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

RESTRUCTURED CURRICULUM FOR B. PHARMACY PROGRAMME (Self Supporting Course) TO BE IMPLEMENTED WITH EFFECT FROM THE ACADEMIC YEAR 2018-2019

SYLLABUS
Choice based credit system (CBCS) Pattern

B. PHARMACY PROGRAMME

(2016-17 Regulations)

Choice based credit system (CBCS) Pattern

Vision

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

Mission

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

Programme Educational Objectives

1. To produce Pharmacy graduates with strong fundamental concepts and high technical competence in pharmaceutical sciences and technology.

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

Programme Outcomes

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

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

8. Update the knowledge through continuous learning to face the challenges for better services to the community.
9. Design and develop process to perform experiments in various pharmaceutical areas like Pharmacognosy, Pharmaceutical Chemistry including Analytical Chemistry, Pharmaceutical Biotechnology, Pharmacology, Formulation and Development.
10. Fill the gap with other health care communities to provide innovative solutions for the purpose of maintain public health.
11. Develop team spirit for the development of student profession to the social needs and professional ethics.
12. Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

Programme Specific Outcomes

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

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

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

Subject Code	Subject	Periods per week	Examination hours	Marks		Total Marks	No of Credits
				Sessional	Seneste r End		
I B.PHARM- I SEMESTER							
BPH 101A	Mathematics (For Bi.P.C. Stream)	3	3	20	80	100	4
BPH 101B	Biology (For M.P.C. Stream)	3	2	10	40	50	2
BPH 101C	Biology Practicals (For M.P.C. Stream)	2	2	–	50	50	2
BPH 102	English & Soft Skills	2	3	20	80	100	4
BPH 103	Pharmaceutical. Inorganic Chemistry	3	3	20	80	100	4
BPH 104	Pharmaceutical Organic Chemistry-I	3	3	20	80	100	4
BPH 105	Human Anatomy and Physiology	3	3	20	80	100	4
BPH 106	Pharmaceutical Inorganic Chemistry Practicals	4	3	–	100	100	2
BPH 107	Pharmaceutical Organic Chemistry-I Practicals	4	3	–	100	100	2
BPH 108	Human Anatomy and Physiology Practicals	4	3	–	100	100	2
I B.PHARM- II SEMESTER							
BPH 109	General & Dispensing Pharmacy	3	3	20	80	100	4
BPH 110	Pharmaceutical Organic Chemistry-II	3	3	20	80	100	4
BPH 111	Computer applications	2	3	20	80	100	4
BPH 112	Pharmacognosy I	3	3	20	80	100	4
BPH 113	Human Anatomy and	3	3	20	80	100	4

	Physiology and Pathophysiology						
BPH 114	General & Dispensing Pharmacy Practicals	4	3	–	100	100	2
BPH 115	Pharmaceutical Organic Chemistry-II Practicals	4	3	–	100	100	2
BPH 116	Computer applications Practicals	2	3	–	100	100	2
BPH 117	Pharmacognosy I Practicals	4	3	–	100	100	2
II B.PHARM- I SEMESTER							
BPH 201	Physical Pharmacy – I	3	3	20	80	100	4
BPH 202	Pharmaceutical Engineering	3	3	20	80	100	4
BPH 203	Pharmaceutical Organic Chemistry – III	3	3	20	80	100	4
BPH 204	Pharmaceutical Biohemistry	3	3	20	80	100	4
BPH 205	Environmental Studies	3	3	20	80	100	4
BPH 206	Physical Pharmacy – I Practicals	4	3	–	100	100	2
BPH 207	Pharmaceutical Engineering Practicals	4	3	–	100	100	2
BPH 208	Pharmaceutical Organic Chemistry – III Practicals	4	3	–	100	100	2
BPH 209	Pharmaceutical Biohemistry Practicals	4	3	–	100	100	2
II B.PHARM- II SEMESTER							
BPH 210	Physical Pharmacy – II	3	3	20	80	100	4
BPH 211	Pharmaceutical Analysis – I	3	3	20	80	100	4
BPH 212	Pharmaceutical Technology – I	3	3	20	80	100	4
BPH 213	Pharmacognosy – II	3	3	20	80	100	4
BPH 214	Pharmacoinformatic	3	3	20	80	100	4

	s & basics in drug discovery						
BPH 215	Physical Pharmacy – II Practicals	4	3	–	100	100	2
BPH 216	Pharmaceutical Analysis – I Practicals	4	3	–	100	100	2
BPH 217	Pharmaceutical Technology–I Practicals	4	3	–	100	100	2
BPH 218	Pharmacognosy – II Practicals	4	3	–	100	100	2
III B.PHARM- I SEMESTER							
BPH 301	Pharmaceutical Technology-II	3	3	20	80	100	4
BPH 302	Medicinal Chemistry-I	3	3	20	80	100	4
BPH 303	Pharmacology-I	3	3	20	80	100	4
BPH 304	Pharmaceutical Microbiology	3	3	20	80	100	4
BPH 305	Drug store & Industrial. Managment.& Marketing	3	3	20	80	100	4
BPH 306	Pharmaceutical Technology-II Practicals	4	3	–	100	100	2
BPH 307	Medicinal Chemistry-I Practicals	4	3	–	100	100	2
BPH 308	Pharmaceutical Microbiology Practicals	4	3	–	100	100	2
III B.PHARM- II SEMESTER							
BPH 309	Medicinal Chemistry-II	3	3	20	80	100	4
BPH 310	Pharmacology-II	3	3	20	80	100	4
BPH 311	Pharmaceutical. Analysis II	3	3	20	80	100	4
Choice Based Credit Course							
BPH 312 A	Forensic Pharmacy	3	3	20	80	100	4
BPH 312 B	Clinical Trials						
BPH 312	Industrial.Pharmacy						

C	& cosmetic Technology						
BPH 313	Medicinal Chemistry-II Practicals	4	3	–	100	100	2
BPH 314	Pharmacology-II Practicals	4	3	–	100	100	2
BPH 315	Pharmaceutical. Analysis II Practicals	4	3	–	100	100	2
IV B.PHARM- I SEMESTER							
BPH 401	Medicinal Chemistry-III	3	3	20	80	100	4
BPH 402	Pharmacology-III	3	3	20	80	100	4
BPH 403	Pharmacognosy-III	3	3	20	80	100	4
BPH 404	Biopharmaceutics & Pharmacokinetics	3	3	20	80	100	4
Choice Based Credit Course							
BPH 405 A	Chemistry of Natural Products	3	3	20	80	100	4
BPH 405 B	Hospital&Community pharmacy						
BPH 405 C	Pharmacovigilance						
BPH 406	Medicinal Chemistry-III Practicals	4	3	–	100	100	2
BPH 407	Pharmacology-III Practicals	4	3	–	100	100	2
BPH 408	Pharmacognosy-III Practicals	4	3	–	100	100	2
BPH 409	Biopharmaceutics & Pharmacokinetics Practicals	4	3	–	100	100	2
IV B.PHARM- II SEMESTER							
BPH 410	Novel Drug Delivery Systems	3	3	20	80	100	4
BPH 411	Pharmaceutical Biotechnology	3	3	20	80	100	4
BPH 412	Clinical. Pharmacy &Therapeutics	3	3	20	80	100	4
BPH 413	Comprehensive Viva Voce			–	50	50	2
BPH 414	Project Work &Seminar		3	–	100	100	4

SEMESTER I

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 101A	Mathematics (For Bi.P.C. Stream)	3	4
Sessional Marks:20		**End Semester Examination Marks :80**	

Objectives:

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

Course Content:

UNIT I: Algebra

Arithmetic Progression-Geometric progression, quadratic equations: Equations reducible to quadratics, simultaneous equations (linear and quadratic). Logarithms: Logarithm of a real number to an arbitrary base, theorems on logarithms, application of logarithms in pharmaceutical computations and Partial fractions.

UNIT II: Trigonometry

Trigonometric ratios and the relations between them, Sin(A+B),Cos(A+B), Tan(A+B) formulae only, Trigonometric ratios of multiple and sub-multiple angles, Sum and Product transformations.

UNIT-III: Co-ordinate Geometry

Distance between points, Area of a triangle, Co-ordinates of a point dividing a given line segment in a given ratio, equation to a straight line in different forms, angle between straight lines-point of intersection.

UNIT-IV: Differential and Integral calculus

Limit of a function, differentiation, derivative, derivatives of trigonometric functions, logarithmic and partial differentiation, maxima and minima (elementary), derivatives of second order.

Integration: Definition of integration, integration by substitution, integration by parts and definite integrals. *Differential Equations:* Order and degree, formation of a differential, solution of first order differential equations (variable separable method) application of first order and first degree differential equation

TEXT BOOKS:

1. Intermediate first and second year mathematics text books printed and published by Telugu academy.
2. A textbook of Remedial mathematics by P.Seshagiri Rao.
3. Grewal B. S. Numerical Methods Khanna Publishers.
4. Steve Dobbs & Jane, Miller Advanced Level Mathematics Statistics Cambridge University Press.
5. Adams Dany Spencer Laboratory Mathematics Carrol & Graphs.
6. Jenny Olive Maths. A Students Survival Guide Cambridge University Press.

James R Barrante Applied Mathematics for Physical Chemistry (II ED.) Prentice Hall Incorporations

Course Outcomes:

After Completion of the course the student able to

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

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 101B	Biology (For M.P.C. Stream)	3	2
Sessional Marks : 10		**End Semester Examination Marks : 40**	

Objectives:

Course Content:

UNIT I

Plant and animal cell: Detailed structure. Structure, types and functions. Structure, types and functions of nucleic acids.. Mitosis, meiosis, different types of plant tissues and their functions.

UNIT II

Salient features and classification of plants into major groups-algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms. Classification of animal kingdom and salient features of each phyla.

UNIT III:

Simple and compound microscopes used in biology; section cutting; staining and mounting of sections. Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed.

UNIT IV

Study of Structure and life history of parasites: Amoeba, Entamoeba, Trypanosoma, Plasmodium, Taenia, Ascaris, Schistosoma, Oxyuris and Ancylostoma.

General structure and life history of insects like Cockroach, Mosquito and Housefly.

Article I. TEXT BOOKS

1. Intermediate First Year and Second Year Botany / Zoology Text Books printed and published by Telugu Academy, Himayatnagar, Hyderabad.

2. A.C. Dutta, Text Book of Botany

3. Botany for Degree students Vol I & II by B.P. Pandey

Course Outcomes:

After Completion of the course the student able to

1. Understand anatomical and physiological aspects of plant kingdom
2. Understand anatomical and physiological aspects of animal kingdom
3. Develop insights into the certain important histological aspects of plant species
4. Disease biology of parasites.

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 101C	Biology Practicals (For M.P.C. Stream)	2	2
Sessional Marks :00		**End Semester Examination Marks : 50**	

Objectives:

Course Content:

1. EXPERIMENTS:

Care and uses of microscope
Gross identification of permanent slides plants/animals mentioned in the theory syllabus.
Morphology of plant parts indicated in theory.
Preparation, Microscopic Examination of stem, root and leaf of mono and dicot leaves.
Structure of human parasites and insects mentioned in the theory with the help of specimen.

II. Demo/Workshop:

Dissection of cockroach mouth parts

III. Seminar/Assignment/Group discussion:

Preparation of Herbarium of plant parts indicated in theory and study of salient features for identification.

Text Books:

Intermediate Botany/Zoology Text manuals printed and published by Telugu academy, himayatnagar, Hyderabad.

Course Outcomes:

After Completion of the course the student able to

1. Knowledge of basic techniques of microscopy.
2. Understand the morphological characters and their physiological significance (plants/ animals)
3. Understand the importance of herbarium preparation in establishing the taxonomy of plant species.
4. Understand the anatomical aspects of parasites/ insects.

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 102	English & Soft Skills	2	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

1. To enable students speak effectively in formal and informal situation.
2. To equip the students with a wide range of vocabulary, so as to enable them use language more effectively.
3. To understand the strategies of the interviews to facilitate better response during the"placement" interviews.
4. To understand the characteristics of successful group discussions.

Course Content:

UNIT-1

Role and importance of communication, verbal and non verbal communication, group communication, effective communication, barriers to communication, communication media, participating in discussions, conduct of seminars, conferences etc., making presentations through collection, evaluation, organizing the information, interacting with learners and teachers, role of wit and humor in communication

UNIT-2

Agreements and disagreements, how to use a dictionary,, synonyms and antonyms, one word substitutes, comprehension.

Communication through letters, official and personal letters, letters of complaint, letters of enquiries and responses, writing memos, circulars and notices, what to avoid while writing, paragraph writing.

UNIT-3

Scientific/technical report writing, drafting and delivering a speech, resume writing and interview techniques

Grammar: sequence of tenses, voice, articles, direct and indirect speech, degrees of comparison , common errors in English made by Indian learners of English.

Concepts of learning and listening, types and methods of learning and listening, learning and listening of knowledge, attitudes, skills and practices.

UNIT-4

Effective Communication: Elements of Communication,7Cs of Communication, Types of Communication, Speaking and Listening, Non Verbal Communication, Writing Skills, Body Language, Improvement of Communication Skills.

Effective Public Speaking: Audience Analysis, Choosing the Subject, Preparation of Speech, Presentation, Use of various Aids, Launching Pad, Evaluation, How to overcome Stage fear.

Team management: identifying goals, setting targets, delegating tasks, monitoring and coordination.

Interview facing: preparation of the bio-data, preparation for the interview, attire, postures and gestures, right way of answering questions

(i) **Textbooks:**

1. "Bussiness correspondence and report writing"R.C.sharma and Krishna mohan ,Tata Mc grawhill publishers,New Delhi
2. Communicative English,E.Suresh Kumar,RajKamal Publications,Hyd.
3. "Selections of Modern English Prose"Ed by Hladhar Panda,Published by Universities Press(India)Pvt Ltd,Hyd.
4. A hand book of English for professionals, 2nd edition by P.Eliah Published by Pharma book syndicate

Course Outcomes:

After Completion of the course the student able to

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

4. This course will prepare the young pharmacy student to interact effectively with doctors, nurses and other health workers eventually letting them add value to the pharmaceutical business

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 103	Pharmaceutical. Inorganic Chemistry	3	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

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

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

3. The medicinal and pharmaceutical importance of inorganic compounds.

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

5. Knowledge on methods to prepare inorganic pharmaceuticals.

Course Content:

UNIT-1

Brief introduction to I.P. and its contents, sources of impurities in pharmaceutical substances. Principles and procedure for the limit test of chlorides, sulphates, iron, lead and arsenic; test for purity (excluding assays) for the following compounds; aluminium hydroxide gel, barium sulphate, bismuth subcarbonate, calcium gluconate, ferrous sulphate, hydrogen peroxide, iodine, magnesium carbonate, potassium bromide, potassium permanganate and zinc oxide.

UNIT-2

Major intra and extracellular electrolytes: requirements and functions of the following inorganic ions in the human body, sodium, potassium, calcium, chloride, iron, copper, magnesium and iodine. Physiological acid base balance, electrolytes used in acid-base therapy, acids and bases buffers and their pharmaceutical applications.

UNIT-3

Gastrointestinal agents: Acidifying agents, antacids, protective and adsorbents and saline cathartics. Methods of preparation and uses of the following a) Acidifying agents; hydrochloric acid, sodium acid phosphate. b) Antacids: aluminium hydroxide, sodium carbonate, magnesium carbonate (light and heavy), milk of magnesia, mnagnesium trisilcate and magnesium oxide c) Protective and adsorbents: boric acid, zinc oxide, calamine, kaolin, charcoal d) Saline cathartics: sodium potassium tartarate, magnesium sulphate, sodium phosphate.

Topical agents: Protectives, astringents, antifungal, anti protozoal and antiseptics. Ammoniated mercury, borax, hydrogen peroxide, iodine, yellow mercuric oxide, potassium permanganate, silver nitrate, silver protein, sulphar, sodium perborate, alum, bismuth subcarbonate, bismuth subgallate, zinc oxide, zinc sulphate.

UNIT-4

Gases and respiratory stimulants: oxygen , carbon dioxide, helium , nitrogen, nitrous oxide; non essential and essential trace ions; dental products, anticarries agents, dentifrices; inorganic radiopharmaceuticals and their pharmaceutical applications. Inorganic radioopaque substances. Preparation and uses of the following reagents a) lithium aluminium hydride b)anhydrous aluminium chloride c) perchloric acid d)borontrifluoride e)ceric ammonium sulphate. Miscllaneouc inorganic pharmaceutical agents: a) expectorants and emetics b) haematinics c)poisons and antidotes d) sedatives e) complexing and chelating agents. Principles and procedures involved in identification of simple salts.

Text books:

1. Practical pharmaceutical chemistry by A.H. Beckett and J.B. Stenlake
2. Indian pharmacopoeia
3. Text book of pharmaceutical chemistry by Bently and Driver
4. Inorganic pharmaceutical chemistry by Rogers
   Inorganic pharmaceutical and medicinal chemistry by Block, Roche, Soine and Wilson.

Course Outcomes:

After Completion of the course the student able to

1. To understand the history and concept of pharmacopoeia and its editions.
2. Knowledge about the sources of impurities and methods to determine the impurities in inorganic pharmaceuticals.
3. Identification of limit tests of different pharmaceutical inorganic compounds.
4. Understand the methods to prepare inorganic pharmaceuticals, handling and medical applications of radiopharmaceuticals.

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 104	Pharmaceutical Organic Chemistry-I Theory	3	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

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

Course Content:

UNIT-1

Structure and properties of organic molecules: Atomic and molecular orbitals. Bond formation in organic compounds, hybridization, polarity of bonds and molecules, intra and inter molecular forces, influence of structure on physical properties, modern theories of acids and bases, homolysis and heterolysis, types of reagents and reactions, inductive and mesomeric effects; Nomenclature, concepts of isomerism.

UNIT-2

Alkanes: Nomenclature, general methods of preparation, energy of activation, transition state, reactions of alkanes with special reference to substitution, free radicals chain reactions, stability of free radicals, bond dissociation energy, free rotation about carbon-carbon single bonds and conformational isomerism, study of composition and uses of liquid paraffin, soft paraffin, white soft paraffin, hard paraffin and ichtammol.

Stereo chemistry: Optical isomerism, chirality, configuration, specification of R and S configuration, sequence rules, diastereomers, meso structures, stereoisomerism, Cyclo alkanes: Nomenclature, preparation, Bayer's strain theory, chair and boat conformations of cyclohexane, axial and equatorial bonds.

Halo alkanes: Nomenclature, general methods of preparation nucleophilic substitution, Sn1 and Sn2 mechanisms, E1 and E2 mechanisms for eliminations, preparation and uses of ethyl chloride, chloroform and iodoform.

UNIT-3

Alkenes: Nomenclature, two important methods of preparation, structure of ethylene, carbonium ion theory electrophilic and free radical addition to carbon-carbon double bonds, Markovnikav's rule, peroxide effect, ozonolysis, introduction to alkadienes, stability of conjugated dienes, theory of resonance and hypercongugation.

Alkynes: Nomenclature, acidity and general methods of preparation, structure of acetylene, reactions of alkynes (Formation of metal acetylides, stereo specific reduction of alkynes, addition reactions of alkynes).

UNIT-4

Organometallic compounds: preparation and synthetic applications of Grignard reagents.

Alcohols: Nomenclature, industrial sources, general metod of preparation and reactions, study of ethyl alcohol, rectified spirit, industrial spirit, proof spirit, absolute alcohol, benzyl alcohol, cinnamyl alcohol, propylene glycol and glycerol.

Ethers: Nomenclature, general methods of preparation and reactions (Williamson's-synthesis and action of HI), preparation and uses of diethyl ether.

Article II. TEXT BOOKS

1. Organic chemistry, Bruice 6th Edition, Pearson Publisher, 2010.

2. Reactions and Mechanism, Jerry March, 4th edition Wiley Publication.

3. Organic chemistry, Carey, 8th Edition, Mc Graw-Hill.

4. Organic chemistry, Pillai Orient Longman Publisher.

5. The Fundamentals Principles of Organic Chemistry Vol.I & Vol. II, I.L.Finar, ELBS/Longman

Course Outcomes:

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

1. Guess and write the structure, systematic/ trivial name, and pharmaceutical uses (if any)

associated with the specifiedorganic compounds.

2. Understand the general concept of isomerism and distinguish structural isomers.
3. Infer the chemical nature of the compounds on the basis of qualitative chemical tests.
4. Understand the significance of certain electronic effects with respect to the reactivity/ stability of organic compounds specified. In addition, develop insight into molecular events happening in organic reactions (reaction mechanisms).

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 105	Human Anatomy and Physiology Theory	3	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

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

Course Content:

UNIT I:

Cell, tissues and musculoskeletal system

a. Scope of anatomy and physiology, basic terminology used in these subjects. Structure of cell, its components and their functions. Body fluids, biological molecules and homeostasis.

b. Elementary tissues of the human body: epithelial, connective, muscular and nervous tissues, their sub-types and characteristics.

c. Haemopoietic system: Composition and functions of blood and its elements, blood groups and their significance and mechanism of blood coagulation.

