.
2. Remington's Pharmaceutical Sciences.
3. Martindale's extra pharmacopoeia. 129
4. Organic Chemistry by I.L. Finar, Vol. II.
5. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3hr	75	

		Total	100	

Course code	Course Title	L	T	P	C
BP602T	Pharmacology-III (Theory)	3	1	0	4

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

1. The students will get familiar with the basic biochemical aspects of human body and its relation to diseases.
2. Students will understand various drugs used for various ailments
3. Understanding of mechanism of action adverse drug reactions
4. To understand the basic strategies to manage the poisoning

Course Syllabus:

UNIT-I 10hours

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 10hours

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 10hours

3. Chemotherapy

a. Antitubercular agents

b. Antileprotic agents

c. Antifungal agents

d. Antiviral drugs

e.Anthelmintics

f. Antimalarial drugs

g. Antiamoebic agents

UNIT-IV 08hours

3. Chemotherapy

l. Urinary tract infections and sexually transmitted diseases.

m. Chemotherapy of malignancy.

4. Immunopharmacology

a. Immunostimulants

b. Immunosuppressant

Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

UNIT-V 07hours

5. Principles of toxicology

a. Definition and basic knowledge of acute, subacute and chronic toxicity.

b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity

c. General principles of treatment of poisoning

d. Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenic poisoning

6. Chronopharmacology

a. Definition of rhythm and cycles.

b. Biological clock and their significance leading to chronotherapy.

Text book [TB]:

1. K.D. Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

Reference book(s) [RB]:

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 Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage	Date, Time & Venue

			(%)	
1	Continuous mode		10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP603T	Herbal Drug Technology (Theory)	3	1	0	4

Course 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 drug product
2. Know the who and ich guidelines for evaluation of herbal drugs
3. Know the herbal cosmetics, natural sweeteners, nutraceutical
4. Appreciate patenting of herbal drugs, GMP

Course Syllabus:

UNIT-I 11 Hours

Herbs as raw materials Definition of herb, herbal medicine, herbal medicinal product, herbal

drug preparation

Source of Herbs Selection, identification and authentication of herbal materials

Processing of herbal raw material Biodynamic Agriculture Good agricultural practices in cultivation of medicinal plants including Organic farming.

Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine

Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy

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

UNIT-II 7 Hours

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Castro- intestinal diseases.

Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-III 10 Hours

Herbal Cosmetics 134 Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

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 forms like phytosomes

UNIT- IV 10 Hours

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products:

Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bio-prospecting and Bio-piracy

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 07 Hours

General Introduction to Herbal Industry :

Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

Schedule T – Good Manufacturing Practice of Indian systems of medicine

Components of GMP (Schedule – T) and its objectives

Infrastructural requirements, working space, storage area, machinery and equipment's, standard operating procedures, health and hygiene, documentation and records.

Text book [TB]:

1.Pharmacognosy by Kokate, Purohit and Gokhale

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

3. Pharmacognosy & Phytochemistry by V.D.Rangari

4. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine

Reference book(s) [RB]:

1. Textbook of Pharmacognosy by Trease & Evans.

2. Textbook of Pharmacognosy by Tyler, Brady & Robber

Evaluation Scheme:

	Evaluation Component	Duration	Weightage	Date

			(%)	
1	Continuous mode		10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3hrs	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP604T	Biopharmaceutics and Pharmacokinetics (Theory)	3	1	0	4

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

1. The basic concepts in Biopharmaceutics and Pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. Understand the concepts of bioavailability and bioequivalence of drug products and their significance.

Course syllabus:

UNIT-I 10 Hours

Introduction Biopharmaceutics to Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes, Distribution Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

UNIT- II 10 Hours

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro-in-vivo correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- III 10 Hours

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - KE, t1/2, Vd,AUC,Ka, Clt and CLR- definitions methods of eliminations, understanding of their significance and application

UNIT- IV 08 Hours

Multicompartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

UNIT- V 07 Hours

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity. c. Michaelis-mention method of estimating parameters, Explanation with example of drugs.

Text book [TB]:

1. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,VallabhPrakashan Pitampura, Delhi.

Reference book(s) [RB]:

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 Internationaledition.USA

Evaluation Scheme:

	Evaluation Component	Duration	Weightage	Date, Time & Venue

			(%)	
1	Continuous mode		10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP605T	Pharmaceutical Biotechnology (Theory)	3	1	0	4

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

1. Understand the importance of Immobilized enzymes in Pharmaceutical Industries
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 Syllabus:

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 Substitutes.