UNIT II:

Cardiovascular system

Basic anatomy of the heart. Physiology of heart, blood vessels and circulation. Basic pulmonary, coronary and hepatic system. Understanding of cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation.

Lymph and Lymphatic System: Composition, formation and circulation of lymph; Basic physiology and functions of spleen.

UNIT III:

Skeletal System

Structure, composition and functions of skeleton. Joints, classification of joints, types of movements of synovial joints.

Gross anatomy, physiology of muscle contraction and physiological properties of skeletal muscles.

UNIT IV:

Digestive System*:*

Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food.

Respiratory System: Gross anatomy of respiratory tract, Functions of its different parts, functions, mechanism and regulation of respiration, respiratory volumes and vital capacity.

TEXT BOOKS:

1. Principles of Anatomy and Physiology, Tortora, G.J and Anagnodokas, N.P Harper & Row Publishers N.Y.
2. Text Book of Human Anatomy, Ross & Willson, M.J.Mycek S.B Gerther and MMPER.
3. Human Physiology, C.C.Chatterjee.Rosen Educational Publishing 13th Edition.
4. Textbook of Medical Physiology, Guyton, AC Guyton WB Sannders Company, 1995. 12th Edition Saunder's – Elsewier.

Course Outcomes:

After completion of the course the student able to

1. Know the fundamental knowledge on the structure and functions of the various systems of the human body.
2. understanding all the homeostatic mechanisms of the body
3. Understand the relationship of anatomy with various disciplines of pharmacy.

4. Understand the dynamic constancy of the body, cell and its components, tissue and types of tissue, blood and its function and composition

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 106	Pharmaceutical Inorganic Chemistry Practicals	4	2
Sessional Marks : 00		**End Semester Examination Marks : 100**	

Objectives:

1. Understanding the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.
2. The medicinal and pharmaceutical importance of inorganic compounds.
4. Identification on different types of limit test in pharmaceutical inorganic compounds.
5. Knowledge on methods to prepare inorganic pharmaceuticals.

Course Content:

I. Experiments:

A) Limit tests for the following as per the procedure given in Indian Pharmacopoeia (1996 – including the latest addenda)

1) Chlorides
2) Sulphates
3) Heavy metals
4) Iron
5) Arsenic
6) Modifications in limit test for chlorides and sulphates in potassium permanaganate, sodium bicarbonates, sodium benzoates and sodium salicylates.

B)

7) Balances and Weighing; Calibration of weights, Pipette and Burette.

8) Preparation and standardization of **Hydrochloric acid solution (0.1N).**

9) Preparation and standardization of **Potassium permanganate** solution

(0.1N & 0.1M).

10) Preparation of a primary standard solution of 0.1N **Potassium hydrogen-phthalate.**

11) Preparation and standardization of 0.1N **EDTA** solution.
12) Preparation and purification of **Boric acid**.
13) Preparation and purification of **Sodium citrate**.
14) Preparation and purification of **Potash alum**.
15) Preparation and purification of **Magnesium stearate**.
16) Assay of sodium bicarbonate and assay of **Boric acid** (Neutralization).
17) Assay of Calcium gluconate (or) any calcium compounds (Complexometry).
18) Assay of Copper sulphate (Redox titration).
19) Assay of Sodium acetate (Non-aqueous titration).
20) Assay of Ferrous sulphate (Oxidation-reduction / Redox titration).
21) Swelling power of **bentonite**
22) Test for purity (Ammonium salts in potash alum, presence of iodates in KI)

II. Demo/workshop

Labelling, handling, storage of inorganic compounds, safety practices in laboratory, identification of anions and cations.

III. Assignment/Seminar/Group Discussion

1. Radioactive metals in the environment and its importance
2. Importance of inorganic compounds in cancer
3. Different catalysts which are used in various organic preparations and their characteristics
4. Inorganic metals used in biochemical functions and their rule.

Text Books:

1. Practical pharmaceutical chemistry, Part-I, A.H.Beckett and J.B.Stenlake, The Athtone press, University of London, London.
2. Inorganic chemistry, Gary L.Miessler and Donald A.Tarr,3/e, Pearson education, New Delhi
3. Inorganic pharmaceutical chemistry, P. Gundu Rao, Vallabh Prakashan, Delhi.
4. Advanced Inorganic Chemistry, G.D.Tuli, Satya prakash, S.Chand 2006.
5. Modern inorganic chemistry by William L. Jolly Mc Graw-Hill, New Yark 1984
6. Indian Pharmacopoeia 1996, 2007.

Course Outcomes:

After Completion of the course the student able to

1. To recall the sources of limit tests, preparation and identification of compounds.

2. To demonstrate the preparation of inorganic pharmaceuticals

3. Knowledge to perform modified limit tests

4. Selection of suitable method for the preparation of inorganic pharmaceuticals and assessment of their quality (assays).

CO-PO Mapping

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

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

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 107	Pharmaceutical Organic Chemistry-I Practicals	4	2
Sessional Marks : 00		**End Semester Examination Marks : 100**	

Objectives:

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

Course Content:

I. Experiments:

A. Introduction to Equipment & Glassware, Recrystallization method, details of melting point (m.p), boiling point (b.p) and distillation

B. Determination of physical constants like melting point and boiling point.

C. Identification of the following organic compounds by systematic qualitative analysis including acidic/basic/neutral character, aromatic/aliphatic, saturated/unsaturated, test for special elements and functional group identification tests.

a. Phenols
b. Amides
c. Amines
d. Carboxylic acids
e. Aldehydes and Ketones
f. Alcohols
g. Anilides and nitrocompounds
h. Esters

II. Demo / work shop

Crystallization by using various solvents, Melting point for different crystals of same compound, Laboratory safety exercises, Atomic models emphasizing hybridization/organic molecules

III. Seminar/assignment/group discussion

Article III. Exercise on nomenclature of compounds, Knowledge on CAS, IUPAC, ACS, material safety data and different types of explosive, oxidizable substances.

Text Books:

1. Text Book of Practical Organic Chemistry, Vogel's, 5th Edition Pearson.
2. Laboratory Manual of Organic Chemistry, R.K. Bansal, New Age International 5th Edition 2007.
3. Advanced Practical Organic Chemistry, O.P. Agarwal, 3rd Edition Goel Publication.
   Practical Organic Chemistry, F.G.Mann & B.C. Saunders, Pearson 4th Edition

Course Outcomes:

After Completion of the course the student able to

1. Assess the identity of organic compounds in terms of the physico-chemical properties.
2. Get hands- on- experience in basic techniques of organic synthesis.
3. Assess the basic chemical nature of organic classes through general systematic qualitative identification tests.
4. Understand the important of molecular models in representing basic concepts like hybridization, conformation, and configuration of organic molecules.

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 108	Human Anatomy and Physiology Practicals	4	2
Sessional Marks : 00		**End Semester Examination Marks : 100**	

Objectives:

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

Course Content:

I. EXPERIMENTS:

1. Study of compound microscope
2. Microscopic study of different tissues

3. Study of human skeleton
4. Estimation of Haemoglobin in blood
5. Determination of bleeding time
6. Determination of clotting time
7. Study of neubar's chamber
8. Estimation of R.B.C. count
9. Estimation of W.B.C count
10. Estimation of D.L.C.
11. Recording of body temperature
12. Recording of pulse rate and blood pressure.
13. Experiments on spirometry -- Determination of vital capacity etc.,
14. Study of different family planning appliances

II. DEMO/ WORK SHOP

1. Study of different systems with the help of charts and models.

2. Study of ECG - basic understanding of electrocardiogram-PQRST waves and their significance

III. SEMINAR/ ASSIGNMENT/ GROUP DISCUSSION

1. Lysosomal storage disorders

2. Vaccination and vaccination schedule

Text Books:

1. Practical human anatomy and physiology, S.R.Kale & R.R.Kale, latest edition.
2. Practical Biochemistry, Plummer.
3. Human Anatomy & Physiology, Elaine N. Marieb.
4. Human Physiology, A.K. Chartterjee.

Course Outcomes:

After Completion of the course the student is able to

1. Differentiate the structures of the various systems of the human body.
2. Perform the experiments like blood cell count, hemoglobin content, bleeding and clotting time and various physiological Parameters theoretically and practically.
3. Identify the structural (microscopical and macroscopical) and functional details about different organ systems such as cardiovascular, lymphatic, digestive, muscular system.
4. Knowledge of basic clinical diagnostic methods.

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

I B.PHARM- II SEMESTER

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 109	General & Dispensing Pharmacy	3	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

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 theirQuality

UNIT I Origin and History

Development of pharmacy, Evolution of Pharmacy education &Pharma industry in India.Originanddevelopment of the Pharmacopoeias, History of Ayurveda, salient features of IP, USP and BP.

UNIT II Dispensing Pharmacy

Drug - Definition, Essential characteristics. Dosage form – Definition, Classification, Formulation andpurpose. Principles of dispensing, parts of prescription, handling of prescription, general dispensingprocedures, source of errors in prescription and care required in dispensing procedures includinglabeling of dispensed products.

UNIT III Pharmaceutical calculations

Weights and Measures, introduction to Latin terms, Percentage calculations, alligation method, proofspirit calculations, displacement value and calculations of isotonicity adjustment. Posology-factorsaffecting selection of dose & dosage form and calculations of doses.

UNIT IV Principles involved and procedures adopted in dispensing of the following

classes of preparations:

i) Powders ii) Solutions iii) Mixtures iv)Lotions& liniments v) Suspensions vi) Emulsions and vii) Ointments.

Incompatibilities: Introduction, classifications, methods to overcome incompatibility.

TEXT BOOKS

1 Dispensing Pharmacy, Cooper &Gunns CBS, Publ. and Distributors New Delhi – (2008).

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

REFERENCES

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

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

Course Outcomes:

After Completion of the course the student able to

1. Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product
2. Understanding the evolution of pharmacy.
3. Knowing the charecteristics of dosage forms .
4. Ensuring the safety and security of patients and the public.

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 110	Pharmaceutical Organic Chemistry-II	3	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

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

UNIT - I:

Alcohols: Nomenclature, classification, general methods of preparation, physical properties, hydrogen bonding, characteristic nucleophilic substitution reactions (replacement of -OH by -Cl), elimination reactions, and relative reactivities of 1º, 2º and 3º alcohols, MeerweinPondorffVerley reduction.

Phenols: Nomenclature, general methods of preparation, physical properties, acidity of phenols,stability of phenoxide ion, reactions of phenols, Kolbe-Schmidt reaction, Fries rearrangement, and Reimer-Tiemann Reaction.

Ethers: Nomenclature, Williamson's synthesis, action of hydro iodic acid on ethers (Ziesel'smethod).

UNIT - II:

Aromatic Hydrocarbons:

Kekule Structure of Benzene, Bond Length, Heat Of Hydrogenation, Stability, Molecular Orbital Picture Of Benzene, Aromaticity, Huckel's rule, Nomenclature of benzene derivatives, Characteristic reactions of Benzene, Theory of reactivity and orientation in Monosubstituted Benzenes

Aromatic Halogen Compounds:

Nomenclature, Low reactivity of Halobenzenes towards nucleophilic substitution, Arenes, Benzyne ion Concept.

UNIT-III:

Polynuclear Aromatic Hydrocarbons

Nomenclature, Structure and Aromatic Character of Naphthalene, Anthracene and Phenanthrene resonance structures, electron density and reactivity, electrophilic substitution, oxidation and reduction reactions.

UNIT - IV:

Carboxylic acids: Nomenclature, intermolecular association, stability of carboxylate anion, twoimportant methods of preparation, decarboxylation, functional groups reactions and reduction of carboxylic acids.

Acid derivatives: (acid chlorides, anhydrides, esters and amides): Nomenclature, reactions likehydrolysis, reduction of esters and amides, Hofmann's degradation of amides. Brief account of preparation and properties of malonic and acetoacetic esters, their importance in organic synthesis.

Nitro compounds: Nomenclature, acidity of nitro compounds containingα- hydrogens, reductivereactions of aromatic nitro compounds.

Amines: Nomenclature, classification, basicity of amines, relative reactivity, Hinsberg method ofseparation, acylation reactions. Diazotisation and reactions of diazonium salts.

TEXT BOOKS

1 Organic chemistry, Bruice 6th Edition, Pearson Publisher, 2010.

2 Reactions and Mechanism, Jerry March, 4th edition Wiley Publication.

3 Organic chemistry, Carey, 8th Edition, Mc Graw-Hill.
4 Organic chemistry, Pillai Orient Longman Publisher.
5 The Fundamentals Principles of Organic Chemistry Vol.I& Vol. II, I.L.Finar, ELBS/Longman.

Course Outcomes:

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

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

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 111	Computer applications	2	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

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

2. know the various types of databases

3. know the various applications of databases in pharmacy

Course Content:

UNIT-1

Introduction to computers-their development through generations-classification-applications of computers. Anatomy of computers; keyboard, monitor and CPU-input devices like **OCR;OMR,MICR-** output devices like printers, types of computer memory, storage devices-floppy disk, hard disk drives and magnetic tapes.

Software-types of software-machine language-binary code-bits and –bytes-ASC11 codes, high level languages, languages processors- compilers, interpreters, problem solving, algorithms and flow charts.

UNIT-2

BASIC-character set-features of BASIC program-statements, keywords-writing and editing a program-execution, saving and loading Constants and variables, expressions- use of statements like LET, INPUT, READ DATA, RESTORE, REM, PRINT, END-printer controls-control statements GOTO,ON GOTO,IF THEN, IF –THEN-ELSE, FOR NEXT, GOSUB-graphics in basic

UNIT-3

Operating systems-MSDOS-various internal commands-DIR and its keys, MD, RD, CD,COPY CON, COPY, REN, DEL, TREE, DEL TREE, FORMAT.

Windows- important features, various accessories-windows explorer, locating and copying files.

MS-OFFICE: MS-WORD-editing documents, formatting text and various features.

MS- EXCEL- organization of work sheet, editing cells, generating graphs.

UNIT-4

ORACLE-introduction to managing data-data base concepts-RDBMS characteristics.

Interactive SQL-the oracle data types- two dimensional matrix creation, creating tables, data entry, editing data, updating-computation-logical operations, manipulating data-oracle functions-indexes

Text Books:

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

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

Course Outcomes:

After Completion of the course the student is able to

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

2. know the various types of databases used in profession

3. know the usage of softwares in pharmacy

4.Operating different internal commands in different operating systems.

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 112	Pharmacognosy I	3	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

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

UNIT I

A) Definition, history, development and scope of Pharmacognosy
B) Brief introduction to natural sources of drugs with examples: plants, animals, minerals, marine and microorganisms

UNIT II

A) Classification of drugs of natural origin: Alphabetical, morphological, taxonomical, chemotaxonomic, pharmacological and chemical classification with suitable examples.
B) Cultivation, collection, processing, drying, and storage of medicinal plants.

- Factors influencing cultivation of medicinal plants.
- Plant hormones and their applications.
- Improved methods of cultivation techniques: polyploidy, mutation and hybridization with reference to medicinal plants.
- WHO guidelines on Good Agricultural and Collection Practices (GACP) for medicinal plants

UNIT III

A) Introduction, definition, classification, different chemical tests for the carbohydrates and derived products. Systemic Pharmacognostic study of the following carbohydrates and derived products: Acacia, Tragacanth, Agar, Starch, Guar gum, Pectin, Isabgol and Honey.
B) Definition, classification and properties of tannins. Study of tannin containing drugs- Gambir, Black catechu, Galls, Myrobalan and Arjuna.

UNIT IV

A) Study of source, preparation and identification of fibres used in pharmacy like cotton, silk, wool, nylon and polyester.
B) Introduction, definition, classification, different physical, chemical properties, extraction methods, chemical tests for the lipids. Systemic Pharmacognostic study of the following lipids: castor oil, cod liver oil, shark liver oil, linseed oil, cocoa butter, kokum butter, bees wax, wool fat, hydnocarpus oil, Rice bran oil and Lard.

TEXT BOOKS:

1. Kokate C.K., Purohit A.P., Gokhale S. B. Pharmacognosy, NiraliPrakashan, New Delhi.
2. Text book of Pharmacognosy by Handa and Kapoor.
3. Pharmacognosy by Robert, Tyler.

Course Outcomes:

After Completion of the course the student able to

1.The main purpose of subject is to impart the students the knowledge of how the

secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially.

2. Pharmacognostic study of the carbohdrates.
3. Development and scope of pharmacognosy.
4. Study of source and identification of fibers used in pharmacy.

CO-PO Mapping

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

b) 3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 113	Human Anatomy and Physiology and Pathophysiology	3	4
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

1. This subject describe the etiology and pathogenesis of the selected disease states.

2. Knowledge on name the signs and symptoms of the diseases.

3. It also describe and Mention the complications of the diseases.

UNIT I

a. Central Nervous System: Functions of different parts of brain and spinal cord. Structure of bloodbrain barrier and its importance. Neurochemical transmission in the central nervous system, reflex action, electroencephalogram, Specialized functions of the brain, cranial nerves and their functions.

b. Autonomic Nervous System: Physiology and functions of autonomic nervous system. Mechanism ofneurohumoral transmission in the A.N.S.

UNIT II

a. Urinary System: Various parts, structures and functions of the kidney and urinary tract. Physiologyof urine formation and acid base balance.

b. **Reproductive Systems:** Male and Female reproductive systems and their hormones, physiology ofmenstruation, coitus and fertilization. Sex differentiation, spermatogenesis &oogeneisis, pregnancy its maintenance and parturition.

UNIT III

a. Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals,pancreas, testes and ovary, their hormones and functions.

b. Study of sense organs: Structure of eye, ear, nose, skin and tongue along with their detailedfunctioning.

UNIT IV

a. Basic Principles of Cell Injury, Adaptation & process of inflammation: Causes of cellular injury,pathogenesis, and morphology of cell injury. Cellular adaptations, atrophy, hypertrophy. acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair.

b. Cancer: Classification of tumours, difference between benign and malignant tumours, disturbancesof growth of cells, etiology and pathogenesis of cancer, invasions, metastasis and patterns of spread of cancer and histological diagnosis of malignancy.

c. **Pathophysiology of common diseases** like epilepsy, psychosis, depression, mania, hypertension,angina, congestive cardiac failure, atherosclerosis, myocardial infarction, rheumatoid arthritis, gout, peptic ulcer, asthma, hepatic disorders, T.B, UTIs and STDs.

TEXT BOOKS:

1. Harsh mohan, text book of pathology, latest edition.
2. Sherword- Principles of Human Physiology. Cenage learning.
3. Ross &Willson, Principles of anatomy and physiology, John wiley& Sons
4. C.C.Chatterjee, Human Physiology, Pub by Medical allied agency, Delhi, India.
5. M.P. Rang, M.N.Dale, J.M RiterAnotamy& Physiology.

Course Outcomes:

After Completion of the course the student able

1. Identifies Name the signs, symptoms and complications of the diseases.
2. Students Get thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms.

3. To Study the aetiology and pathogenesis of the selected disease states
4. The baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 114	General & Dispensing Pharmacy Practicals	4	2
Sessional Marks : 00		**End Semester Examination Marks : 100**	

Objectives:

This course to knowledge on formulation and evaluation of different types of tablets and capsules, injection, ointments, creams

I. EXPERIMENTS

a) Dispensing of prescriptions falling under the categories: Mixtures, syrups, solutions, emulsions, ointments, powders, lotions, liniments (minimum two prescriptions from each class).

b) Identification of physical, chemical and therapeutic incompatabilities in a prescription, and dispensing ofsuch prescriptions (3 Exercise).

c) Dispensing procedures involving pharmaceutical calculations, and dosage calculations for

paediatric and geriatric patients

II. DEMO/WORKSHOP

Demo on homogenizer and identification test for emulsions.

III. SEMINAR/ASSIGNMENT/GROUP DISCUSSION

a) Current status of Indian pharma industry.

b) Applications of various dosage forms.

REFERENCE:

a) Dispensing Pharmacy, Cooper &Gunns CBS, Publ. and Distributors New Delhi – (2008).

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

LIST OF MINIMUM EQUIPMENT REQUIRED

Adequate number of the following, such that each student gets

1. Mortars and pestles.

2. Analytical balance and weight box.

3. Percolators.

4. Dispensing containers.

5. PH meter.

6. Electronic balance.

7. Adequate quantities of chemicals and glassware.

Text Books:

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen& C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

Course Outcomes:

After Completion of the course the student able to

1.This is help to understand the basic information of formulation process and how to optimise quality control solid, semisolid and parenteral dosage forms

CO-PO Mapping

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

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

3-High, 2-Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 115	Pharmaceutical Organic Chemistry-II Practicals	4	2
Sessional Marks : 00		**End Semester Examination Marks : 100**	

Objectives:

1.Understand the chemistry of drugs with respect to their pharmacological activity

2. Understand the drug metabolicpathways, adverse effect andtherapeutic value ofdrugs

3. Know the Structural ActivityRelationship of different class of drugs

4. Study the chemical synthesis of selected drugs

Course Content:

I. Experiments:

A. Preparation of organic compounds (each involving a specific organic reaction covered in theory- any 10 synthesis)

1. Sulphonation : Preparation of Toluene para sulphonic acid from toluene.
2. Bromination : Tribromoaniline from Phenol or Aniline.
3. Addition/Elimination : Preparation of phenyl hydrazone or oxime from Benzaldehyde.
4. Addition : Preparation of 2,3-dibromo-3-phenyl propionic acid from cinnamaldehyde.
5. Dehydration : Preparation of acetonedicarboxylic acid from citric acid
6. Condensation : Preparation of dibenzalaetone from benzaldehyde

B. Identification of the following organic compounds by systematic qualitative analysis including acidic/basic/neutral character, aromatic/aliphatic, saturated/unsaturated, test for special elements and functional group identification tests.

a. Phenols

b. Amides
c. Amines

d. Carboxylic acids

e. Aldehydes and Ketones

f. Alcohols

g. Anilides and nitrocompounds
h. Esters

II. Demo / work shop

Crystallization by using various solvents, atomic models emphasizing organic molecules & TLC for synthesized compounds.

I. Seminar/assignment/group discussion

Exercise on nomenclature of compounds, Knowledge on Protection of groups by green chemical methods, microwave assisted synthesis.

Text Books:

1. Text Book of Practical Organic Chemistry, Vogel's, 5th Edition Pearson.
2. Laboratory Manual of Organic Chemistry, R.K. Bansal, New Age International 5th Edition 2007.
3. Advanced Practical Organic Chemistry, O.P. Agarwal, 3rd Edition Goel Publication.
4. Practical Organic Chemistry, F.G.Mann& B.C. Saunders, Pearson 4th Edition.

Course Outcomes:

This subject is designed to impart fundamental knowledge on the structure,chemistry and therapeutic value of drugs. The subjectemphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism ofdrugs. The syllabus also emphasizes on chemicalsynthesis of important drugs under each class

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course	Course Title	No of Hours	No of

Code		Per week	Credits
BPH 116	Computer applications Practicals	2	2
Sessional Marks : 00		**End Semester Examination Marks : 100**	

Objectives:

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

2. know the various types of databases

3. know the various applications of databases in pharmacy

Course Content:

1. use of MS-DOS commands like DATE, TIME, DIR,COPY CON, MD, CD,RD, COPY, DEL, FORMAT, PATH etc.,
2. writing of at least ten programs in basic using various statements like REM, LET, PRINT, END, INPUT, READ-DATA, GO TO, IF THEN, FOR-NEXT,PSET, LINE, CIRCLE, COLOUR etc.,
3. At least five exercises each in MS-WORD and MS-EXCEL using various features available/preparation of documents- editing-tabulation of data-generation of charts.
4. at least five exercises in data base management using ORACLE- interactive SQL-creating tables, editing, computation etc.,

Text Books:

1. basic computer programming- V.K Jain, pusthak mahal, Delhi
2. programming in basic by E.Balagurusami,tatamcgrawhill
3. programming in basic-Gottfried,tatamcgrawhill
4. abc of windows 98-BPB Publications ,New Delhi
5. working in microsoft office-Ronmansfield
6. commercial application development using ORACLE developer 2000 by Iran bay ross,BPB Publications, New Delhi
7. Computer fundamentals with pharmacy applications by N.K.Tiwari published by pharma book syndicate.

Course Outcomes:

After Completion of the course the student is able to

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

2. know the various types of databases used in profession

3. know the usage of softwares in pharmacy

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 117	Pharmacognosy I Practicals	4	2
Sessional Marks : 00		**End Semester Examination Marks : 100**	

Objectives:

To identify 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 of different compounds

Course Content:

EXPERIMENTS:

1. Collection and preparation of herbarium/laminated photos/ specimens of natural drugs.
2. Study of microscope.
3. Study of various morphological characters of the drugs mentioned in theory under carbohydrates.
4. Study of various morphological characters of the drugs mentioned in theory under lipids.
5. Study of various morphological characters of the drugs mentioned in theory under tannins.
6. Study of various morphological characters of the drugs mentioned in theory under

fibres.

7. Chemical tests for Acacia, Tragacanth, Guar gum, Agar and Starch.
8. Chemical tests for Castor oil, Linseed oil, Shark liver oil, Cod liver oil.
9. Chemical tests for Gambir, Black catechu.
10. Chemical test for fibres mentioned in theory.
11. Determination of swelling factor of mucilage containing herbal drug.

Seminar/ Assignment:

Seminar/ Assignment related to theory:

Workshop/Demo

Cultivation of medicinal plants

Text Books:

1. Practical Pharmacognosy, C K Kokate, NiraliPrakashan
2. Practical Pharmacognosy, Khandelwal, NiraliPrakashan
3. Practical Pharmacognosy Iyengar, Manipal Press Ltd.
4. Brain KR and Turner TD. The practical Evaluation of Phytopharmaceuticals, Wright-Scientechnics, Bristol.
5. Peach K and Tracey MV, Modern methods of Plant analysis, Narose publishing house, New Delhi.

Course Outcomes:

1. After Completion of the course the student able to know the modern extraction
2. to know techniques, characterization and identification of the herbal drugs
3. To know the phytoconstituents by use chromatographic technique

CO-PO Mapping

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

3-High, 2-Medium, 1-Low

II B.PHARM- I SEMESTER

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 201	Physical pharmacy –I (Theory)	03	04
Sessional Marks: 20		**End Semester Examination Marks : 80**	

Objectives:

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 sand determination of expiry date of formulations

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

UNIT I

Intermolecular forces and states of matter: Binding forces between molecules, the states of matter, change in the state of matter, latent heat and vapour pressure, sublimation critical point, eutectic mixtures, relative humidity, the liquid state, liquid crystalline state,Glossy state and solid state, amorphous and polymorphism.

Phase rule: Definition and explanation. One component(water system), two compartment system (phenol - water system&TEA (Tri Ethyl Amine) and Water system).

UNIT II

Thermodynamics: The zeroth, first, second and thirdlaw of thermodynamics, Free energy functions and applications.

Physical properties of drug molecules: Dielectric constant induced polarization, dipole moment,

refractive index and molar refraction and optical rotatory dispersion.

UNIT III

Solutions of Non electrolytes: Concentration expressions, ideal and real solutions, colligativeproperties (lowering of vapour pressure, depression in freezing point, elevation of boiling point and

Osmotic pressure), molecular weight determinations.

Solutions of Electrolytes: Properties of solutions of electrolytes. The Arrhenius theory of electrolyte

dissociation. The modern theory of strong electrolytes (Activity co-efficient and ionic strength).

UNIT IV

Ionic equilibria: Modern theories of acids, bases and salts,Sorensen's pH scale, concentration as a function of pH, calculation of pH and acidity constants.

Buffers and isotonic systems: The buffer equation, buffercapacity, buffers in pharmaceutical and biological systems, isotonic solutions, methods of adjusting tonicity and pH(relevant numerical problems).

Kinetics and drug stability: General consideration and concepts**,** half life period (t1/2) determination, influence of temperature and Arrhenious theory, light, solvent, catalytic species and other factors. Accelerated stability studies, expiration dating

TEXT BOOKS:

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences Fifth Edition.Lippin

Cott Williams and Wilkins.

2. C.V.S.Subramanyam, Essentials of Physical Pharmacy, VallabhPrakashan.

3.Manavalan &Ramaswamy. Physical pharmaceutics. 2nd ed. Vignesh publisher, 2008.

REFERENCE BOOKS:

1. Pharmacopoeia, (I.P., B.P., U.S.P. and European)

2. Martindale, The Extra Pharmacopoeia; latest edition, the Royal Pharmaceutical Society.

3. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.

4. L. Lachman, H. Lieberman The Theory And Practice Of Industrial Pharmacy J**.** L Kaniz Lee &Febiger Philadelphia, USA.

Outcomes:

1. The course deals with the various physical and physicochemical properties
2. The principles involved in dosage forms/formulations.
3. Theory and practicalcomponents of the subject help the student to get a better insight into variousareas of formulation research and development
4. Stability studies ofpharmaceutical dosage forms.

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 202	Pharmaceutical Engineering (Theory)	03	04
Sessional Marks: 20		**End Semester Examination Marks : 80**	

Objectives :

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

Unit I

Introductory concepts: Unit operation / Unit processes, material and energy balance, equilibriumstate, rate process.

Fluid Flow: Types of flow, Reynold's number, bernoulli's equation, viscosity, concept of boundarylayer, basic equations of fluid flow, valves, flow meters, manometers and principles of measuring

instruments.

Material handling systems

a. Liquid and Gas handling - Study of different types of pumps such as Reciprocating pumps, Turbine pumps and centrifugal pumps, fans, blowers and compressors.

b. Solid handling – Conveyor**.**

Corrosion:

Classification, mechanism of corrosion, factors effecting, prevention and control.

Unit II

Dehumidification and Humidity control

Basic concepts and definition, wet bulb and adiabatic saturation temperature.Psychrometric chart andmeasurement of humidity, application of humidity measurement, Equipments for dehumidificationoperations.

Refrigeration and air-conditioning: Principles and applications**.**

Evaporation and drying: Basic concept of phase equlibria**.** Definition and theory of evaporation, factorsaffecting evaporation, evaporators-film evaporators.

Moisture content and theory of drying, rate of drying and time of drying calculations, drying

curves. Concept of loss on drying and its importance. Classification and types of dryers, dryers usedin pharmaceutical industries- tray dryer, Fluid bed dryer, spray dryer, freeze-dryer, tunnel dryer andvacuum dryer.

UNIT III

Crystallization:

Miers supersaturation theory, crystals growth, size, shape, geometry. Material and heat balances around Swenson walker crystallizer. Nucleation mechanisms, steady of various types of crystallizers, tanks, agitated batch, single vacuum, circulating magma and krystal crystallizer.

Filtration and Centrifugation: Theory of filtration, Factors affecting filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, Air filtration. Principles of centrifugation, industrial centrifugal filters and centrifugal sedimenters**.**

UNIT IV

Size Reduction: Definition, theory and objectives of size reduction, factors affecting size reduction,

laws governing energy and power requirements of a mill. A brief study of ball mill, hammer mill, fluid energy mill.

Size Separation: Different techniques of size separation, sieves, sieve shakers, sedimentation tank, cyclone separators, bag fillers.

Mixing: Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipments-double cone,twin-shell, silverson mixer, colloid mill, sigma blade mixer, planetary mixer, propeller mixer andturbine mixer. Homogenizer, triple roller mill.

Automated process control systems:

Process variables, temparature, pressure, flow, level and vacuum and their measurements. Elements of automatic process control and introduction to automatic process control systems, elements of computer aided manufacturing. Reactors and fundamentals of reactors design for chemical reactions.

TEXT BOOKS:

1. S.J. Carter, Cooper and Gunn‟s Tutorial Pharmacy, 6th ed., CBS publisher, Delhi.

2. CVS Subramanyam, Pharmaceutical Engineering. Vallabh Prakasham New Delhi.

3. K. Samba Murthy, Pharmaceutical Engineering new Age International Publishers Ltd. 1998.

4. L. Lachman, H. Lieberman & J.B.Schwartz. Pharmaceutical dosage forms volume-II, 2nd ed.,marcel dekker Inc.

REFERENCE BOOKS:

1. E.A. Rawlin‟s, Bentley‟s Text Book of Pharmaceutics, 8th ed ELBS.
2. Badzer&Banchoro, Introduction to Chemical Engineering. Tata – Mc Graw Hill.

Outcomes :

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

CO-PO Mapping

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

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

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 203	Pharmaceutical organic chemistry III (Theory)	03	04
Sessional Marks: 20		**End Semester Examination Marks : 80**	

Objectives :

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

UNIT I: Heterocyclic chemistry

Definition, nomenclature, structure, aromaticity, reactivity, synthesis, acidity-basicity and characteristic reactions of the following heterocyclic compounds. Few examples of drugs which contain the cited ring system.

Five membered ring systems: Furan, pyrrole, thiophene, Pyrazole, imidazole, oxazole, isoxazole,thiazole. Six membered ring systems: pyridine, pyrazine, pyrimidine and pyridazine. Fused ring systems: Indole, quinoline, iso-quinoline, acridine, Benzimidazole, phenothiazine, purines.

UNIT II: Stereochemistry of Carbon compounds - Optical rotation, plane polarized light, opticalactivity, chirality, notations (assignment of configuration), relative configuration (Fischer DL configuration), absolute configuration (R & S), sequence rules (with examples), enantiomers, meso compounds, racemic mixture and resolution of racemic mixture.Concept of E & Z, Cis & Trans, Syn & Anti configurations. Elements of symmetry. Stereo selective & stereo specific reactions. Optical activity of biphenyl compounds.

UNIT III

Carbohydrates: Definition, classification, nomenclature, study of glucose structure, mutarotation,ring structure, oxidation-reduction reactions, osazone formation, epimerization, Lobry De Bruyn – Van Ekenstein reaction, structure of the sucrose, starch and cellulose. non-reducing nature; A brief account on pharmaceutical importance of various carbohydrates. **Glycosides**: Definition, classification, α, β – glycosidic linkages, enzymatic hydrolysis, structure and physiological importance of Anthraquinone glycosides.

UNIT IV

Amino acids and Proteins: Definition, classification, configuration, methods of preparation of aminoacids, physical, chemical properties, Zwitter ionic nature and isoelectric point. peptide synthesis, CTAA and NTAA concept and determination. Structure and chemistry of Insulin, Oxytocin, Heparin. Pharmaceutical importance of polypeptides and proteins.

Lipids (oils and fats): Definition, classification of fatty acids, trans and cis fatty acids, fat analysisincluding Saponification value, acid value, peroxide value and Iodine value etc..), hydrogenation and rancidity of oils and fats. Comparison of fat, oil, wax based on their properties.

Reaction mechanisms and applications in Drug synthesis

Beckmann rearrangement, Birch reduction, Mannich reaction, Michael addition reaction, Wittig reaction, MPV reduction, Oppanauer oxidation, Curtius rearrangement, Schmidt reaction. Neighbouring group effects and reduction by transition metal complexes.

TEXT BOOKS:

1. Heterocyclic chemistry by Bansal, 5th edition.
2. Arun Bahl & S.S Bahl, Advanced Organic Chemistry-S.Chand.
3. R Morrison and R. Boyd, organic chemistry, Pub by Printice Hall of India, New Delhi.
4. I L Finar, Organic Chemistry, Vol. I. & II, 6th Pearson education
5. O.P Agarwal, A Textbook of Organic Chemistry
6. Eliel, Stereochemistry of Organic compounds.
7. Oraganic reactions,Stereo chemistry&mechanizam by PS Kalsi

REFERENCE BOOKS:

1. Jerry March, Advanced Organic Chemistry 4th Edition Wiley Publication.

2 Cram & Hammond.Organic Chemistry Mc Graw-Hill.

3.A.I. Vogal‟s, A textbook of practical organic chemistry Mc Graw Hill. 6th Edition.
4.Solomons, Organic Chemistry 9th Edition Wiley Publication.

Course Outcomes :

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

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

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 204	Pharmaceutical Biochemistry (Theory)	03	04
Sessional Marks: 20		**End Semester Examination Marks : 80**	

Objectives :

1. To create knowledge on Cell Processes, Bioenergetic and Cellular Reactions.
2. Impart basic skill on Bio-Molecules, structure of cell and its functions
3. Metabolism of carbohydrates and its significance in the living organism
4. Metabolism of lipidsand its significance in the living organism
5. Clinical biochemistry importance

UNIT I:

Cell Processes, Bioenergetic and Cellular Reactions

Bio chemical organization of the cell, molecular constitutents of membrane, active & passivetransport process, sodium and potassium pumps, osmoregulation and heamostatis. The concept of freeenergy, determination of change in free energy from equilibrium constant & reduction potential.

Production of ATP and its biological significance.

UNIT II

Introduction to Bio-Molecules: Structure, classification, cell and biological functions of

carbohydrates, proteins, lipids, nucleic acids (DNA & RNA) vitamins & minerals.

Enzymes & Co-Enzymes: Classification, Structure, mechanism of action, properties, factors

affecting enzymes action, enzyme kinetics and enzyme inhibitions, Coenzymes from Vitamins, Nucleotides and non-nucleotides. clinical importanceof enzymes in treatment and diagnosis.

UNIT III : Metabolism of carbohydrates

Metabolic pathway, regulation and significance of the following pathways and cycles: Metabolism ofCarbohydrates: Glycolysis (aerobic and anaerobic), glycogenolysis, gluconeogenesis, Kreb's cycle,HMP &uronic acid pathways, Cori cycle.

UNIT IV : Metabolism of Lipids and Proteins

Lipids : Alpha, Beta, Gama & Omega oxidations of fatty acids, bio-synthesis of fatty acids,

cholesterol, ketogenesis, Utilization of ketone bodies, ,Metabolic disorders of lipid metabolism.

Proteins: Structure, classification of protein. Classification of aminoacids, concept of essential andnonessential amino acids and their importance in deamination, Trans-amination, de-carboxylation,Urea cycle. Metabolism of Valine, cystine, cystein, tryptophan, tyrocine, methionine.Biosynthesis ofpurines, pyrimidines, proteins.Metabolic disorders of Carbohydrate and protein.

Clinical Biochemistry

Introduction to clinical biochemistry, Normal values of various biochemical parameters (Blood / orUrine: Glucose, VLDL, LDL etc. total proteins, urea, Minerals, Hormones… etc.)

and their abnormalvalues in diagnosis.Liver function test and kidney function test, OGTT.

TEXT BOOKS:

1. A.L.Lehninger, Principles of Biochemistry; CBS Publishers and distributors.

2. Harper, Biochemistry McGraw Hill Medical, 28th Edition.

3. Text Book of Biochemistry by Satyanarayana Oxford University Press.

4. J.L.Jain, Fundamentals of Biochemistry S.Chand

REFERENCE BOOKS:

1. Biochemistry, C.B.Powar&G.R.Chatwal, Himalaya publishing house

2. L.Stryer, Text Book of Bio Chemistry. W.H.Freemann& Co. Ltd. 6th Edition.

3. West, Edward Text Book of Biochemistry; Freeman and company, Sanfransisco.

4. E.E.Conn and PK Stumpf, Outlines of Biochemistry; John Wiley and sons, New York.

Outcomes:

1. Understand the principles of various fields of chemistry and biology (organic chemistry, analytical chemistry, biochemistry, genetics, metabolism, and molecular biology)
2. Develop as independent thinkers who are responsible for their own learning.
3. Develop transferable quantitative skills.
4. Applying the knowledge on the various aspects of bilogical reactions

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours**	**No of**

		Per week	Credits
BPH 205	Environmental studies (Theory)	03	04
Sessional Marks: 20		**End Semester Examination Marks : 80**	

Objectives :

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

UNIT – I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.

b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Text Books:

1. Text Book of Environmental Studies for Undergraduate Cources, Erach Bharucha, Universities Press Pvt Ltd, Hyderabad. 2nd Edition 2013.
2. Environmental Studies by Kaushik, New Age Pubilishers.

References:

1. Environmental Studies by Rajagopalan, Oxford Pubilishers.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.

Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

Outcomes :

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

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

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

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

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 206	Physical pharmacy –I (Practical)	04	02
Sessional Marks: 00		**End Semester Examination Marks : 100**	

Objectives :

1. To analyse the solubility of various drugs and excipients

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

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

3.Evaluate stability constant of complex compound.

I. EXPERIMENTS:

1. Molecular weight – Rast camphor method.
2. Calibration of pH Meter using standard buffers pH Estimation – pH meter.
3. pKa Estimation by Half Neturalization Method.
4. Refractive index of liquids.
5. Phenol water system – CST.
6. Lower consolute temperature – TEA (Tri Ethyl Amine) and Water.
7. Ternary phase diagram.
8. Preparation of phosphate Buffers and their Buffer Capacity Determination.
9. Effect of temperature on first order kinetics and to find the energy of activation.

II. Demo/ Workshop

Demo on polarimeter (To prove that the hydrolysis of sucrose follows first order kinetics).

III. SEMINAR/ASSIGNMENT/GROUP DISCUSSION

Thermodynamics of solutions and polymers, Types of electrodes.

LIST OF MINIMUM EQUIPMENTS REQUIRED

1. Ostwald's viscometer

2. Stalgnometer

3. Polarimeter

4. Abbe's refractometer

5. CST apparatus

6. pH meter

7. Colorimeter

8. Digital balances

Outcomes :

1. This course helps to compare and evaluate the solubility of various combinations
2. compound and modify for better solubility approaches by use different level of methods
3. Knowledge on Buffers
4. Knowledge on first order kinetics

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 207	Pharmaceutical Engineering (Practical)	04	02
Sessional Marks: 00		**End Semester Examination Marks : 100**	

Objectives :

To know various unit operations used in Pharmaceutical industries.