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 and transposons. 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 Substitutes.

Text book [TB]:

1. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.

Reference book(s) [RB]:

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of 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 Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP606T	Pharmaceutical Quality Assurance (Theory)	3	1	0	4

Course 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 pharmaceutical
4. Understand the responsibilities of QA, Industries & QC departments

Course Syllabus:

Unit I

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP Total Quality Management (TQM): Definition, elements,

philosophies ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines Quality by design (QbD): Definition, overview, elements of QbD program, tools ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration NABL accreditation : Principles and procedures

Unit II

Organization and personnel: Personnel responsibilities, training, hygiene and personal records. Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. 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 packing 141 materials. Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

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 Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, 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.

Text book [TB]:

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.

Reference book(s) [RB]:

1. How to Practice GMP's – P P Sharma

2. Good Laboratory Practice Regulations, 2 nd Edition, Sandy Weinberg Vol. 69
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1hr	15	
3	End-Term Examination	3hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP607P	Medicinal Chemistry- III (Theory)	0	0	4	2

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

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

Course Syllabus:

Preparation of drugs and intermediates

1 Sulphanilamide

2 7-Hydroxy,

3.methyl coumarin

4. Chlorobutanol

5. Triphenyl imidazole

6. Tolbutamide

7. 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, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Text book [TB]:

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

Reference book(s) [RB]:

1. Introduction to principles of drug design- Smith and Williams.

2. Remington's Pharmaceutical Sciences.

3. Martindale's extra pharmacopoeia. 129

4. Organic Chemistry by I.L. Finar, Vol. II.

5. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		05	
2	Sessional exams	4hr	10	
3	End-Term Examination	4hr	35	
		Total	50	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 608 P	Pharmacology-III (Practical)	0	0	4	2

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

1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases

2. Comprehend the principles of toxicology and treatment of various poisonings

3. Appreciate correlation of pharmacology with related medical sciences.

Course Syllabus:

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
8. Test for pyrogens (rabbit method)
9. Determination of acute oral toxicity (LD50) of a drug from a given data
10. Determination of acute skin irritation / corrosion of a test substance
11. Determination of acute eye irritation / corrosion of a test substance
12. Calculation of pharmacokinetic parameters from a given data
13. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
14. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon

Text book [TB]:

1. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,

2. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,

3. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

Reference book(s) [RB]:

1. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
2. 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.
3. The Point Lippincott Williams & Wilkins

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		05	
2	Sessional exams	4hrs	10	
3	End-Term Examination	4hrs	35	

		Total	50	

Course code	Course Title	L	T	P	C
BP 609 P	Herbal Drug Technology (Practical)	0	0	4	2

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

1. Understand raw material as source of herbal drugs from cultivation to herbal drug product
2. Know the WHO and ICH guidelines for evaluation of herbal drugs
3. Know the herbal cosmetics, natural sweeteners, Nutraceuticals
4. Appreciate patenting of herbal drugs, GMP.

Course Syllabus:

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 Pharmacopoeias 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

Text book [TB]:

1.Pharmacognosy by Kokate, Purohit and Gokhale

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

3. Pharmacognosy & Phytochemistry by V.D.Rangari

4. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy

Reference book(s) [RB]:

1. Textbook of Pharmacognosy by Trease & Evans.

2. Textbook of Pharmacognosy by Tyler, Brady & Robber

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		05	
2	Sessional exams	4hr	10	
3	End-Term Examination	4hr	35	
		Total	50	

Course code	Course Title	L	T	P	C
BP 701T	Instrumental Methods of Analysis (Theory)	3	1	0	4

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

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis.

2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

Course Syllabus:

UNIT – I 10 Hours

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 10 Hours

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

UNIT–III 10 Hours

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 08 Hours

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 07 Hours

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 application.

Text book [TB]:

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. Text book of Medical Physiology- Arthur C, Guyton and John.E.Hall. Miamisburg, OH, U.S.A.
5. Text book of Pharmaceutical Analysis by Dr S. Ravi Sankar

Reference book(s) [RB]:

1. Organic spectroscopy by William Kemp
2. Quantitative Analysis of Drugs by D. C. Garrett
3. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
4. Spectrophotometric identification of Organic Compounds by Silverstein

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	To be announced later
2	Sessional exams	1hr	15	
3	End-Term Examination	3 hrs	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 702T	Industrial pharmacy-II (Theory)	3	1	0	4

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

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch.
3. Know different Laws and Acts that regulate pharmaceutical industry.
4. Understand the approval process and regulatory requirements for drug

Course Syllabus:

UNIT-I 10 Hours

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 10 Hours

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 equipments, 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 10 Hours

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 08 Hours

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 07 Hours

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 book [TB]:

1. Text Book of Industrial. Pharmacy-II, Dr. S.S. Sheikh et al.

2. Consise course in Industrial Pharmacy-II by Kriti Malviya & et al.

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.