2. To understand the material handling techniques.

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

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

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

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

I. EXPERIMENTS:

1. Evaluation of filter media, determination of rate of filtration and study of factors affecting filtration Including filter aids.

2. Particle size measurement by sieve shaker.

3. Determination of Humidity-using Dry Bulb and Wet Bulb thermometers and Psychometric charts.

4. Determination of overall Heat Transfer Coefficient.

5. Determination of rate of evaporation.

6. Determination of rate of drying, free moisture content and bound moisture content.

7. Experiments to illustrate the influence of various parameters on construction of drying curves.

8. Experiments to illustrate principles of size reduction, Laws governing energy and power

requirements of a size reduction (Ball mill).

9. Experiments to illustrate solid-solid mixing, determination of mixing efficiency using different types of mixers.

10. Analysis of pharmaceutical packaging materials-leaching of contents from packaging materials.

II. DEMO/ WORKSHOP

Determination of type of flow (Reynolds experiment)

Double cone blender, homogenizer, tray dryer.

III. SEMINAR/ASSIGNMENT/GROUP DISCUSSION

Advances in packaging technology.

LIST OF MINIMUM EQUIPMENTS REQUIRED

1. Tray dryer

2. Ball mill

3. Seive shaker with set of sieves as per IP

4. Double cone blender

5. Propeller type mechanical agitator

6. Homogeniser

7. Buchner filtration apparatus

8. Vaccum pump

9. Desiccators'

10. Energy meter

11. Autoclave

Outcomes :

To understand the basic principles involved in unit operations such as size reduction, size separation, distillation and drying.

2. To demonstrate and explain about the construction, working and applications of pharmaceutical equipment's such as colloid mill, planetary mixer, fluidized bed dryer and freeze dryer.
3. To experiment with the process variables of filtration, evaporation and infer the same.
4. To determine radiation constant of brass, iron, unpainted and painted glass.

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 208	Pharmaceutical organic chemistry III (Practical)	04	02
Sessional Marks: 00		**End Semester Examination Marks : 100**	

Objectives :

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

I. Experiments:

A. Quantitative determination of organic compounds via functional groups

1. Phenolic groups by bromination method.

2. Alcoholic group by acetylation method.
3. Carbonyl group by hydroxylamine hydrochloride-pyridine method.

4. Aldehyde group by sodium sulphite-sulphuric acid procedure.
5. Carboxyl group by acid-base method.

6. Amino group by bromination method.
7. Amino acid formal titration method.

B. Synthesis/preparation involving more than one step (Any five).

8. Synthesis of acetophenone oxime and its conversion to acetamide.
9. Phenothiazine from diphenyl amine

10. Benzimidazole from o-phenylene diamine
11. Knorr quinoline synthesis (4-methyl 2- quinoline) from aceto acetanilide

12. Synthesis of Imidazole -4,5-dicarboxylic acid from tartaric acid

13. Benzilic acid from benzene.
14. Preparation of 2-phenylindole from Phenylhydrazine by Fischer's method.

C. Analysis of oils & fats

a. Determination of Acid value of fixed oils.
b. Determination of Saponification value of a fixed oils.
c. Determination of Iodine value of a fixed oils.

d. Determination of peroxide value of a fixed oils.

II. Demo/Workshop:

Synthesis of some asymmetric organic molecules, identification of synthesized compounds by TLC, Catalyst and solvent effect in synthesis.

III. Seminar/Assignment/Group discussion:

Principles of green chemistry, solvent free synthesis, sonication as the green chemical method for organic synthesis.

References:

1. Indian Pharmacopoeia. – 1996.

2. A.I. Vogel‟s – Practical Organic Chemistry – Prentice Hall.

3. Text Book of Practical Organic Chemistry, Vogel‟s, 5th Edition Pearson.

4. Laboratory Manual of Organic Chemistry, R.K. Bansal, New Age International 5th Edition 2007.

5. Advanced Practical Organic Chemistry, O.P. Agarwal, 3rd Edition Goel Publication.

Practical Organic Chemistry, F.G.Mann & B.C. Saunders, Pearson 4th Edition

Outcomes :

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

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

Understand and gain insight into the organic reactions by analyzing their fair reaction mechanisms

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 209	Pharmaceutical Biochemistry (Practical)	04	02
Sessional Marks: 00		**End Semester Examination Marks : 100**	

Objectives :

1. It gives the knowledge of biological phenomena at the molecular level.

2.Its aim is to understand the fundamental chemical principles that govern complex biological systems.

3. The program is an interdepartmental major between biology and chemistry that emphasizes the importance of a solid foundation in the natural sciences, including mathematics and physics. 4. The major focuses on biology and chemistry, ranging from cell biology and molecular biology to analytical chemistry and physical chemistry.

I. EXPERIMENTS:

1. Identification of carbohydrates
2. Identification of amino acids.
3. Identification of lipids.
4. Estimation of glucose in urine and blood.
5. Estimation of creatinine in urine.
6. Estimation of creatinine in blood.
7. Estimation of cholesterol in blood.
8. Estimation of Urea in Blood
9. Estimation of Serum protein.
10. Estimation of bile pigments in serum.
11. Estimation of alkaline phosphatase, SGOT, SGPT in serum
12. Effect of temperature on the activity of alpha-amylase.

NOTE: Collection of blood samples from human should be carried out by trained pathologist andsubject as per norms from the human subject.

II. WORKSHOP / DEMO

Different diagnostic methods in diagnostic lab, Blood Glucose estimation by Glucometer

III. SEMINAR / ASSIGNMENT/GROUP DISCUSSION

Various diagnostic tests for different diseases, Gene therapy and gene targetting

LIST OF MINIMUM EQUIPMENTS REQUIRED

1. Colorimeter

2. Table top centrifuge

3. Digital balance

4. Physical/chemical balance

5. pH meter

6. Water bath

7. Folin-Wu tubes

8. Autoanalyser

9. Adequate glass wares

<u>Outcomes :</u>

.1. Understand the principles of various fields of chemistry and biology (organic chemistry, analytical chemistry, biochemistry, genetics, metabolism, and molecular biology)

2. Develop as independent thinkers who are responsible for their own learning.

3. Develop transferable quantitative skills.

4. importance of Biological Values .

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

II B.PHARM- II SEMESTER

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 210	Physical Pharmacy II (Theory)	03	04
Sessional marks : 20		**End Semester Examination Marks : 80**	

Objectives :

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 sand determination of expiry date of formulations

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

UNIT I

Solubility and distribution phenomena: Solvent-solute interaction, solubility of gases in liquids,

solubility of liquids in liquids, solubility of solids in liquids, distribution of solutes in immiscible

solvents.

Introduction to phenomena of diffusion: Fick's first law and second law.

Complexation: Classification of complexes, methods of preparation, analysis and applications.

UNIT II

Interfacial Phenomena: Liquid interfaces, spreading coefficient, measurement of surface and interfacial tensions,adsorption at liquid interfaces. Adsorption isotherms only

(freundlich's isotherms and Langmuir'sisotherm's).Surface-active agents and HLB classification, solubilization, detergency.Parachor, Adsorption at solid interfaces. Solid gas and solid liquid interfaces, complex films, electrical propertiesof interfaces.

UNIT III

Micromeritics and Powder Rheology: Particle size and size distribution, number and weight distribution, particle number, methods for determining particle volume, methods of determining particle size: optical microscopy and sedimentation, measurement of particle shape, specific surface area: methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness and flow properties.

UNIT IV

Rheology: Newtons law of flow, kinematic viscosity, effect of temperature, Newtonian systems, non-Newtonian systems: pseudoplastic, dilatant, plastic, thixotropy, negative thixotropy Determination of viscosity, capillary, falling ball and rotational viscometers.

Colloids: Introduction, types of colloidal systems, protective colloids, applications of colloids in pharmacy.

Coarse Dispersions:

Suspensions: Types and theories of suspensions, effect of Brownian motion, interfacial properties of suspended particles, settling in suspensions. Sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations.

Emulsions: Theories of emulsification, physical stability of emulsions.

TEXT BOOKS:

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences 5th Edition.Lippincolt

Williams.

2. CVSSubhramanyam, Physical Pharmaceutics, Vallabhprakashan.

3. Manavalan&Ramaswamy. Physical pharmaceutics. 2nd ed. Vignesh publisher, 2008.

REFERENCE BOOKS:

1. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences

2. L. Lachman, H. Lieberman The Theory And Practice Of Industrial Pharmacy J. L Kaniz Lee &Febiger Philadelphia, USA

Outcomes :

1. The course deals with the various physical and physicochemical properties,
2. Principles involved in dosage forms/formulations.
3. Theory and practicalcomponents of the subject help the student to get a better insight into variousareas of formulation research and development
4. Stability studies ofpharmaceutical dosage forms

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 211	Pharmaceutical Analysis I (Theory)	03	04
Sessional marks : 20		**End Semester Examination Marks : 80**	

Objectives :

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

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

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

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

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

UNIT I

a) Definition of Analytical chemistry and role of pharmaceutical analysis in pharmaceutical industry.

Significant figures, concept of error, precision, accuracy, rejection of doubtful values with specialreference to volumetric analysis. Calibration of glassware used in volumetric analysis-Burette, pipette and volumetric flask. Methods of expression of concentration(w/w,w/v,v/v).

b) **Theory of Neutralization Titrations**: Acid-base concept, Acidimetry, Alkalimetry, Common ioneffect and solubility product, indicators, Ostwald and quinonoid theories of Indicators

c) **Non-aqueous titration:** Theory, types, solvents used and application in pharmaceutical analysis.

Application of the above methods in the analysis of drugs and formulations as under IP 2007and2010.

UNIT II

a) General principles, theory and examples of **oxidation-reduction methods,** permanganomerty**,**ceriometry, iodometry, iodimetry indicators used in these titrations, self indicators.

b) General principles, theory and examples of **Precipitation methods:** Mohr's method, volhard'smethod, account of the indicators used in these titrations, Adsorption indicators.

c) **Complexometric titration:** Theory, types and application in pharmaceutical analysis. Indicatorsused, Masking and demasking and their applications.

Application of the above methods in the analysis of drugs, as under IP 2007and 2010.

UNIT III

a) Potentiometry: Introduction to EMF, electrochemical cells and half cells, Electrodes, measurementof potential, pH curve, EMF curve, derivative curve in application to end point determination.

b) Conductometric titrations: Basic concepts, conductivity cell, different types of conductometrictitrations.

c) Polarography: Basic concepts, apparatus and principles, different currents, polarographic maxima,general polarographic analysis, applications in identification and quantification of metals.

d) Amperometric titrations with one polarized electrode, general procedure, titration curves,

applications in pharmaceutical analysis.

UNIT IV

Fluorimetry: Theory, Fluorescence and chemical structure, stokes and anti-stokes, quantum efficiency,factors affecting the intensity of fluorescence, Instrumentation (double beam), Applications inPharmaceutical analysis.

Flame Emission photometry Vs Atomic absorption spectroscopy: Emission spectra, Absorptionspectra, line spectra, principle of absorption / emission of UV light by elements, instrumentation,applications in pharmaceutical analysis. Focus on interference.

Nephelo-turbidimetry: Introduction, principle, instrumentation of Nephelo-turbidimeter,pharmaceutical application as specified in IP, determination chlorides and sulphates.

a) Principle and applications of the following instruments and various grades of reagents a in QC laboratory.

i) Refractometry ii) Polarimetry. iii) LR Grade iv) AR grade v) HPLC grade.

b). Role of moisture content determination in QC of pharmaceuticals (including Karl-Fisher method, LOD, IR balance).

TEXT BOOKS:

1. A.H. Beckett & J.B Stanlake Vol. I & II., Practical Pharmaceutical Chemistry, Athlone Press of the Univ of London

2. B.K. Sharma, Instrumental Chemical Analysis, Goel Publishers.

3. Chatwal & Anand, Instrumental Methods of Analysis. Himalaya Publishing Home, 2009.

REFERENCE BOOKS:

1. A.I Vogel, Quantitative Chemical Analysis, VI edition, Pearson education Delhi.

2. Pharmacopoeia (IP, BP, USP).

3. D. A. Skoog, Principles of Instrumental Analysis, V edition, Thomson Brooks Banglore.

4. Connors, a Textbook of Pharmaceutical Analysis. Wiley India Pvt. Ltd.

Course Outcomes :

1) To understand selected instrumental analytical techniques (spectroscopic and chromatographic methods) and differentiate with volumetric analysis.

2.To gain knowledge on interaction of EMR with matter and to build the analytical understanding at the level of atom, group and molecular structure of organic and inorganic compounds with different functional groups and their applications in pharmacy.

3) To maximize knowledge on characterization and estimation of ions by spectroscopical techniques

4) To simplify affinity of matter with stationary phase and mobile phase, physical and chemical.

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 212	Pharmaceutical Technology I (Theory)	03	04
Sessional marks : 20		**End Semester Examination Marks : 80**	

Objectives :

Gives knowledge on the

1. Production of pharmaceutical dosage forms, bioavailability and stability of produced dosage forms, preparation, development and testing of modified release systems.
2. Determination of the properties of excipients and formulation of these excipients with active ingredients in the most convenient way, and finally

It deals with the development and testing of new drug carrier systems.

UNIT I

Preformulation: Goals, Physicochemical properties like physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution, partition coefficient, organoleptic additives, hydrolysis, oxidation-reduction, racemization, polymerization, etc and their effect on formulation, drug-excipient incompatability studies,. Introduction to Stability testing of finished products as per

ICH guidelines.

UNIT II

Liquid dosage forms: Introduction, types of additives used in formulations, vehicles, stabilizers,preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavours and others,manufacturing packaging and evaluation of clear liquids, suspensions and emulsions official inpharmacopoeia.

Dry syrups: Requirements, formulation, methods of preparation, containers, evaluation.

UNIT III

Semisolid dosage forms: Definitions, types, mechanisms of drug penetration, factors influencingpenetration, semisolid bases and their selection. General formulation of semi solids, clear gelsmanufacturing procedure, evaluation and packaging.

Suppositories: Ideal requirements of bases, Different types of bases, displacement value, manufacturing procedure, packing and evaluation.

UNIT IV

Pharmaceutical aerosols: Definition, propellants general formulation, manufacturing and packagingmethods, pharmaceutical applications. Quality control tests for aerosols.

Blood Products and Plasma Substitutes: Collection, processing and storage of whole human blood, Concentrated human RBC's, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin, foam plasma substitutes, ideal requirements, PVP, Dextran etc. For control of blood pressure as per IP.

Text Books:

1. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy, Lea &Febieger, Philadelphia Latest Edn.

2. L. V. Allen Jr., N. G. Popovich, H. C. Ansel. Ansel‟s pharmaceutical dosage forms and drugdelivery systems. Lippincott Williams & Wilkins, 2005.

3. M. E. Aulton Pharmaceutics. The science of dosage form design. - 2nd ed. Churchill-Livingstone,2002

4. B.M.Mithal. a text book of pharmaceutical formulations, 6thed., vallabh prakashan, 2010.

Reference Books:

1. Banker and Rhodes, Modern pharmaceutics, marcel dekker series.

2. James Swarbrick, Encyclopedia of pharmaceutical technology, 3 rd edi, informa healthcare.

Outcomes :

1. basic concepts in the field of drug delivery systems that is used in Pharmaceutical Technology.
2. uses pharmaceutical information sources medical
3. Lists in the form of liquid drug delivery systems.
4. Defines the concepts of dissolution, solubility and stability.

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 213	Pharmacognosy II (Theory)	03	04
Sessional marks : 20		**End Semester Examination Marks : 80**	

Objectives :

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

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

3.Familiar with the evaluation techniques for herbal drugs

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

UNIT I

Glycosides

Definition, classification, properties and general tests of glycosides and detailed Pharmacognostic study of the following glycosides containing drugs:

a. **Saponin glycosides**- Glycyrrhiza, Ginseng, Dioscorea, Senega, Sarsaparilla
b. **Cardioactive glycosides**-Digitalis, Squill, Strophanthus, Thevetia
c. **Anthraquinone glycosides**-Aloe, Senna, Rhubarb, Cascara
d. **Bitter Glycosides**- Psoralea, Gentian, Chirata

UNIT II

A) General introduction to cosmeceuticals, role of herbs in cosmetics.
   - Study of the following cosmeceuticals - Amla, Henna, Cyperus, Soap Nut, Aloe Vera, Turmeric, Sandal Wood and Bitter Orange Peel.

B) Definition and study of Neutraceuticals: Garlic, Spirulina, Soya and Royal jelly.

UNIT III

Alkaloids:

Definition, classification, properties and general tests and detailed pharmacognostic study of the following alkaloid containing drugs:

a. **Pyridine-Piperidine alkaloids**- Tobacco, Lobelia
b. **Tropane**- Belladonna, Hyoscyamus, Datura, Coca.
c. **Indole**-Ergot, Rauwolfia, Vinca, Nux Vomica
d. **Imidazole**-Pilocarpus
e. **Steroid**- Kurchi, Veratrum, Aswagandha

UNIT IV

a. **Quinoline-Isoquinoline**-Cinchona, Ipecac, Opium
b**. Alkaloidal amine**- Ephedra, Colchicum

c. **Glycoalkaloid**-Solanum

d**. Purine**-Coffee, Tea, cola

e**. Quinazoline** -Vasaka

A) **Biogenesis:** General techniques of biosynthetic studies and basic metabolic pathways.

- Biogenesisof secondary metabolites of pharmaceutical importance.

B) **Extraction of herbal materials**: Definition of extraction, principle involved in extraction,different types of extraction.

- Factors affecting the process of extraction.

C) Phytochemical Screening: Preparation of extracts, identification and screening of alkaloids, saponins, cardiac glycosides, flavonoids, tannins and anthraquinones in plant extracts.

Text Books:

1. Kokate CK, Purohit A.P. & Gokhale; Pharmacognosy Nirali Prakashan, New Delhi.

2. Text book of Pharmacognosy by Handa and Kapoor.

3. Peach K and Tracey MV, Modern methods of Plant analysis, Narose publishing house, New Delhi.

4. Pharmacognosy by Brady & Tyler.

5. Tutorial Pharmacy by Cooper and Gunn.

6. text book of pharmacognosy and phytochemistry by Vinod D Rangari, Vol I and II.

Reference Books:

1. Text book of Pharmacognosy by Wallis.
2. Herbal drug technology by Pulok Mukharjee
3. Pharmacognosy by Trease and Evans
4. Biosynthesis of natural products by Manitto P
5. Harbone JB, Phytochemical methods, Champman and Hall

Outcomes :

After Completion of the course the student able to

This subject is intended to impart students about the fundamental knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially, involved in the study of producing plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine.

1. Significance of pharmacognostic parameters & study of crude drugs.

2. Understand theunderlying reason of evolutionary significance of secondary metabolites production in plants & other organisms & deduce their significance as medicinal molecules.
3. How these primarymetabolites are used comprehensively as a source to develop Pharmaceutical & industrial applications.
4. Study about the source, name, chemical structures, methods of extraction, qualitative & quantitative analysis of glycosides & tannin compounds of plant origin.

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 214	Pharmacoinformatics & Basics in drug discovery (Theory)	03	04
Sessional marks : 20		**End Semester Examination Marks : 80**	

Objectives :

1. Understanding the scope of bioinformatics in day to day life .
2. Knowledge on drug , lead structures, QSAR and lead molecules
3. Inculcating the information regarding Docking, drug design, Ligand – receptor mechanism.
4. Various disciples interlinked with Bioinformatics, transcriptomics, genomics and their applications.

UNIT-1

Classification of Pharmacoinformatics: Bioinformatics, Genome Informatics, Immunoinformatics, Neuroinformatics, Toxic Informatics, Metabolome Informatics, Healthcare Informatics, Nursing informatics, Chemo informatics

UNIT-2

Basics in Drug Discovery:

Identification of new lead structures, Optimization of lead structures, Establishment of quantitative structure activity relationships (QSAR), Comparison of chemical libraries.

UNIT-3

Definition and analysis of structural diversity, Planning of chemical libraries, Docking of a ligand into a receptor, De novo design of ligands, Modeling of ADME-Tox properties, Drug design based on pharmacophore and virtual library screening.

UNIT-4

Disciplines of bioinformatics, transcriptomics, functional genomics, structural genomics, metabolomics, pharmaco-genomics

TEXT BOOKS

1. Developing Bioinformatics Skills. Alfonso Valencia and Blaschke. L (2005) Oreille.s Publication.

2. Bioinformatics sequence, structure and data banks ed. By Des Higgins Willie Taylor. (2006).

3. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins" (Andreas D. Baxevanis, B. F. Ouellette), Paperback, 2nd ed., 470 pp., ISBN: 0471383910, Publisher: Wiley, John & Sons, Inc., Pub.

4. David W. Mount, Bioinformatics: Sequence and Genome Analysis, 2nd edition, Cold Spring Harbor Laboratory, 2004, ISBN 0-87969-687-7.

5. Introduction to Bioinformatics by T.K.Altwood and D.J Parry-Smith (Pearson Education Asia 1999).

Outcomes :

1. Thorough Knowledge on Bioinformatics and its classification.
2. Importance of of drug discovery, lead molecules in the preparation of drugs in pharmaceutical industries.
3. Good information about drug design, ligand –receptor mechanism and its applications.
4. How this subject is collaborate with other disciplinary subjects, Understanding Genomics &transcriptomics.

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 215	Pharmaceutical pharmacy II (Practical)	04	02
Sessional Marks: 00		**End Semester Examination Marks : 100**	

Objectives :

1. To analyse the solubility of various drugs and excipients

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

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

3.Evaluate stability constant of complex compound.

I. EXPERIMENTS:

1. Determination of bulk density, true density and percentage porosity.

2. Effect of particle size and effect of glidant on angle of repose.

3. Study of particle/globule size distribution by optical microscopy

4. Determination of CMC of a surfactant.

5. Determination of partition coefficient

Iodine between water and carbon tetrachloride

6. Determination of sedimentation volume and degree of flocculation.

7. Effect of addition of Salt/pH/co-solvent on the solubility

8. Surface tension using Stalagmometer.

9. HLB value estimation of surfactants.

10. Viscosity – by Ostwald Viscometer.

II. DEMO/ WORKSHOP

Determination of particle size by AndreasonPippette, Plotting of an adsorption isotherm

Brook field viscometer.

III. **SEMINAR/ASSIGNMENT/GROUP DISCUSSION**

Viscoelasticity, solublisation techniques

References

1.Physical Pharmaceutics, By Mohanta, and Guru Prasad B.S. Publications

List Of Minimum Equipments Required

1. Ostwald‟s viscometer

2. Stalgnometer

3. Digital pH meter

4. Microscopes

5. Stage and eyepiece micrometer

6. Digital electronic balance

7. Thermometer

8. Andreasonpipetter

9. Adequate glasswares

Outcomes :

1. This course helps to compare and evaluate the solubility of various combination compound modify for better solubility approaches by use different level of methods
2. Principles involved in dosage forms/formulations.
3. Theory and practicalcomponents of the subject help the student to get a better insight into variousareas of formulation research and developmen
4. Stability studies ofpharmaceutical dosage forms

CO-PO Mapping

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

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

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 216	Pharmaceutical Analysis I (Practical)	04	02
Sessional Marks: 00		**End Semester Examination Marks : 100**	

Objectives :

To develop ability to work in pharmaceutical industries on modern analytical methods, instruments like

1. Analytical method development, Validation,
2. Analytical research
3. Achieving global standards.

I. Experiments:

1 Calibration of analytical glass ware.

2 Assay of Sodium carbonate by acid-base titration.

3 Assay of Ferrous sulfate (redox) ceric ammonium sulfate titration.

4 Assay of Sodium benzoate by non-aqueous titration.

5 Assay of Sodium chloride by precipitation titration.

6 Assay of Calcium gluconate by complexometry.

7 Potentiometric titration : Determination of strength of unknown solution HCl, HCl –Acetic acid mixture) against std. NaOH Solution.

8 Assay of any drug by potentiometry, (eg. Frusemide, metronidazole).

9 Conductometric titration – Determination of strength of unknown solution (HCl, HCl– Acetic Acid mixture) against std. NaOH Solution.

10 Determination of refractive index of any sample by Abbe's refractometer.

11 Determination of sucrose concentration by Polarimetry.

12 Determination of moisture content by Karl-Fishcer reagent.

II. Demo/work shop

1. Demonstration on gel electrophoresis
2. Demonstration on Polarography

III. Seminar/Assignment/Group discussion

1. List out various drugs that can be assayed by acid-base titration, as perI.P.2007.

2. What is the need of determination of moisture content, what is the limit ofmoisture in various natural and synthetic drugs.

Outcome:

1. Discusses the effect of impurities on the quality of drugs and behavioural pattern of drugs
2. Aids in understanding the SOP and usage of software associated with various analytical instruments
3. Helps in gaining knowledge of interpretation of spectra.
4. Knowledge on chromatograms

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 217	Pharmaceutical technology I (Practical)	04	02
Sessional Marks: 00		**End Semester Examination Marks : 100**	

Objectives :

Gives knowledge on the

1. Preparation of Solutions
2. Preparation of Emulsions
3. Preparation of Syrups
4. Preparation of semisolid dosage forms

I. EXPERIMENTS:

1. Preparation, evaluation and packaging of

a) Solutions: Paracetamol syrup, codeine phosphate linctus

b) Ferrous sulphate syrup

c) Suspensions: Milk of magnesia

d) Emulsions: o/w or w/o type

e) Benzyl benzoate lotion

f) Ointments: Benzoic acid ointment

g) Methyl salicylate ointment

h) Suppositories: Boric acid

i) Eye drops: Gentamycin.

j) Eye ointments: Chloramphenicol.

k) Sodiumchloride eye lotion

l) Cream: Cetrimide

m) Cold cream

n) Zincoxide jelly

o). Preparation of gel

II. DEMO/ WORKSHOP

Drug-excipient incompatibility studies, ointment filling machine.

III. SEMINAR/ASSIGNMENT/GROUP DISCUSSION

1) Excipients and their concentrations in various dosage forms.

2) Seminar on blood products
Outcome:

COURSE OUTCOMES

Students are capable of

1. Preparing the solutions
2. Preparing the emulsions
3. Preparing the syrups
4. Preparing the semisolid dosage forms

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 218	Pharmacognosy II (Practical)	04	02
Sessional Marks: 00		**End Semester Examination Marks : 100**	

Objectives :

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

EXPERIMENTS:

1. Study of various morphological characters of the drugs mentioned in theory under alkaloids
2. Study of various morphological characters of the drugs mentioned in theory under glycosides.
3. Microscopy (Transverse section & powder) of Datura and Vinca leaf
4. Microscopy (Transverse section & powder) of Cinchona and Ephedra
5. Microscopy (Transverse section & powder) of Nux vomica and Rauwolfia
6. Microscopy (Transverse section & powder) of Digitalis and Senna
7. Microscopy (Transverse section & powder) of Squill and Liquorice
8. Preparation and evaluation of any one herbal cosmeceutical preparation
9. Preliminary phytochemical screening of any one plant
10. Determination of crude fibre content for any one nutraceutical listed under theory.

Seminar/ Assignment/Group discussion

Seminar/assignment related to theory.

Workshop/Demo

Extraction of plant material using Soxhlet apparatus

References

1. Practical Pharmacognosy, C K Kokate, Nirali Prakashan
2. Practical Pharmacognosy, Khandelwal, Nirali Prakashan
3. Practical Pharmacognosy Iyengar, Manipal Press Ltd.
4. Peach K and Tracey MV, Modern methods of Plant analysis, Narose publishing house, New Delhi.

Outcome:

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

1. Demonstrate chemical tests to identify unorganized crude drugs
2. Evaluate the quality and purity of crude drugs
3. Perform linear measurements for crude drug identification
4. Develop quality control methods for standardisation of herbal drugs.

CO-PO Mapping

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

3- High, 2- Medium, 1-Low

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III B. PHARM- I SEMESTER

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 301	Pharmaceutical Technology-II	03	04
Sessional Marks:20		End Semester Examination Marks:80	

Objectives

Upon completion of the course the student shall be able to

1. Know the various pharmaceutical solid and parenteral dosage forms and theirmanufacturingtechniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, Parenteral dosage forms and Packaging of Pharmaceutical products

Course content

UNIT I

Capsules: Advantages and disadvantages of capsule dosage forms, material for production of hard and soft gelatin capsules, sizes of capsules, capsule filling, soft processing problems in capsule manufacturing, importance of base absorption and minimum/gm factors in soft capsules, quality control, stability testing and storage of capsule dosage forms.

UNIT II

Microencapsulation: Types of microencapsulation and importance of microencapsulation in pharmacy, micro capsulation by coacervation phase separator, multi orifice

centrifugalseparation. Spray drying, spray congealing, polymerization complex emulsion, air suspension technique, and pan coating techniques, evaluation of microcapsules.

UNIT III

Tablets: Introduction to different types of tablets, Formulation of tablets, direct compression, Granulation technology on large-scale by various techniques and equipments. Tablet processing problems and their remedy. Physics of tablet making. Types of tablet compression machinery and the equipments employed and evaluation of tablets. Coating of Tablets: Types of coating, coating materials and their selection, formulation of coating solution, equipment for coating, coating processes, evaluation of coated tablets. Tablet coating defects and their remedy.

UNIT IV

Parenteral Products

a. Preformulation factors, routes of administration, water for injection, treatment ofa pyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment.

b. Formulation details, containers, closures and their selection.

c. Prefilling treatment, washing and sterilization of containers and closures, preparation of solutions and suspensions, filling and closing of ampoules, vials, infusion fluids,lyophilization& preparation of sterile powders, equipment for large-scale manufacture and evaluation of parenteral products.

d. Aseptic techniques, sources of contamination and methods of prevention. Design of aseptic area, laminar flow benches, Environmental control monitoring.

Packaging of Pharmaceutical products:

Packaging components, types, specifications and methods of evaluation as per I.P. Factors influencing choice of containers, package testing, legal and other official requirements for containers, packing testing. Methods of packing of solid, liquid and semi-solid dosage forms, Factors influencing packing material, stability aspects of packaging.

Text Books:

1. L. Lachman, H.A, Lieberman and J.L. Kanig, Theory & Practice of industrial pharmacy, Lea &Febieger, Philadelphia Latest Edn.

2. L. V. Allen Jr., N. G. Popovich, H. C. Ansel. Ansel‟s pharmaceutical dosage forms and drug delivery systems. Lippincott Williams & Wilkins, 2005.

3. M. E. Aulton Pharmaceutics. The science of dosage form design. – 2nd ed. ChurchillLivingstone, 2002

4. B.M.Mithal. a text book of pharmaceutical formulations, 6thed, vallabhprakashan, 2010.

5. U.K.Jain, D.C.Goupale&S.Nayak. Pharmaceutical packing technology. Isted, pharmamed press, 2009.

Reference Books:

1. Sagarin& MS Balsam, Cosmetics Sciences &Technology Vol.1, 2 & 3 Wiley India Pvt. Ltd.

2. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences.

3. E.A.Rawlkins, Bentley‟s Text Book of Pharmaceutics, Elbspubl

4. Banker and Rhodes, Modern pharmaceutics, marcel dekker series.
5. L. Lachman, H.A, Lieberman and J.L. Kanig,Tablet vol I,II and III. marcel dekker series.
6. James Swarbrick, Encyclopedia of pharmaceutical technology, 3 rdedi, informahealthcare.
7. NK Jain, Pharmaceutical product development, CBS publishers.

Course Outcome:

1. Course enables the student to understand and appreciate the influence ofpharmaceutical manufacture of
2. Understand the various pharmaceutical dosage forms
3. Performance ofthe drugproduct by used of specific technology
4. Pharmaceutical product development

CO-PO Mapping

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

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH 302	**MEDICINAL CHEMISTRY-**I	03	04
Sessional Marks:20		**End Semester Examination Marks :80**	

Course Objectives:

The main objectives of this courseare to

1.Impart keen knowledge about the chemical structure, Systematic/trivial names, classificationmechanism of action, side effects and indications of each and every class of drugs.

2. Create awareness about the influence of various structural modification on the biological activities through Structural Activity Relationship (SAR) studies

4. To discuss simple routes of chemical synthesis for the prescribed drugs.

Course Content

UNIT I

Physico chemical properties of drug molecules in relation to biological activity – sssSolubility,lipophilicity, partition-coefficient, Ionization, hydrogen bonding, Chelation, redox potential and surface activity, Bioisosterism and steric features of drugs, drug distribution and protein binding. Mechanisms of Drug action: Introduction, Enzyme stimulation, Enzyme inhibition. Theories of drug action (Ferguson's, Dale's, perturbation and occupation). Drug metabolism:Introduction to Biotransformation, concept of soft and hard drug, phase I & II (With one drug example). Introduction, basic concepts and clinical importance of Prodrug and criteria
for drug latentiation approach.
NOTE: Introduction, definition, chemical classification with structure, nomenclature, synthesis (only for * marked drugs), mechanism of action, SAR including stereo chemical aspects, metabolites (including its ADR) and therapeutic uses of the following classes of drugs from UNIT II to UNIT V.

UNIT II Drugs acting on ANS

Adrenergic and antiadrenergic agents: Adrenergic agonist: Chemistry and metabolism of neurotransmitters, Dopamine, Epinephrine, Ephedrine*, Phenylephrine, Isoprenaline*, Naphazoline, Oxymetazoline*, Terbutaline, Salbutamol*, Salmetrol, metarminol. Adrenergic antagonist: Classification, Phenoxy benzamine*, Prazosin*,Tamsulosin, Propranolol, Atenolol*, Metaprolol, Labetolol, Esmolol. SAR-Sympathomimetics (Catecholamines)Cholinergic and anti-cholinergic agents: Cholinergic receptor and neuro chemistry and concept of neuro muscular blocking agents. Succinylcholine*, Methacholine, carbachol, pilocarpine*, Physostigmine, pyridostigmine, Neostigmine, Malathion, Pralidoxime, Propantheline, Nicotine, Dicyclomine*, Biperiden*, Decamethonium*, pancuronium. SARCholinergic agonists, Anti-cholinergics, Neuro muscular blockers.

UNIT III

CNS system Depressants and Central dopaminergic signalling agentsAnxiolytics, Sedatives and Hypnotics: Benzodiazepines (Diazepam*, Oxazepam, Nitrazepam, Clonazepam,Midozolam, Alprazolam*), Barbiturates (Phenobarbital*, Amobarbital, Pentobarbital, Secobarbital), Glutethimide*, Meprobamate*, methocarbamol, Methyprylon. SAR-Benzodiazepines, Barbiturates.Anti-Psychotics: Phenothiazines (Chlorpromazine*, Thioridazine, Fluphenazine), thioxanthines (Thiothixene*), Butyrophenones (Haloperidol*, Droperidol, resperidone, penfluridol), Miscellaneous-Lithium salts, Clozapine andOlanzapine. SAR- Phenothiazines, Butyrophenones.Anti-convulsants: Phenytoin*, Valproic acid, Carbamazepine*, Primidone, Ethosuximide*, Gabapentin, Lamotrigine, Levetiracetam, Zonisamide, Tropiramate. SAR- Hydantoins, Oxazolidinediones, Succinimides. Anti-parkinsonism: Levodopa*-Carbidopa, Amantidine*, Selegiline, Apomorphine, Ropinirole, Entacapone, Tolcapone.

UNIT IV

Analeptics: Picrotoxin, Doxapram*, Methyl xanthines (Caffeine, Theophylline,Theobromine) Psychomotor stimulant: Dextro amphetamine*, Methamphetamine, Phenfluramine, Sibutramine, Methylphenidate. Anti-depressants: Types, Phenelzine, Tranylcypromine*, Tricyclic anti-depressants: Imipramine*, Desipramine, Amytriptyline*, Doxepin*, Fluoxetine*, Sertraline, Newer agents: Venlafaxine, Buspirone, Mirtazapine and Bupropion. SAR- Tricyclic antidepressants, MAOIs.

Miscellaneous: Psilocybin, Dimethyltryptamine, Mescaline, Lysergic acid and Tetrahydro cannabinol.

Anaesthetics

General anaesthetics: Chemical classification, Inhaled and Injectable, Meyer-Overton theory, Halothane*, Isoflurane, Sevoflurane, Triflurane, Propofol, Ketamine, Etomidate, Thiopental sodium*. Local anaesthetics: Cocaine, Lignocaine*, Procaine*, benzocaine, Ropivacaine, Bupivacaine, Articaine. Adjuvant to local anaesthetics. SAR- Esters and amides.

Reference Books:

1. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.
2. An Introduction to Medicinal Chemistry by Graham. L. Patrick, Oxford University publis0hers.
3. JH Block & JM Beale (Eds), Wilson &Giswold‟s Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcolt, Raven, Philadelphia, 2004
4. Rama Rao Nadendla, Medicinal Chemistry; Mc Millan Publishers.
5. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford
6. D. Abraham (Ed), Burger Medicinal chemistry ad Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
7. M. Atherden, Bentley and Driver‟s Textbook of Pharmaceutical Chemistry Ed: l.Oxford University Press, Delhi.
8. Daniel lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.
9. D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y

Course Outcome:

After compilation of the course the students shall be able to

1. Gain knowledge on physicochemical and biological aspects of various drug classes.
2. Judge the effect of structural medications with respect to biological activity
3. Develop awareness about the application of organic synthesis with respected preparation of drugs
4. Organic Drug Synthesis and Design and discovery

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 303	**PHARMACOLOGY-I**	**03**	**04**
Sessional Marks: 20		**End Semester Examination Marks: 80**	

Objectives: The main objectives of this course are

1. To furnish basic knowledge about the principles of general Pharmacology
2. Discuss pharmacological aspects of drugs acting on nervous system with respect to various diseases associated

Course content:

UNIT I

General Pharmacology

Definition, historical development and scope of pharmacology. Sources of drugs and routes of administration. Principles of discovery and development of new drugs, phases of clinical trials.

b. PharmacodynamicsMechanism of action with special emphasis on receptors, drug-receptor interaction theories, factors modifying drug action.

c. PharmacokineticsDrug absorption, distribution, metabolism and excretion. Factors affecting/modifying pharmacokinetic parameters.

UNIT II

Pharmacology of Peripheral Nervous System

a. Neurohumoral transmission (autonomic and somatic), cholinergic receptors and adrenergic receptors.

b. Parasympathomimetics, parasympatholytics , sympathomimetics and sympatholytics.

c. Ganglionic stimulants and blocking agents.

d. Neuromuscular blocking agents and local anesthetic agents.

UNIT III

Pharmacology of Central Nervous System: I

a. Neurohumoral transmission in the C.N.S with special emphasis on dopamine, GABA and 5-HT neurotransmission.

b. General anesthetics,sleep cycle, sedatives, hypnotics and anti-anxiety agents.

c.CNS stimulants and centrally acting muscle relaxants.
d. Alcohols and disulfiram. Drug addiction, abuse, tolerance and dependence.

UNIT IV

Pharmacology of Central Nervous System: II
a. Pharmacology of drugs used in affective/mood disorders like depression and mania.
b. Pharmacology of drugs used in neurodegenerative disorders like parkinsonism and Alzheimer's disease.
c. Pharmacology of drugs used in behavioral disorders like psychosis.
d. Pharmacology of drugs used in epilepsy
e. Analgesics, Antipyretics, Anti-inflammatory and Anti migraine drugs.
f. Narcotic analgesics and antagonists.

Text Books:

1. Tripathi, Essentials of Medical Pharmacology, Jaypee Brother‟s, Latest Edition
2. H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill living stone, 4th Ed.
3. David E.Golan, Armen H.Tashjian, April W.Armstrong, Principles of pharmacology,Latest edition
4. Bertram. G. Katzung, Basic and clinical pharmacology, 9th Edn; Prentice HallInternational
5. Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.

Reference Books:

1. J.G. Hardman and Lee E. Limbard, Good Mann &Gilmann, The Pharmacological basis of therapeutics, Mc Grawhill, Health Professions Dvn.
2. J. Crossland, Lewis„s Pharmacology, Church living stone.
3. Ruth Woodrow, Essentials of Pharmacology for Health Occupations. Delmar Cenage Learning

Course Outcome:

After completion of this course the students shall be able to

1. Gain knowledge on pharmacokinetic and pharmacodynamic aspects of drugs in general.
2. Develop understanding about physiological, pathological, and pharmacological concepts of nervous system.
3. To understand the Pharmacology and pharmaco therapeutics
4. To understand the Principles of pharmacology

CO-PO Mapping

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

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

5.

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 304	**PHARMACEUTICAL MICROBIOLOGY**	**03**	**04**
Sessional Marks: 20		**End Semester Examination Marks: 80**	

Objectives: The main objectives of this course are

1.To introduce basic principles and application relevance of clinical disease for students

2.To study all categories of microorganisms for production of alcohol, antibiotics, vaccines, vitamins enzymes etc.

3.To impart knowledge of basic principles of bacteriology including nature of pathogenesis, diagnosis, transmission and control of diseases.

Course content

UNIT I

Introduction to Microbiology: Origin, scope and discovery of spontaneous generations theory, contributions of Antonie Van Leeuwenhoek, Pasteur, Koch and Lister. Diversity of Microorganisms: Prokaryotes versus eukaryotes – eukaryotic and prokaryotic cell structure, threedomains of life (bacteria, archaea and eurkaryotics). Pharmaceutical significance ofprotozoa, algae,fungi, bacteria and viruses. Characterization and identification ofmicroorganisms.