Reference book(s) [RB]:

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

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	To be announced later
2	Sessional exams	1hr	15	
3	End-Term Examination	3 hrs	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP 703T	Pharmacy Practice (Theory)	3	1	0	4

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

1. Know various drug distribution methods in a hospital
2. Appreciate the pharmacy stores management and inventory control
3. Monitor drug therapy of patient through medication chart review and clinical review
4. Obtain medication history interview and counsel the patients
5. Identify drug related problems
6. Detect and assess adverse drug reactions
7. Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. Know pharmaceutical care services
9. Do patient counselling in community pharmacy;
10. Appreciate the concept of rational drug therapy.

Course Syllabus:

Unit I

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

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

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 150 Drug and Poison information Centre, Sources of drug information, Computerized services, and storage and retrieval of information. c) Patient counseling Definition of patient counseling; steps involved in patient counseling, 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

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

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 151 Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee. c) Interpretation of Clinical Laboratory Tests Blood chemistry, hematology, and urinalysis.

Text book [TB]:

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

Reference book(s) [RB]:

1. Scott LT. Basic skills in interpreting laboratory data, 4thed. American Society of Health System Pharmacists Inc; 2009.
2. Parmar N.S. Health Education and Community Pharmacy, 18th ed. India: CBS Publishers & Distributers; 2008.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 hr	15	
3	End-Term Examination	3 hrs	75	

		Total	100	

Course code	Course Title	L	T	P	C
BP 704T	Novel Drug Delivery System (Theory)	3	1	0	4

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

1. To understand various approaches for development of novel drug delivery systems.

2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

Course Syllabus:

Unit-I 10 Hours

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 10 Hours

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 10 Hours

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting

permeation, permeation enhancers, basic components of TDDS, formulation approaches.

Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

Nasopulmonary 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 08 Hours

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

Unit-V 07 Hours

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 book [TB]:

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. Text Book of NDDS by Dr. Aijaz A. Sheikh et al.

5. Current Trends in NDDS by Dr. B. Arul & et al

Reference book(s) [RB]:

1. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001)

2. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 hr	15	
3	End-Term Examination	3 hrs	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP 705P	Instrumental Methods of Analysis (Practical)	0	0	4	2

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

1. Quantitative & Qualitative Analysis of drugs using various analytical instruments.
2. Demonstration of HPLC instrument
3. Separations of sugars and amino acids by chromatography.
4. Assay of drugs via various instrumentations

Course Syllabus:

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds.
2. Estimation of dextrose by colorimetry
3. Estimation of sulfanilamide by colorimetry
4. Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5. Assay of paracetamol by UV- Spectrophotometry
6. Estimation of quinine sulfate by fluorimetry
7. Study of quenching of fluorescence
8. Determination of sodium by flame photometry
9. Determination of potassium by flame photometry

10. Determination of chlorides and sulphates by nephelo turbidometry
11. Separation of amino acids by paper chromatography
12. Separation of sugars by thin layer chromatography
13. Separation of plant pigments by column chromatography
14. Demonstration experiment on HPLC
15. Demonstration experiment on Gas Chromatography

Text book [TB]:

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. Indian Pharmacopoeia 8th edition, 2018

Reference book(s) [RB]:

1. Organic spectroscopy by William Kemp
2. Quantitative Analysis of Drugs by D. C. Garrett
3. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		05	To be announced later
2	Sessional exams	4 hrs	10	
3	End-Term Examination	4hrs	35	
		Total	50	

Course code	Course Title	L	T	P	C
BP801T	Biostatistics and Research Methodology (Theory)	3	1	0	4

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

1. Know the operation of M.S. Excel, SPSS, R and MINITAB ® , DoE (Design of Experiment)
2. Know the various statistical techniques to solve statistical problems
3. Appreciate statistical techniques in solving the problems

Course Syllabus:

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 modeling: Hypothesis testing in Simple and Multiple regression models

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, 2 2 , 23design. Advantage of factorial design

Response Surface methodology: Central composite design, Historical design, Optimization Techniques

Text book [TB]:

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha

Reference book(s) [RB]:

1. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam
2. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue

1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP802T	Social and Preventive Pharmacy (Theory)	3	1	0	4

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

1. Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
2. Have a critical way of thinking based on current healthcare development.
3. Evaluate alternative ways of solving problems related to health and pharmaceutical issues.