UNIT II

Nutrition and Growth of Microbes: Nutritional requirements, Types of Nutrientmedia and growth conditions and Nutritional types based on energy source.Isolation, cultivation (aerobic & anaerobic) and preservation of microorganisms, physiology ofgrowth, bacterial growth curve, methods for determining bacterial numbers, mass and cellconstitutents. Exponential

growth and generation time. Bacterial growth in batch and continuousculture (chemostat and turbidostat) synchronous growth.

UNIT III

Control of Microorganisms: General Concepts, Inhibition of growth and killing,sterilization and disinfection, antisepsis and sanitation, mode of action application & limitation ofphysical agents (moist and dry heat, radiation and filtration), chemical agents. Various typesofdisinfectants, factors affecting sterilization and disinfection, evaluation of antimicrobialactivity.Chemotherapeutic agents, mode of action and applications, drug resistance. Official methods of sterility testing of pharmaceuticals and biosafety measures.

UNIT IV

Epidimeology of Diseases: Study of etiology, diagnosis, source of infection, mode of transmission,immunization methods, prevention and control of the following diseases. Bacillary dysentry,diphtheria, tuberculosis, leprosy, cholera, typhoid, syphilis, gonorrhoea, tetanus, food poisoning andinfective hepatitis. Diagnostic tests of Malaria, Typhoid, Cholera, TB, Leprosy. Application of Microbes in Pharmaceutical Industry

Microbiological Assays: Principles and Methods involved in Assay ofAntibiotics(penicillins,tetracyclines and streptomycins only) Vitamins (cyanocobalamin and

riboflavinonly), Amino acids (lysine and glutamic acid only) & Bio-Sensors in Analysis.

Text Books:

1. Pelczar and Reid, Text Book of Microbiology Lippincolt Williams &wilkins, 2nd Edition.
2. Anantha Narayan and Jayram Panikar, Text Book of Microbiology, Orient Longman, Delhi, Hyderabad.
3. R.C. Dubey, A textbook of Microbiology S.Chand.

Reference Books:

1. Pharmaceutical microbiology by Kishore Gujar, Himalaya publishing house.
2. Nester, Anderson, Roberts, Pearsall, Microbiology, McGraw-Hill.
3. Hugo.W B, Pharmaceutical Microbiology. PA Publishing Pvt. Ltd.
4. Tortora, Gerard, Text Book of Microbiology. Benjamin Cummings.
5. Prescott and Dunn, " IndustrialMicrobiology" 2nd Ed, Mc Graw hill Book Company Inc.

Course Outcome:

1. To know the various types of sterile products with their formulation in large scale industries.
2. To acquire knowledge on GMP standards sanitation, personal hygiene in sterile product manufacturing facilities.
3. Principles and Methods involved in Assay of various medicine
4. Application of Microbiology to develop the pharmaceutical product

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 305	**DRUG STORE & INDUSTRIAL. MANAGEMENT & MARKETING**	**03**	**04**
Sessional Marks: 20		**End Semester Examination Marks: 80**	

Objectives: The main objectives of this course are

1.To manage the details of Medical Shop, Stocks, Inventory, Sells, and Company.

2.The application program to reduce the manual work for managing the Medical Shop, Stocks, Medicines, Inventory, and industrial management.

3.To awareness of pharma industry and processing of various departments and their relevant documentation process.

Course content

UNIT-1

1. Drug Store Management: Selection of site, space, layout and legal requirements. Storage of drugs of various schedules and maintenance of records as per requirement. Hospital supplies, requirements for dispensing extemporaneous preparations. Importance and objectives of purchasing, selection of suppliers, credit information,tenders, contracts and price determination, removal of expired drugs. Patient counselling – maintenance of records.
2. Plant location and layout of an industry: Various factors affecting locational aspects, layout of building and equipment. Product layout versus process layout and compliance of pollution control measures.

UNIT-2

Production, planning and control – scientific purchasing, quality control, problems of productivity, stores organization, location of stores, receiving, inspection of materials and issue from the store, control of stores and stocks, stores accounting and records. Personnel

management – selection, appointment, training, transfer, promotion, demotion policies, remuneration, job evaluation, human relations.

UNIT-3

Sales organization: Market, definition, different approaches to the study of marketing, institutional approach, market planning, product planning, method of marketing, wholesalers, retailers, functional approach, efficiency in marketing, commodity approach.

Distribution policies: Selective and Exclusive distribution, pricing and discount policies,credit policies, trade indication marks, patent policies. Sales promotion policies – detailing to physician, professional persons, sampling, window and interior display, product advertising, sales promotion publicity.

UNIT-4

Budgets and budgetary controls: Elements of accounting, double entry book keeping, books of accounts, trial balance, final accounts of business and profit, profit and loss accounts,appropriation accounts, balance sheets.

Reference Books:

1. Remington's Pharmaceutical Sciences.
2. Pharmaceutical marketing in India, concepts strategy cases by Subba Rao Chaganti Published by Pharma book syndicate.

Course Outcome:

1. 1.This course helps to understand the students how to establishthe drug store
2. To understand the functioning the proper channels and also procurement and dispensing of drugs procedure as per government norms.
3. Gain knowledge on functioning
4. Development of management skills of pharma industry and know the regulating process in all aspects

CO-PO Mapping

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 306	**Pharmaceutical Technology-II**	**04**	**02**
Sessional Marks:00		**End Semester Examination Marks:100**	

Objectives:

1. Know the various pharmaceutical different solid and parenteral preparation methods and evaluation techniquein manufacturingprocess.

2. Know to development of quality control of pharmaceutical formulation of different types tablets, capsules, and parenteral dosage forms

Course content

I. EXPERIMENTS:
1.Manfacturing of tablets:
a. Ordinary compressed tablets by wet granulation.
b. Tablets prepared by direct compression
c. Soluble tablets/dispersible granules
d. Chewable tablets
e.Effervescent tablets.
2. Evaluation of tablets (Weight variation, hardness, friability, disintegration and dissolution)
3. Formulation and filling of hard gelatine capsules.
4. Parenteral:
a) Manufacturing of parenteral (Ampoule sealing (Pull sealing and tip sealing)
b) Evaluation of parenteral (Clarity test, and leaking test).
II. DEMO/ WORKSHOP
Coating of tablets (sugar/film/enteric)
III.SEMINAR/ASSIGNMENT/GROUP DISCUSSION
1. Advances in granulation technology.
2. Multifunctional excipients.
3. Excipients and their commercial names.

Course Outcome:

1. This course helps to Identify, formulate, research on pharmaceutical solid dosage
2. Development of parenteral dosage form and solve complex problems in quality control of product.
3. To development of various manufacturing sealing of pharmaceutical product
4. To development of coating of various dosage form by use of materials

CO-PO Mapping

Cours	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO1**
CO1	1	1	2	1	2	1	2	1	1	1	1	1

CO2	1	1	2		2	1		1	2	1		2
CO3	1	1	2	1	2	2	2	1		1	1	
CO4	1	1	2	1	2	2	2	1	2	1	1	2

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 307	**MEDICINAL CHEMISTRY-I PRACTICALS**	**04**	**02**
Sessional Marks:00		**End Semester Examination Marks:100**	

Course Objectives

To understand to synthesis of selected molecules

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

Course content

I. EXPERIMENTS
1. Synthesis of Barbituric acid from Diethyl Malonate
2. Synthesis of Phenytion from Benzoin or Benzil
3. Synthesis of Diphenyl quinaoxaline from o-phenylene diamine and benzil
4. Synthesis of phenothiazine from o-phenylene diamine
5. Synthesis of Benzocaine from Para amino benzoic acid
6. Synthesis of Dibromo succinic acid from malic acid
7. Synthesis of Benzoxazine from Anthranilic acid
8. Monograph analysis of Caffeine
9. Monograph analysis of Phenytoin
10. Monograph analysis of Barbituric acid
11. Monograph analysis of Benzocaine
12. Monograph analysis of Lignocaine gel

(Literature, Journal reported lead compounds synthesis relevant to theory can also be included)

II Demo/Workshop
1. Stereo models of some drugs relevant to theory.

2. Extraction of drugs from different dosage forms

III Seminar/Assignment/Group discussion

Photochemistry as a green synthetic method, novel methods for the separation of optical isomers, highly selective metalation reactions, high throughput screening, combinatorial chemistry, In silico drug design.

References:

1. A.I. Vogel, Text Book of Practical Organic Chemistry, 5th Edition. Pearson Prentice Hall.
2. F.G. Mann & B.C. Saunders, Pratical Organic Chemistry, 4th Edition. Pearson Publishers.

LIST OF MINIMUM EQUIPMENTS REQUIRED

1. Water bath
2. Suction pumps
3. Analytical/physical balance
4. Triple beam balance
5. Reflux flask with condenser
6. Hot plates
7. Refrigerator
8. Mechanical and magnetic stirrer with thermostat
9. Distillation unit
10. Oven
11. Adequate glass wares

Couse Outcome:

1. This course helps to how to separation and identification compound given unknown mixture.
2. It imparts take it knowledge on crude separation and identification technique
3. To understand the various types of drug moiety
4. Knowledge on the drug development

CO-PO Mapping

Cours	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO1**
CO1	2	1	2	2	1	2	1	1	1	1	2	1
CO2	1	2			1	2		2	1	1		1
CO3	2		2	2			1	1		2	2	
CO4	1	2	2	2	1	2	1	1	1	1	2	1

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

BPH 308	PHARMACEUTICAL MICROBIOLOGY PRACTICALS	04	02
Sessional Marks:00		**End Semester Examination Marks:100**	

Objectives

1.To introduce basic principles ofmicrobiology laboratory.
2.To characterization and of all categories of micro-organisms identification by using of different methods.
2. To impart knowledge on Sterilization techniques and their validations of laboratory conditions
3.To impart knowledge on culture media that helps to growth of organism and also inhibition action of micro-organism.

Course content

I. EXPERIMENTS:

1 Introduction to equipment and glassware used in microbiology laboratory.
2 Preparation of various culture media.
3 Sterilization techniques and their validations.
4 Aseptic transfers of culture into different types of media.
5 Characterization of microbes by staining methods (simple gram's, acid fast and negative staining and spore staining) and motility testing by hanging drop method.
6 Enumeration of bacteria by pour plate/spread plate technique
7 Enumeration of bacteria by direct microscopic count. (Neubauer's chamber)
8 Isolation of pure cultures by streak plate, spread plate and pour plate.
9 Evaluation of antiseptics and disinfectants by phenol coefficient method(R/w),
10 Sterility test for bulk powders and water for injection (IP).
11 Observation of colony/culture characters
12 Bio chemical reactions:
i) Indole test.
ii) Methyl red test.
iii) Voges proskauer test.
iv) Starch hydrolysis test.
v) Fermentation of carbohydrates and gelatin liquefaction.
13 Anti-microbial assay by cup and plate method and turbidometric method
II. Demonstration/Workshop: Construction of Bacterial growth curve by different methods, Rapid Diagnostic tests by kits
III. Assignment/Seminar/Group discussion:
Recent trends in Identification, Cultivation, Handling of Microorganisms. Polymer Chain Reaction (PCR).

Course Outcome:

1. This course help to able to understand the different levels of microorganism grow those different conditions.
2. Gain knowledge of the various types of sterile products with their formulation in large scale industries
3. Acquire knowledge on GMP standards sanitation, personal hygiene in sterile product manufacturing facilities.
4. To understand the different types of cultures and media for investigation and identification of anti-bacterial activity.

CO-PO Mapping

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

III B. PHARM- II SEMESTER

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

Code			
BPH 309	**MEDICINAL CHEMISTRY-II(Theory)**	**03**	**04**
Sessional Marks: 20		**End Semester Examination Marks: 80**	

Objectives:

The main objectives of this course are to

1. Impart keen knowledge about the chemical structure, Systematic/trivial names, classification mechanism of action, side effects and indications of each and every class of drugs.

2. Create awareness about the influence of various structural modification on the biological activities through Structural Activity Relationship (SAR) studies

4. To discuss simple routes of chemical synthesis for the prescribed drugs.

Course content:

UNIT I Drugs acting on renal system

Renin-Angiotensin system inhibitors: Captopril*, Lisinopril, Enalapril*, Ramipril, Benzapril, Losartan*, Candesartan, Telmisartan, Valsartan, Aliskiren.
Diuretics: Acetazolamide*, Methazolamide, Dichlorphenamide, Hydrochlorthiazide*, Benzthiazide, Furosemide*, bumetanide, Newer- Piretanide, Ethacrynic acid*, Indacrinone, Spironolactone, Aldosterone, Amiloride, Triamterene and Mannitol. SARCarbonicanhydrase inhibitors, Thiazides, Loop diuretics, Phenoxy acetic acid derivatives.

UNIT II Drugs acting on CVS

Anti-anginal agents & vasodilators: Nitroglycerin, Isosorbide dinitrate, Erithrityl tetranitrate*, pentaerythritol tetranitrate. Ion channel blockers- Verapamil, Diltiazem, Nifedipine, Amlodipine*, Felodipine, Nicardipine, Bepridil, Ranolazine.Antithrombotic agents- Aspirin, Dipyridamole, Clopidogrel* and TiclopidineAntiarrhythmic drugs: Quinidine,Procainamide*, Disopyramide, Lidocaine, Mexiletine*, Propaferone, Amiodarone,Bretylium, Sotalol.
Antihypertensive agents: classification, Reserpine, Guanethidine, Prazosin, Terazosin, Methyldopa, Clonidine, Hydralazine, Sodium nitroprusside, Sildenafil citrate, Minoxidil, Amrinone, Milrinone. SAR- beta-blockers
Antihyperlipidemic agents: Clofibrate, Fenofibrate*, Dextrothyroxine, Cholestyramine resin, Colestipol, Nicotinic acid, ß-Sitosterol, Probucol, Ezetimibe, Simvastatin*, Lovastatin, Pravastatin, Fluvastatin, Atorvastatin, Rosuvastatin. SAR-HMG CO-A inhibitors

UNIT III Drugs acting on Blood, hypoglycemic agents and thyroid. Anticoagulants: Factors, Warfarin sodium*, Dicumarol,
AnisindioneSynthetic hypoglycemic agents: Tolbutamide*, Tolazamide, Chlorpropamide,Acetohexamide, Glipizide, Glyburide, Glimepiride, Gliclazide, Repaglinide,

Pioglitazone, Metformin*, Acarbose, Miglitol.Thyroid and antithyroid drugs: Levothyroxine, Liothyronine, Propylthiouracil, Methimazole.

UNIT IV Analgesic, antipyretic and anti-inflammatory agents

Opioids: Levorphanol, Dextromethorphan, Pentazocine, Meperidine, Loperamide, Fentanyl,Methadone, Tramadol*, Butorphanol, Buprenorphine. Opioid antagonist: Naltrexone,Naloxane, Methylnaltrexone.

NSAIDs: A note on prostaglandins and leukotrienes. Aspirin, Indomethacin, Sulindac*, Tolmetin, Ketorolac, Ibuprofen*, Naproxen, Fenoprofen, Mefenamic acid, Diclofenac*, Lumiracoxib, Piroxicam, Meloxicam, Celecoxib, Paracetamol*.Management of Gout and Hyperuricemia: Colchicine, Allopurinol*, Probenecid, Sulfinpyrazole. Antimigraine drugs: Sumatriptan, Zolmitriptan. SAR – Salicylates, Aryl propionic acids, oxicams.Antibioticsβ-Lactams: Penicillin G, Penicillin V, Methicillin, Oxacillin, Cloxacillin*, Dicloxacillin,Ampicillin*, Amoxicillin, piperacillin. β- Lactamase inhibitors: Clavulanate potassium, Sulbactam, Tazobactam, Newer-Meropenem, Biapenem, Cephalosporins: Cephalexin*, Aminoglycosides and Tetracyclines: Streptomycin, Neomycin, Kenamycin, Amikacin, Gentamicin, Tobramycin, Tetracycline, Chlortetracycline, oxytetracycline, Doxycycline, Minocycline. SAR-Aminoglycosides and tetracyclines.

Text Books:

1. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.
2. An Introduction to Medicinal Chemistry by Graham. L. Patrick, Oxford University publishers.
3. JH Block & JM Beale (Eds), Wilson &Giswold‟s Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcolt, Raven, Philadelphia, 2004
4. Rama Rao Nadendla, Medicinal Chemistry; Mc Millan Publishers.

Reference Books:

1. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford
2. D. Abraham (Ed), Burger Medicinal chemistry ad Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
3. M. Atherden, Bentley and Driver‟s Textbook of Pharmaceutical Chemistry Ed: l.Oxford University Press, Delhi.
4. Daniel lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley, N. Y. 1998.
D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.

Course Outcome:

1. Gain knowledge on physicochemical and biological aspects of various drug classes.
2. Judge the effect of structural modification with respect to biological activity
3. Develop awareness about the application of organic synthesis with respected preparation of drugs
4. To understand the drug development process

CO-PO Mapping

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

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

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH310	**Pharmacology II– Theory**	03	04
Sessional Marks: 20		**End Semester Examination Marks: 80**	

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 Content:

UNIT I

Drugs acting on cardiovascular System

a. Pharmacology of drugs used in hypertension and CHF
b. Pharmacology of drugs used in coronary artery diseases (Atherosclerosis, Angina and MI)
c. Pharmacology of drugs used in arrhythmias
d. Shock and treatment of different types of shock

UNIT II

Drugs acting on hematopoietic system

a. Coagulants, anticoagulants
b. Fibrinolytics, anti fibrinolytics, anti platelet drugs
c. Haematinics and plasma expanders

UNIT III

a. Drugs acting on urinary system

i) Fluid and electrolyte balance

ii) Diuretics and anti diuretics

b. Drugs acting on respiratory system

i) Antiasthmatics including bronchodilators
ii) Antitussives and expectorants
iii) respiratory stimulants

UNIT IV

Autacoids

a. Amine autacoids- Histamine, 5-HT and their antagonists

b. Lipid derived autacoids-Prostaglandins, thromboxanes and leukotrienes.

c. Peptide autacoids- Angiotensin, bradykinin

Hormones and hormone anatagonists

a. Insulin,Oralhypoglycemic agents
b. Thyroid and antithyroid drugs
c. Adrenocortical steroids and their analogues
d. Uterine stimulants and relaxants
e. Oestrogens, progesterones, androgens, anabolic steroids and oral contraceptives

Text Books:

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

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

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

Course Outcomes:

1. In continuation with the previous semester, this subject would have continued describing about the different drugs used for the treatment of diseases.
2. Students understood the mechanism of drug action and its relevance in the treatment of different diseases.
3. Have understood about the drugs used to treat respiratory disorders, metabolic disorders, coagulants and anti-coagulants.
4. Recognise and explain the rationales behind the use of widely used, national organization approved treatment for the management and treatment of common diseases and conditions.

CO-PO Mapping

Cours	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1

e	1	2	3	4	5	6	7	8	9	0	1	2
CO1	1	2	1			1	1	1	2	1	2	3
CO2	1	2	1	1	1	2	2	2	1	3	1	3
CO3	1	2	1			1	1	1	2	2	2	3
CO4	1	2	1	1	1	1	2	2	1	1	2	3

Course Code	Course Title	No of Hours Per week	No of Credits
BPH311	**PHARMACEUTICAL. ANALYSIS II (Theory)**	03	04
Sessional Marks: 20		**End Semester Examination Marks: 80**	

Course Objectives:

The main objectives of this course are to

1. Impart keen knowledge on basic principles of the UV, Visible AND NMR Spectroscopy,

2. Create awareness about factors affecting the intensity of fluorescence, Instrumentation, Applications in Pharmaceutical analysis

4. To discuss Principle, instrumentation involved in ORD,XRD, HPLC to determine characterises of compounds.

Course Content

UNIT I

UV and Visible Spectroscopy: EMR, Molecular energy, types of electronic transition during UV-Visible light absorption, Beer-Lambert's law & deviations, chromophores, Auxochromes, isobestic point, instrumentation – Construction of single beam and double beam spectrophotometers, WoodwardsFiesher rules for calculation of □- max, quantitative applications (calibration method, A1%cm, single- and double-point standardization, simultaneous equation method) to dosage forms.

IR Spectroscopy: Vibrational energy in bond, types of vibrations, Hook's law, sample preparation, instrumentation – FT- IR (single and double beam), ATR, determination of functional group by IR spectra, Application of IR spectra in monograph analysis as per IP. Note on "mutual exclusion principle".

UNIT II

H1-NMR spectroscopy: Principle, theory, spin-quantum number, energy levels, relaxation process, chemical shift and NMR spectrum, shielding and de-shielding, spin-spin coupling, J – value, Instrumentation, applications, ESR Vs NMR (comparison of principle and application).

Mass Spectrometry: Basic principle, types of peaks in mass spectrum, fragmentation pattern, instrumentation (single and double focusing), ionization techniques, Nitrogen rule, unsaturation index (formula).

UNIT III

Fluorimetry: Theory, Fluorescence and chemical structure, stokes and anti-stokes, quantum efficiency, factors affecting the intensity of fluorescence, Instrumentation (double beam), Applications in Pharmaceutical analysis.
Flame Emission photometry Vs Atomic absorption spectroscopy: Emission spectra,Absorption spectra, line spectra, principle of absorption / emission of UV light by elements, instrumentation, applications in pharmaceutical analysis. Focus on interference.Nephelo-turbidimetry: Introduction, principle, instrumentation of Nephelo-turbidimeter, pharmaceutical application as specified in IP, determination chlorides and sulphates.

UNIT IV

Principle of optical activity, optical purity, concept of Optical Rotatory dispersion (ORD), Octant Rule, Circular dichroism Vs ORD.
XRD: production X-ray, types, Braggs law, XRD pattern in identification and comparison of polymorphs with examples.
Radio Immuno Assay & Enzyme Linked Immuno Sorbate Assay : principle, Procedure and application in diagnosis.
Gas Chromatography: Principle, adsorption isotherm and its relation to tailing and fronting, Instrumentation - carrier gas, flow regulators, injectors columns, detectors. Various parameters used in GC analysis.
HPLC: Principle, Vandeemter equation, Instrumentation - mobile phase, degassing, pumps, injectors, columns, detectors. Isocratic and gradient elution in RP-HPLC.

Text Books:

1.R.M. Silvesterin and G.C. Bassler, Spectrometric Identification of Organic Compounds. John Wiley & Sons.
2.AH Beckett &Stenlake, Text book of Practical Pharmaceutical chemistry, Vol.IIContinum International Publishing Group, Althone.
3.Robert D. Braun, Introduction to Instrumental Analysis. Pharma Med Press.
4.Skoog, West and Holler Principles of Instrumental Analysis; Saunders college Publishing, London.
5.William Kemp. Organic spectroscopy, wiley edition

Reference Books:

1.Hobart. H. Willard and others, Instrumental methods of analysis, CBS publishers and Distributors New Delhi.
2.Settle, Handbook of Instrumental Techniques for Analytical Chemistry. Prentice Hall.
3.P.D. Sethi, Quantitative analysis of Drugs and Pharmaceuticals. CBS Publishers.
4.K. A. Connors, A Textbook of pharmaceutical analysis, Wiley Interscience, NY.
5.Pharmacopoeia (IP, BP, USP).
6.B.K. Sharma, Instrumental Chemical Analysis, Goel Publishers.

Course Outcome:

After compilation of the course the students shall be able to

1. Gain knowledge on identification of functional groups of various drugsand other excipients.
2. Judge the chemical interaction between the compound that effect on structural modification ions with respect to biological activity
3. Develop awareness about the analytical equipment which are help to obtain good quality control of pharmaceutical formulation as per pharmacopeia's
4. To understand the howto characterization of drug formulation by analytical techniques

CO-PO Mapping

Cours	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1
CO1	1	3	2	3	2	2	2		1	1	1	2
CO2	1	3	1	3	1	2	1	2	1	1	1	3
CO3	1	3	2	2				1	2	2	1	2
CO4	1	3	1	3	1	1	2	2	1	1	2	2

BPH 312 A: FORENSIC PHARMACY

Course Code	Course Title	No of Hours Per week	No of Credits
BPH312A	**FORENSIC PHARMACY– Theory**	03	04
Sessional Marks: 20		**End Semester Examination Marks: 80**	

Course Objectives:

Understand the Knowledge of Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.

2. Knowledge on various Indian pharmaceutical Acts and Laws.

3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals

4. The code of ethics during the pharmaceutical practice.

Course Content

UNIT-1

Evolution of pharmacy and drug legislation in India. A study of the following acts with up-to-date amendments.
a) Pharmacy Act
b) Drugs and Cosmetic Act and Rules
UNIT-2
c)Narcotic Drugs and Psychotropic Substances Act (1986)
d)Drugs and Magic Remedies Act
UNIT-3
e) Drugs (Price Control) Order
f) Medicinal and Toilet Preparations (Excise duties) Act and Rules.
UNIT-4
g) Patents Act and Intellectual Property Rights
h) Medical Termination of Pregnancy Act
i)Code of Pharmaceutical Ethics

Reference Books

1.Original Laws Published by Government of India.
2.Forensic Pharmacy by B.M. Mithal
3.Laws of drugs in India – Hussain
4.Intellectual Property Law by R.K. Nagarajan
5.Text book of forensic pharmacy by C.K.Kokate and S.B.Gokhale published by Pharma book syndicate.

Course Outcomes:

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

CO-PO Mapping

Cours	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO1**

e												
CO1	2	1	1	1	1	1	1		1	1	1	1
CO2	2	1	1	1	1			1	1	1	2	
CO3	2	1	1	1	1			1	1	1	1	1
CO4	2	1	1	1	1	1	1	1	1	1	2	1

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH312B	**CLINICAL TRIALS– Theory**	03	04
Sessional Marks: 20		**End Semester Examination Marks: 80**	

Course Objectives:

1.To provide a scientific basis for advising and treating patients.

2.To determine new ways to prevent, detect or treat diseases.

3.To obtain data whether the drug actually works in treating a disease or indication.

4.To promote education and training opportunities for clinical researchers.

5.For providing expert advice on investigator-initiated clinical trials to governments, policy makers and others

Course Content

UNIT I

Introduction to drug discovery and drug development
Drugs, Preclinical studies, Pharmacodynamics, Pharmacokinetics, Drug interactions, Introduction to Pharmacoeconomics.

UNIT II

Ethics committee and its member, Institutional ethics committee, Role of ethics committee for approval of protocols

UNIT III

Preclinical toxicology, Systemic toxicology, Carcinogenecity, Mutagenecity, Teratogenicity, Reproductive toxicity, Local toxicity, Genotoxicity.

UNIT IV

Clinical trials, Phase I, II, III, IV
Types of Clinical trials, Single blinding, Double blinding, Open access, Randomized trials, Cross over design, Data management in clinical research.New drug Discovery, NDA, INDA.

Text Books:

1.Tripathi, Essentials of Medical Pharmacology, Jaypee Brother‟s, Latest Edition

2.H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill living stone, 4th Ed.

3.DavidE.Golan, ArmenH.Tashjian, April W.Armstrong, Principles of pharmacology, Latest edition

4.Bertram. G. Katzung, Basic and clinical pharmacology, 9th Edn; Prentice Hall International

Reference Books:

5.Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.
6.J.G. Hardman and Lee E. Limbard, Good Mann &Gilmann, The Pharmacological basis of therapeutics, Mc Grawhill, Health Professions Dvn.
7.J. Crossland, Lewis„s Pharmacology, Church living stone.
Ruth Woodrow, Essentials of Pharmacology for Health Occupations. Delmar Cenage Learning

Course outcomes

At the end of course students will be able to:

1. 1.Know the regulatory requirements for conducting clinical trial
2. 2.To understand the various types of clinical trial designs
3. 3.To gain knowledge on basic concepts and establishment of pharmacovigilance
4. 4.To know the ADRreporting, methods and tools used in pharmacovigilance

CO-PO Mapping

Cours	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO1**
CO1	1	2	1		1		1		1		1	1
CO2	1	1	1	1	1	1		1	1	1	2	1
CO3	1	2	1					1			1	
CO4	1	1	1	1	1	1	1	1	1	1	2	1

Course Code	Course Title	No of Hours Per week	No of Credits
BPH312 C	**INDUSTRIAL.PHARMACY & COSMETIC TECHNOLOGY– Theory**	03	04
Sessional Marks: 20		**End Semester Examination Marks: 80**	

Course Objectives:

1.Know the various pre-formulation studies involved different dosage forms by use of techniques.
2. Know impact of drug- excipient interaction on dosage stability.
3. case studies of different formulation categorised Formulate solid, liquid and semisolid dosage forms.

UNIT-1

1.Pre – formulation: Objectives – Protocols – Physical, chemical, Micromeritic studies in pre– formulation, stability considerations, drug – excipient compatibility. 2.Formulation Development: Factors involved,
I.Case studies: Formulation of (i) An antacid product (ii) An ampicillin product for Paediatric use (iii) An antibacterial product for a child (iv) Pain balm (v) An anti-inflammatory gel.

UNIT-2

II.A study of the formulation, process and equipment used in the large scale manufacture, evaluation, and quality control of the following dosage forms.
(i)Suspensions (ii) Emulsions (iii) Liquid orals (Syrups and Elixirs).
i.Tablets , Tablet Coating – sugar, film and enteric coating
ii.Capsules – hard and soft.

UNIT-3

(i)Parenterals , Other sterile products – eye ointments, eye drops.
(ii)Sustained release products , Microencapsulation and microcapsules
(iii)Aerosol preparations

UNIT-4

Formulation and preparation of the following Cosmetics – Hand lotions and creams, face powders, baby and bath powders, dentifrices, shampoo, lipstick, shaving preparations and hair dyes and creams, skin creams.

Course outcomes

At the end of course students will be able to:

1. To understand the how to prepare the various types of dosage form
2. To acquire knowledge on manufacture of pharmaceutical product
3. To acquire knowledge on modified drug release by novel approaches
4. To acquire knowledge cosmetics preparation

CO-PO Mapping

Cours	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1
CO1	3	1	2	3	2	2	1	2	1	2	1	3
CO2	2	1	2	1	1	1	3	1	1	1	2	3
CO3	2	1	3	2	2	3	2	1	1	2	1	3
CO4	2	1	3	1	1	1	1	1	1	1	2	3

Course Code	Course Title	No of Hours Per week	No of Credits
BPH313	**MEDICINAL CHEMISTRY-II PRACTICALS**	04	02
Sessional Marks: 00		**End Semester Examination Marks: 100**	

Course Objectives:

To understand to synthesis of selected molecules

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

Course Content

I.EXPERIMENTS:
1.Synthesis of Paracetamol from p-amino phenol
2.Synthesis of Cinnamic acid from benzaldehyde
3.Synthesis of Benzotriazole from o-phenylene diamine
4.Synthesis of 1-phenyl-3-methyl-5-pyrazolone from hydrazine hydrate
5.Synthesis of 7-Hydroxy-4-methyl coumarin from resorcinol and ethyl acetoacetate
6.Synthesis of Salicylaldehyde from phenol
7.Synthesis of Aspirin from salicylic acid
8.Identification and test for purity for Aspirin tablet as per IP
9.Identification and test for purity for Acetazolamide tablet as per IP
10.Identification and test for purity for propranolol tablet as per IP
11.Identification and test for purity for Diclofenac sodium tablet as per IP
12.Identification and test for purity for Paracetamol tablet as per IP
II.DEMO/WORKSHOP:

Microwave assisted organic synthesis, Purification of synthesized compounds (Column chromatography)

III.SEMINAR/ASSIGNMENT/GROUP DISCUSSION

Antibiotic discovery in the twenty-first century: Current trends and future perspectives, Current Trends in β-Lactam based β-Lactamase inhibitors and CVS agents.

References:

1.A.I. Vogel, Text Book of Practical Organic Chemistry, 5th Edition. Pearson, Prentice Hall.
2.F.G. Mann & B.C. Saunders, Practical Organic Chemistry, 4th Edition, Pearson Publishers.

LIST OF MINIMUM EQUIPMENTS REQUIRED

1.Water bath
2.Suction pumps
3.Analytical/physical balance
4.Triple beam balance
5.Reflux flask with condenser
6.Hot plates
7.Refrigerator
8.Mechanical and magnetic stirrer with thermostat
9.Distillation unit
10.Oven
11.Adequate glass wares

Couse Outcome:

1. This course helps to how to separation and identification compound given unknown mixture.
2. It imparts take it knowledge on crude separation and identification technique
3. To understand the drug development process
4. To understand the purity of various marketed active pharmaceutical ingredient.

CO-PO Mapping

Cours	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO1**
CO1	2	2	1	1	1	1	1	1	1	1	1	1
CO2	2	1	2	1	1	1	1	1	1	1	2	1
CO3	2	2	1	1	1	1	2	1	1	2	1	1
CO4	2	1	3	1	1	1	1	1	1	1	2	1

Course Code	**Course Title**	**No of Hours Per week**	**No of Credits**
BPH314	**PHARMACOLOGY-II PRACTICALS**	04	02
Sessional Marks: 00		**End Semester Examination Marks: 100**	

Course Objectives:

1.To understand the handling of different equipment's used in experimental pharmacology.

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

3.Knowledge on miotics and mydriasis, locomotor movements.

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

Course Content

I.EXPERIMENTAL PART

(To use appropriate software's for animal experimentation)
1.Introduction to Experimental Pharmacology
Preparation of different solutions for experiments.
Drug dilutions, use of molar and % w/v solutions in experimental Pharmacology.
Common laboratory animals and anaesthetics used in animal studies.
Commonly used instruments in experimental pharmacology. Different routes of administration in animals
Collection of blood samples from animals
2.Study the effect of autonomic drugs on rabbit's eye
3.Record the concentration response curve (CRC) of acetylcholine using rectus abdominus muscle preparation of frog.
4.Record the CRC of 5-HT on rat fundus preparation.
5.Record the CRC of histamine on guinea pig ileum preparation.
6.To study the inotropic and chronotropic effects of drugs on isolated frog heart.
7.To study the effects of various agonists and antagonists and their characterisation using isolated preparations like frog's rectus abdominus muscle and isolated ileum preparation of rat& guinea pig.
II.DEMO/ WORK SHOP
Arterial and venous cannulations, organ isolation and its application in research.
III.SEMINAR/ ASSIGNMENT/ GROUP DISCUSSION
1.Isolation, characterization and nomenclature of receptors.
2.Metabolic disorders and their complications
3.Novel targets for the treatment of various disorders

References:

1. Practicals in pharmacology By Dr.R.K.Goyal
2. Handbook of experimental pharmacology By S.K.Kulakarni
3. Experimental pharmacology By M.N.Ghosh
4. EXPO – Experimental pharmacology software.

Course Content:

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

1.Handling of different instruments used in Experimental Pharmacology.

2.Know about the different routes of drug administration, blood withdrawal etc.,

3.Evaluate the different activities on animals.

4.Demonstration of different simulation methods.

CO-PO Mapping

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH315	**PHARMACEUTICAL. ANALYSIS II PRACTICALS**	04	02
Sessional Marks: 00		**End Semester Examination Marks: 100**	

Course Objectives:

1.To understand the handling of different analyticalequipment's.

2.To know about the purity and chemical stability of compound by use of different analytical methods.

3.Knowledge on chromatography techniques and their importance on pharmacy.

Course Content

I.EXPERIMENTS
1.Determination of Lamda- max of KMnO4 (Visible)
2.Determination of Lamda- max of ciprofloxacin (any one drug) (UV)

3.Determination of isobestic point of any 2 drugs.
4.Assay of Riboflavin-Colorimetric method.
5.Assay of Ibuprofen (any one drug)-UV-spectro photometry-calibration curve method.
6.Assay of Paracetamol-UV-spectro photometry-A(1%,1cm) method
7.Assay of Thiamine by Fluorimetry.
8.Study of quenching effect of quinine by Fluorimetry.
9.Determination of Na/K ions by Flame photometry.
10.Determination of sulphates in calcium gluconate by Nepheloturbidometry.
11.Interpretation of UV and IR Spectra.
12.Interpretation of NMR and Mass Spectra.

II.DEMO/WORK SHOP
1.Demonstration of HPLC, determination of any drug, selection of solvent, mobile phase, stationary phase, and optimization of chromatographic conditions.
2.Demonstration of GC, determination of any drug, selection of solvent, mobile phase, stationary phase, and optimization of chromatographic conditions.
3.Demonstration of gel electrophoresis.

III.SEMINAR/ASSIGNMENT/GROUP DISCUSSION
Determination of two drugs simultaneously by using UV spectrophotometer. criteria in selection of mobile phase, stationary phase & detector in HPLC.

LIST OF MINIMUM EQUIPMENTS REQUIRED
1.Fluorimeter
2.UV-Spectrophomenter
3.TLC kits
4.Electrophoresis equipment
5.Digital balace
6.Chromatographic columns
7.Colorimeter
8.KF titrator
9.Adequate glasswares

Course Outcome:

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

1. Handling of different analytical instruments.
2. Know about the different spectroscopy and chromatography techniques that helps to attain desired quality control of all pharmaceutical aspects as per the standard pharmacopoeias
3. To acquire knowledge to make good stability of pharmaceutical product by using of pharmaceutical analytical technicalmethods.
4. To acquire knowledge on protocols testing animal samples by chromatographic techniques

CO-PO Mapping

Cours	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1
CO1	1	1	1	1	1	2	1		1	1	1	2
CO2	1	1	1		1	1	1	1	1	1	1	1
CO3	1	1		1	1	2	1		1	1		
CO4	1	1	1	1	1	2	1	1	1	1	2	2

IV B.PHARM- I SEMESTER

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 401	MEDICINAL CHEMISTRY-III	04	04
Sessional Marks : 20		End Semester Examination Marks : 80	

COURSE OBJECTIVES

1. Helps in correlating between pharmacology of a disease and its mitigation or cure.
2. To write the chemical synthesis of some drugs.
3. To know the structural activity relationship of different class of drugs.
4. Knowledge about the mechanism pathways of different class of medicinal compounds.
5. To acquire knowledge about the chemotherapy for cancer.
6. To understand the chemistry of drugs with respect to their pharmacological activity

Course Contents:

UNIT I

Histamine and Antihistaminic agents- H1-Antagonists: Chlorpheniramine*, Triprolidine,Phenindamine, Diphenhydramine*, Doxylamine succinate, Tripelennamine, Antazolinephosphate,Cyclizine, Meclizine*, Buclizine, Promethazine*, Methdilazine, Cyproheptadine, Azatadinemaleate,Fexofenadine, Loratadine, Desloratadine, Cetrizine, Acrivastin, H2 Antagonists: CimetidineFamotidine, Ranitidine*, Omeprazole*, Esomeprazole, Lansoprazole, Pantoprazole, Rabeprazole,Sucralfate, Misoprostol. Note on H3-Agonist and antagonists. SAR – H1 and H2 receptoantagonists.

UNIT II

Synthetic antibacterials and antifungal agents Sulphonamides and quinolones: Cotrimaxazole, Sulphacetamide*, Sulphaquanidine, sulfiisoxazole*, sulfadoxime, trisulfapyrimidines, triple sulfa, Norfloxacin, Ciprofloxacin, Ofloxacin*, Levofloxacin.SAR- Sulphonamides, Fluroquinolones. Unrinary antiseptics: Nitrofurantoin*, Furazolidine, Nitrofurazole, Methenamine. Antifungal agents: Clotrimazole*, Itraconazole, Ketoconazole, Miconazole*, Fluconazole,Amphotericin B, Nystatin, Griseofulvin*. SAR- azoles.

UNIT III

Anti-paracytic and antimycobacterial agents Antimalarials: Life cycle, Chloroquine*, Amodiaquine, Primaquine, Quinacrine*, ArtemisininPyrimethamine, Atovaquone and Proguanil. SAR – 4 -aminoquinolines, Aminoacridines. Antiamoebics and anthelmentics: Metronidazole, Tinidazole*, Dilaxanide, Iodoquinol, DEC*,Thiabendazol, Piperazine, Mebendazole*, Albendazole, Dimercaprol, Niclosamide, PyrantelPamoateIvermectin. SAR-Azole Antimycobacterials: Isoniazid*, Ethambutol*, Pyrazinamide, Rifampicin, Thioacetazone, 4-AsaCycloserins, Dapsone*, Clofazimine.

UNIT IV

Antiviral and antineoplastic agents Antiviral: Viral replication, Amantidine*, Acyclovir*, Oseltamivir, Idoxuridine, Zidovudine*, Lamivudine, Stavudine, Efavirenz, Didanosine, Tenofovir, Zalcitabine, Emitricitabine, NevirapineRitonavir, Saquinavir. SAR- RTIs, NNRTIs. Antineoplastic: Chlorambucil*, Cyclophosphamide, Ifosamide, Thiatepa,

Lomustine, BusulfanCarmustine*, Cisplatin, Procarbazine, Streptazocin, Methotrexate, 5-FU, Cytarabine, 6-Mp,Thioguanine, Vidarabine, Tamoxifen. Chemistry of anticancer antibiotics, A note on Newer agents.SAR – Alkylating agents, Nitrosoureas, Antimetabolites.

Basic concepts of Drug Design and discovery Concept on ligand, targets, lead molecules, Pharmacophore. Basis of structure based and ligand basedrug design, note on Combinatorial chemistry, SAR, QSAR.

NOTE: Introduction, definition, chemical classification with structure, nomenclature, synthesis (only for * marked drugs), mechanism of action, SAR including stereo chemical aspects, metabolites (including its ADR) and therapeutic uses of the following classes of drugs from UNIT I to UNIT IV.

Text Books:

1. JH Block & JM Beale (Eds), Wilson &Giswold‟s Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcolt, Raven, Philadelphia, 2004
2. William O. Foye, Textbook of Medicinal Chemistry, Lea Febiger, Philadelphia.
3. An Introduction to Medicinal Chemistry by Graham. L. Patrick, Oxford University publishers.
4. Rama Rao Nadendla, Medicinal Chemistry; Mc Millan Publishers.