Course Syllabus:

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 158 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 book [TB]:

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 Rabindra Nath, Saha Indranil, 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

Reference book(s) [RB]:

1. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2 nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
2. Park Textbook of Preventive and Social Medicine, K Park, 21 st Edition, 2011, ISBN-14: 9788190128285, Banarsidas Bhanot Publishers.
3. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP803T	Pharma Marketing Management (Theory)	3	1	0	4

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

1. The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

Course Syllabus:

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 labeling 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; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.

Text book [TB]:

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

Reference book(s) [RB]:

1. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
2. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, IndianContext,Macmilan India, New Delhi.
3. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
4. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP804 ET	Pharmaceutical Regulatory Science (Theory)	3	1	0	4

Course Objectives: Upon completion of the subject student shall be able to;

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets

Course Syllabus:

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 drug product in overseas market Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical

Document (eCTD), ASEAN Common Technical Document (ACTD)research.

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 book [TB]:

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences,Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus

Reference book(s) [RB]:

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143 7.
2. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
3. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin

and Frederick P. Ognibene

4. Drugs: From Discovery to Approval, Second Edition By Rick Ng

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP805 T	Pharmacovigilance (Theory)	3	1	0	4

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

1. Why drug safety monitoring is important?
2. History and development of pharmacovigilance
3. National and international scenario of pharmacovigilance
4. Dictionaries, coding and terminologies used in pharmacovigilance
5. Detection of new adverse drug reactions and their assessment
6. International standards for classification of diseases and drugs
7. Adverse drug reaction reporting systems and communication in pharmacovigilance
8. Methods to generate safety data during pre-clinical, clinical and post approval phases of drugs' life cycle
9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
12. CIOMS requirements for ADR reporting
13. Writing case narratives of adverse events and their quality

Course Syllabus:

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 book [TB]:

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.

Reference book(s) [RB]:

1. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy,Wiley Publishers.
2. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills:G. Parthasarathi, Karin NyfortHansen,Milap C. Nahata
3. National Formulary of India
4. Text Book of Medicine by Yashpal Munjal
5. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP806 ET	Quality Control and Standardization of Herbals (Theory)	3	1	0	4

Course Objectives: Upon completion of the subject student shall be able to;

1. Know WHO guidelines for quality control of herbal drugs
2. Know Quality assurance in herbal drug industry
3. Know the regulatory approval process and their registration in Indian and international markets
4. Appreciate EU and ICH guidelines for quality control of herbal drugs

Course Syllabus:

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 book [TB]:

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.

Reference book(s) [RB]:

1. 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.
2. 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.
3. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
4. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
5. 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.

6. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode	1 Hr	10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP807ET	Computer Aided Drug Design (Theory)	3	1	0	4

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

1. Design and discovery of lead molecules
2. The role of drug design in drug discovery process
3. The concept of QSAR and docking
4. Various strategies to develop new drug like molecules.
5. The design of new drug molecules using molecular modeling software

Course Syllabus:

UNIT-I 10 Hours

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 10 Hours

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 10 Hours

Molecular Modeling 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 08 Hours

Informatics & Methods in drug design

Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT-V 07 Hours

Molecular Modeling: Introduction to molecular mechanics and quantum

mechanics.Energy Minimization methods and Conformational Analysis,

global conformational minima determination.

Text book [TB]:

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.

Martin YC. "Quantitative Drug Design" Dekker, New York

Reference book(s) [RB]:

1. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
2. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP808ET	Cell and Molecular Biology (Theory)	3	1	0	4

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

1. Summarize cell and molecular biology history.
2. Summarize cellular functioning and composition.
3. Describe the chemical foundations of cell biology.
4. Summarize the DNA properties of cell biology.

5. Describe protein structure and function.
6. Describe cellular membrane structure and function.
7. Describe basic molecular genetic mechanisms.
8. Summarize the Cell Cycle.

Course Syllabus:

Unit I 10Hours

a) Cell and Molecular Biology: Definitions 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 10 Hours

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 10 Hours

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 08 Hours

a) Science of Genetics

b) Transgenics and Genomic Analysis

c) Cell Cycle analysis

d) Mitosis and Meiosis

e) Cellular Activities and Checkpoints

Unit V 07 Hours

a) Cell Signals: Introduction

b) Receptors for Cell Signals

c) Signaling Pathways: Overview

d) Misregulation of Signaling Pathways

e) Protein-Kinases: Functioning

Text book [TB]:

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

Reference book(s) [RB]:

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP809ET	Cosmetic Science (Theory)	3	1	0	4

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

1. The course aims to provide an understanding of cosmetic concepts and techniques and their applications in the pharmaceutical industry.

Course Syllabus:

UNIT I 10Hours

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 10 Hours

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-phylene diamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth

whitening, Mouthwash.

UNIT III 10 Hours

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 08 Hours. Principles of Cosmetic Evaluation:Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties of Soaps, and syndet bars. Evolution and skin benfits.

UNIT V 07 Hours

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 book [TB]:

1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3. Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.

Reference book(s) [RB]:

1. Drugs and Cosmetics Act/Rules by Govt. of India publication
2. Medicinal and Toilet preparations act 1955 by Govt. of India publications.

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	

3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP810ET	Pharmacological Screening Method (Theory)	3	1	0	4

Course Objectives: Upon completion of the subject student shall be able to;

1. Appreciate the applications of various commonly used laboratory animals.
2. Appreciate and demonstrate the various screening methods used in preclinical research
3. Appreciate and demonstrate the importance of biostatistics and research methodology
4. Design and execute a research hypothesis independently

Course Syllabus:

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, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaethetics.

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

Text book [TB]:

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.

Reference book(s) [RB]:

1. Drug discovery and Evaluation by Vogel H.G.
2. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
3. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**

BP811ET	Advanced Instrumentation Techniques (Theory)	3	1	0	4

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

1. Understand the advanced instruments used and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Understand the calibration of various analytical instruments
4. Know analysis of drugs using various analytical instruments.

Course Syllabus:

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, Analyzers-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 immuno assay 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 book [TB]:

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.

Reference book(s) [RB]:

1. Quantitative Analysis of Drugs by D. C. Garrett
2. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
3. Spectrophotometric identification of Organic Compounds by Silverstein

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	**Course Title**	**L**	**T**	**P**	**C**
BP812ET	Dietary Supplements and Nutraceuticals (Theory)	3	1	0	4

Course Objectives: Upon completion of the subject student shall be able to:

1 Understand the need of supplements by the different group of people to maintain healthy life.

2 Understand the outcome of deficiencies in dietary supplements.

3 Appreciate the components in dietary supplements and the application.

4 Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

Course Syllabus:

UNIT I 07 hours

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 15 hours

Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following

a) Carotenoids- α and β-Carotene, Lycopene, Xanthophylls, leutin

b) Sulfides: Diallyl sulfides, Allyl trisulfide.

c) Polyphenolics: Reservetrol

d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones

e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum

f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans

g) Tocopherols

h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats,

wheat bran, rice bran, sea foods, coffee, tea and the like.

UNIT III 07 hours

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 10 hours

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 06 hours

a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.

b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.

c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

Text book [TB]:

1. Dietetics by Sri Lakshmi

2. Role of dietary fibres and neutraceuticals in preventing diseases by K.T Agusti and P.Faizal:

BS Punblication.

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 2nd Edn. Avery Publishing Group, NY (1997).

6. G. Gibson and C.williams Editors 2000 Functional foods Woodhead Publ.Co.London.

7. Goldberg, I. Functional Foods. 1994. Chapman and Hall, New York.

8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good 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

Reference book(s) [RB]:

1. Advanced Nutritional Therapies by Cooper. K.A., (1996)
2. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988)

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode		10	
2	Sessional exams	1 Hr	15	
3	End-Term Examination	3 Hr	75	
		Total	100	

Course code	Course Title	L	T	P	C
BP813PW	Project Work	0	0	12	6

Course Objectives: Upon completion of the subject student shall be able to;

1. To learn the literature review
2. To learn soft skills
3. To learn technical skills

Course Syllabus:

As per the Interest of the students and teacher (Supervisor)

Text book [TB]:

Reference book(s) [RB]:

Evaluation Scheme:

	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue
1	Continuous mode			
2	Sessional exams			
3	End-Term Examination	4 Hr	150	
		Total	150	