COURSEOUTCOMES

1. To develop an understanding of the physico-chemical properties of drugs.
2. To understand how current drugs were developed by using pharmacophore modelling and docking technique.
3. To acquire knowledge in the chemotherapy for cancer and microbial diseases and different anti-viral agents.
4. To acquire knowledge about the mechanism pathways of different class of medicinal compounds.

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 402:	**PHARMACOLOGY-III**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVES

1. The students would appreciate the basic knowledge in the field of pharmacology pertaining to the drugs and its therapeutic applications
2. They would have elaborately learnt the recent advances in the drugs used for the treatment of various diseases.
3. They would have understood the concepts of drug action and mechanisms involved.
4. They would have understood the underlying mechanism of drug actions at cellular and molecular level.
5. They would have learnt the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

Course Contents:

UNIT I

Drugs acting on the gastrointestinal tract

a. Anti-ulcers Drugs

b. Laxatives and anti-diarrhoeal drugs

c. Emetics and anti-emetics

d. Appetite Stimulants and Suppressants

UNIT II

Chemotherapeutic agents and their applications

a.General principles of chemotherapy.

b. Sulphonamides, co-trimoxazole and β-lactam antibiotics

c. Tetracyclines, aminoglycosides, chloramphenicol, macrolides, quinolones, fluoroquinolones and polypeptide antibiotics

UNIT III

a. Chemotherapy of tuberculosis & leprosy

b. Chemotherapy of malignancy and immunosuppressive agents.

UNIT IV

a. Chemotherapy of fungal and viral diseases

b. Chemotherapy of protozoal diseases and helmintic infections

Principles of toxicology &Principles of bioassays.

a. Definition of poison, general principles of treatment of poisoning

b. Treatment of barbiturate, opiod, organophosphorous and atropine poisoning.

c. Heavy metals and heavy metal antagonisits. $LD_{50,}ED_{50}$ and therapeutic index

d. Principles of bioassays and errors in bioassys.

e. Study of bioassay methods for the following drugs

i. Digitalisii. d-tubocurarine,iii.Oxytocin iv. Insulin v. HCV

(a) Text Books:

1. H.P Rang, M. M. dale & J.M. Ritter, Pharmacology, Churchill living stone, 4th Ed.
2. J.G. Hardman and Lee E. Limbard, Good Mann &Gilmann, The Pharmacological basis of therapeutics, Mc Grawhill, Health Professions Dvn.
3. Illiterated Pharmacology by Lippincotts

(b) REFERENCES

1. Tripathi, Essentials of Medical Pharmacology, Jaypee Brother's, Latest Edition
2. Sathoskar, Pharmacology and pharmaco therapeutics Vol. 1 & 2, Publ by Popular Prakashan, Mumbai.

COURSE OUTCOMES:

1. Students would have understood the pharmacological actions of different categories of drugs

2. They would have studied in detailed about mechanism of drug action at organ system/sub cellular/ macromolecular levels.

3. They would have understood the application of basic pharmacological knowledge in the prevention and treatment of various diseases.

4. They would have observed the effect of drugs on animals by simulated experiments

CO-PO Mapping

Cours	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1	PO12

e											1	
CO1	3	3	2	3	3	2	3	2	2	3	3	3
CO2	3	3	2	3	3	2	3	2	2	3	3	3
CO3	3	3	2	3	3	2	3	2	2	3	3	3
CO4	3	3	2	3	3	2	3	2	2	3	3	3

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 403:	**PHARMACOGNOSY-III**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVE

1. Herbs, and their Science Classification of Medicinal Plants, Phytochemistry.
2. Carbohydrates, Lipids How herbs influence our physiology and can be helpful against several disorders.
3. Relations between Phyto -therapy and the Elderly, Phytotherapy and Children, Understanding Herbal Action, and Understanding the MateriaMedica.
4. The recognition of medicinal plants, identification of adulteration and Contamination.
5. Ethnobotany&Ethnopharmacology in drug discovery process.

Course Contents:

UNIT I

A) Phytochemical Screening: Preparation of extracts, screening of alkaloids, saponins, cardiac glycosides, flavonoids, tannins and anthraquinonesin plant extracts. Identification and estimation of various phytoconstituents.

B) Plant tissue culture: History, types, media requirements, methodology for establishment of cell cultures; growth measurements, viability measurements and applications. Micropropagation, immobilization, hairy root culture.

UNIT II

Introduction, classification and study of different chromatographic methods and their applications in evaluation of crude drugs. Concept of finger printing and marker compound analysis.

UNIT III

A)Study oftraditionaldrugs-commonandvernacularnames,sources,chemicalconstituents and uses of Kantakari, Malkanguni, Shatavari, Tylophora, Bilva, Kalijeeri, Rasna, Aparmarga, Gokhuru, Guduchi, Bach, Amla, Guggul, Kalimusali, Punarnava, Chirata and Brahmi.

B) General introduction to Indian Systems of Medicine like Ayurveda, Siddha, Unani and Homeopathy.

C) Methods of preparation of formulations in Ayurveda like churnas, lehyas, tailas, asavas and aristas.

UNIT IV

A) General introduction to cosmeceuticals, role of herbs in cosmetics. Study of the following cosmeceuticals - Amla, Henna, Cyperus, SoapNut, AloeVera, Turmeric, Sandal Wood and Bitter Orange Peel.

B) Definition and study of Neutraceuticals: Garlic, Spirulina, Soya and Royaljelly.

C) Introduction and importance of trade in herbal medicine, herbal cosmetics and Indian herbal drug industry.

D) Natural dyes and their applications in pharmacy.

E) Study of mineral drugs- Bentonite, Kaolin, Keiselghur and Talc

F) Study of natural products from natural sources

TextBooks:

1. Kokate CK, PurohitA.P. &Gokhale;Pharmacognosy
2. NiraliPrakashan, New Delhi.
3. Textbook of Pharmacognosy by Handa and Kapoor.
4. Pharmacognosyby Robert,Tyler.

COURSE OUTCOMES

1. Terpenes, Polyphenols, Alkaloids, Pharmacology, Toxicity,
2. Formulations and Preparations of Herbal Medicines.
3. How herbs influence our physiology and can be helpful against several disorders.
4. Understand DNA Finger printing.

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 404:	**BIOPHARMACEUTICS & PHARMACOKINETICS**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVES

1. Broader understanding about the concepts of biopharmaceutics and pharmacokinetics.

2. Ability to calculate the various pharmacokinetic parameters by using various mathematical models.

3. Ability to design a basic protocol for the conduct of BA/BE study and the interpretation of the BA/BE data 4. Preparedness to use the concepts of pharmacokinetic principles in the clinical contexts.

5. Ability to design and perform in-vitro dissolution studies for various drugs as per the standards of official monographs

6. Basic understanding about the concepts of in-vitro - in-vivo correlations (IVIVC)

Course Contents:

UNIT – I

Biopharmaceutics, Pharmacokinetics and Pharmacodynamics. Structure of GI membrane. Routes of drug administration and absorption from different routes.

Drug Absorption. Mechanisms of GI absorption, physico-chemical, biological and dosage form factors influencing absorption.

Drug distribution. Factors affecting drug distribution, physiological barriers of drug diffusion, apparent volume of distribution, drug binding to blood, tissues, protein binding – factors affecting, significance and kinetics of protein binding.

UNIT – II

Drug Metabolism: Pathways of drug metabolism. Phase-I (oxidative, reductive and hydrolytic reactions). Phase II reactions (conjugation) Enzyme induction and inhibition, hepatic clearance, pharmacological activity of metabolites, first pass effect.

Drug excretion. Glomerular filtration, tubular secretion and reabsorption, effect of pH and other drugs. Clearance concept, excretion through bile, feces, lungs and skin in brief.

UNIT – III

Bioavailability and bioequivalence:concept of equivalents, Definitions of various types of equivalents, types of Bioavailability studies, measurement of Bioavailability, plasma level and urinary excretion studies. Bioequivalence study design, IVIVC.

UNIT – IV

Pharmacokinetics. Basic considerations, compartment modeling, one compartment open model - i.v. bolus and extra vascular administration, urinary excretion studies. Apparent volume of distribution, elimination rate constant, biological half-life, area under the curve and clearance. Calculation of pharmacokinetic parameters. Method of residuals, Wagner and Nelson method, excretion rate method, sigma minus method. Solving of simple problems

Nonlinear kinetics. Non compartmental models, reasons for non-linearity, concepts of linearity and non-linearity, Michaelis- Mentenequation and its significance.

Text Books:

1. L. Shargel and ABC Yu, textbook of applied biopharmaceutics & Pharmacokinetics, 4th edn, Appleton – centuary – crofts, Connecticut, 2004.

3. Milo Gibaldi, Biopharmaceutics and clinical pharmacokinetics 4/Edn. Pharma Book

Syndicate.Hyderabad.

4. DM Brahmankar and SB Jaiswal, biophamaceutics and pharmacokinetics- a treatise, vallabhprakasham, Delhi.

Reference Books:

1. Ronald & trouser. Clinical pharmacokinetics concepts & applications. 3rd ed, wolterskluwer Pvt Ltd., 2007.

2. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, marcel dekkerinc., NY

3. Basic pharmacokinetics by Hedaya, CRC press

COURSE OUTCOMES

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

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 405A:	**CHEMISTRY OF NATURAL PRODUCTS**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVES

1. Learn the different types of alkaloids, glycosides & terpenes and their chemistry and medicinal importance.
2. Importance of natural compounds as lead molecules for new drug discovery.
3. Learn the constituent present in crude drugs responsible for anti-diabetic activity
4. rDNA technology tool for new drug discovery.
5. Vitamins Chemistry and Physiological significance of Vitamin
6. Elaborate general methods of structural elucidation of compounds of natural origin.

Course Contents:

UNIT I

General structural elucidation of natural products General extraction procedure for various phytoconstituents, techniques in identification for alkaloids, glycosides, steroids, terpenes, flavonoids, phenols, lignans, resins, carbohydrate and proteins. Chemical methods for determination of active hydrogen, methoxy, hydroxyl, N-methyl and degradation (Hoffmann, Edmannetc) techniques for the determination of ring size. Structural elucidation of Ephedrine, Atropine, Morphine, Papaverine.

UNIT II

Alkaloids Definition of alkaloids, pseudoalkaloids and protoalkaloids. General methods of extraction, isolation, Properties and tests for alkaloids.

Opium alkaloids: Structural features of Morphine molecule – Peripheral groups. Modification of structure and effect on analgesic activity – SAR of morphine and morphine-like analgesics.

Narcotic antagonists: Nalorphine, Levallorphan. Anti-tussive agents: Noscapine, Dextromethorphan. Smooth muscle relaxants: Papaverine and related compounds like ethaverine, Dioxyline. Structures and uses of these compounds.

Tropane alkaloids: Structures of Atropine/hyoscyamine, Hyoscine, Hydrolytic products of these – Tropine and Scopine. Relationship between tropine&pseudotropine. Biological actions and uses of tropane alkaloids. Homatropine.

Rauwolfia alkaloids: Structures and uses of Reserpine, Rescinnamine, Deserpidine, ajmaline, syrosingapine. Hydrolysis of reserpine and rescinnamine. Mechanism of action of reserpine.

Ergot alkaloids: Classification, structures, hydrolytic products, pharmacological actions, therapeutic uses and toxicity. Synthetic derivatives: Methyl ergonovine (Methyl ergometrine), LSD, Ethysergide.

UNIT III

Terpenes &Terpenoids: Introduction to Volatile oils, terpene vs terpenoids, Classification, isoprene, special isoprene and gemdialkyl rules. Sources and structures (Including isomerism), general extraction procedure and Pharmaceutical uses for Citral, citral-a (Geranial), citral-b (Neral). Alpha-terpeniol, Carvone, Menthol, Menthone, 1,8Cineole, Camphor. Chemical transformation and interconversion of citral to citronellal, citronellol, geraniol, nerol, geranic acid, p-cymene, alfa-terpeneol and ionones. Conversion and interconversion of camphor into camphoric acid, camphoronic acids, p-cymene, Borneol, isoborneol.

UNIT IV

Steroids: Introduction, nomenculature and classification of steroids. Stereochemistry of Cholesterol. Structure and uses of Bile acids, steroidal hormones. Different Sources of steroidal drugs like diosgenin, cholesterol, stigmasterol and ergosterol. synthesis of progesterone and testosterone. Synthetic oestrogens like diethyl stilbosterol, hexosterol, 17-alpha ethinyloestradiol, Interconversions of Estrone, Estriol, Estradiol. Chemistry of keto and non ketoadreno corticoids. A note on anabolic

steroids (Structure and uses).

Cardiac glycosides: structures of glycosides from Digitalis, Strophanthus, Squill and Bufa. Enzymatic and acid hydrolytic reactions of the glycosides. Mechanism of action, SAR, therapeutic uses and toxicity.

Vitamins: Classification, structure and related function in enzyme and physiological activity. Chemistry of thiamine, riboflavin, Niacin, Pyridoxine, Vitamin A, D, E, K. structural elucidation of Riboflavin, Vitamin D.

Text Books:

1)JB Harborne, Phyto Chemical methods. Springer.

2)I L Finar, Organic chemistry, Vol. 1 & 2, the English language book society, London, New

Delhi.

3)O.P.Agarwal, Natural products by. Vol.1 & 2, Goel publications – Meerut.

COURSE OUTCOMES

1. To attain detailed knowledge about chemistry of medicinal compounds from natural origin.
2. To understand general methods of structural elucidation of medicinally active natural compounds.
3. To attain knowledge regarding isolation and purification of medicinal compounds from natural origin.
4. Drugs of natural origin including Biologicals & Herbals, Food and Nutraceuticals.

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 405B:	**HOSPITAL&COMMUNITY PHARMACY**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVE

1. Understand the organizational structure of hospital pharmacy
2. Understand drug policy and drug committees
3. Know about procurement & drug distribution practices
4. Know the admixtures of radiopharmaceuticals
5. Understand the community pharmacy management

Know about value added services in community pharmacies

UNIT-1

1. Hospital Pharmacy – Definition, Hospital organization, Pharmacy organization and personnel, Location and layout of a hospital pharmacy unit in a hospital, responsibilities of a hospital pharmacist.
2. Pharmacy and therapeutics committee, Hospital formulary, Dispensing to inpatients (a) Floor stock system, (b)Individual prescription order system, (c) Combination of (a) and (b), Dispensing to out patients.

UNIT-2

1.Purchase and inventory control in hospitals and in community pharmacy, Storage of drugs.

2. Drug info ration center, Central sterile supply, Intravenous drug admixture, Unit dose dispensing, prepackaging in the hospital

3. Manufacturing – Bulk and sterile handling of controlled drugs, Current state of hospital Pharmacy in India.

UNIT-3

1.Community Pharmacy: (1) Drug house management – selection of site, space, lay-out, and legal requirements, Structure of pharmacy organization.

2.Sales promotion: Market research-salesmanship, qualities of a salesman, advertising and window display.

UNIT-4

1.Recruitment, training, evaluation of pharmacists and compensation to the pharmacist.

2.Pharmacy finance: Capital requirements, sources of pharmacy capital, Risk management and insurance.

Reference Books:

1. Merchant and qadry's text book of hospital pharmacy revised by Dr. Ramesh K Goyal and RK Parikh; BS Shah Prakashan Publications.
2. Hospital Pharmacy by William E Hassan.
3. Pharmacy management for students and practitioners, by C. Patrick Tharp and Pedro J Lecca.
4. Remington's Pharmaceutical Sciences.

COURSE OUTCOMES

1. Discuss the roles and responsibilities of hospital pharmacist, hospital drug policies and guidelines for hospital pharmacy.
2. Discuss and apply various methods of inventory control and drug distribution methods in a hospital pharmacy.
3. Formulate parenteral preparations Contribute to a newsletter for providing continuous education and awareness.
4. Explain about handling and packaging of radiopharmaceuticals

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 405C	**PHARMACOVIGILANCE**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVES

1. The students would appreciate the knowledge on the clinical research.
2. They would get a better understanding in the regulatory requirements for conducting clinical trial.
3. They would have understood the types of clinical trial designs.
4. They would have studied the responsibilities of key players involved in clinical trials
5. They would have an understand on the safety monitoring, reporting and close-out activities.They would have studied the principles of Pharmacovigilance

Course Contents:

UNIT –I

Introduction to Pharmacovigilance

History and development of Pharmacovigilance

Importance of safety monitoring / Why Pharmacovigilance

National and international scenario

Pharmacovigilance in India

Pharmacovigilance global perspective

WHO international drug monitoring programme

UNIT –II

Basic terminologies used in Pharmacovigilance

Terminologies of adverse medication related events

Information resources in Pharmacovigilance

Establishing Pharmacovigilance programme

Establishing in a hospital

Establishment & operation of drug safety department in industry

Establishing a national programme

SOPs – Types, designing, maintenance and training

Roles and responsibilities in Pharmacovigilance

Licence Partners, Contract Research Organisations (CROs) and Market Authorisation Holders (MAH)

UNIT –III

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.

UNIT –IV

Adverse drug reaction reporting

Introduction to reporting systems

Spontaneous reporting system

Reporting to regulatory authorities

Guidelines for reporting ADRs in biomedical literature

Communication in Pharmacovigilance

TEXTBOOKS

1. Textbook of Pharmacovigilance by S.K. Gupta, Jaypee brothers.

2. Pharmacovigilance by Ronald D. Mann, Elizabeth B.Andrews, 2nd edition.

COURSE OUTCOMES

1. Explain various types of clinical trial designs,regulatory requirements for conducting clinical trial
2. Explain the responsibilities, documentational requirements for clinical trials
3. Describe basic concepts, and establishment of Pharmacovigilance
4. Explain ADR reporting, methods and tools used in Pharmacovigilance

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 406	**MEDICINAL CHEMISTRY-III PRACTICALS**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVES

To understand the chemistry of drugs with respect to their biological activity

. 2. To know the metabolism, adverse effect and therapeutic activity of drugs.

3. To understand the different modern techniques of drug design.

4. To appreciate the SAR of some important drug classes.

5. To acquire knowledge in the chemotherapy for cancer and microbial diseases and different anti-viral agents.

6. To have been introduced to a variety of drug classes and some pharmacological properties.

I. EXPERIMENTS:

1. Synthesis of hydrazones of benzoic acid

2. Synthesis of Eosin from Fluoroscein

3. Synthesis of benzilic acid from benzil

4. Synthesis of Sulphanilamide

5. Synthesis of 1,4- napthaquinone from naphthalene

6. Synthesis of orthoiodo benzoic acid from anthranilic acid

7. Synthesis of Diazo amino benzene from aniline

8. Synthesis of acid hydrazides from salicylic acid

9. Synthesis of chalcones

10. Assay of Sulphamethoxazole (anti bacterial)

11. Assay of Glibenclamide (hypoglycaemic agent)

12. Assay of Metronidazole (antiprotozoal)

13. Assay of Isoniazid (anti tubercular)

14. Assay of Diethylcarbamazine (antihelmentic)

15. Assay of Compound benzoic acid (anti fungal)

II. DEMO/WORKSHOP

Vacuum drying, Chemdraw, Chemsketch, Recrystallization process, Separation of ternary mixtures

III. SEMINAR/ASSIGNMENT/GROUP DISCUSSION

Water in phase transfer catalysis, Current topics on Cancer, Antibiotics, Anti-oxidants and

chemotherapy of infectious diseases.

References:

1. A.I. Vogel, Text Book of Practical Organic Chemistry, 5th Edition. Pearson, Prentice Hall.

2. F.G. Mann & B.C. Saunders, Practical Organic Chemistry, 4th Edition, Pearson Publishers.

3. I.P. – 1996.

4. P.D.Sethi – Quantative Analysis of Drugs in Pharmaceuticals. Formulations, CBS Publishers.

5. B.P. - 2004.

List of minimum EQUIPMENTS required

1. Water bath
2. Suction pumps
3. Analytical/physical balance
4. Triple beam balance
5. Reflux flask with condenser
6. Hot plates

COURSE OUTCOMES

1. Synthesis compounds of medicinal interest and conduct monograph analysis of the pharmaceutical compounds.
2. Determine the amount of drug present in an unknown solution
3. Estimate the purity of drugs by performing assays.
4. Determine partition coefficient and dissociation constant of a given compound

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 407	**PHARMACOLOGY-III PRACTICALS**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVES

1. The students would appreciate the basic knowledge in the field of pharmacology pertaining to the drugs and its therapeutic applications

2. They would have elaborately learnt the recent advances in the drugs used for the treatment of various diseases.
3. They would have understood the concepts of drug action and mechanisms involved.
4. They would have understood the underlying mechanism of drug actions at cellular and molecular level.
5. They would have learnt the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

A. EXPERIMENTAL PART

1. Experiments on Isolated Preparations:
   a. Calculate the PA_2 value of atropine using acetylcholine as an agonist on rat ileum preparation.
   b. Calculate the PA_2 value of chlorpheniramine using histamine as an agonist on guinea pig ileum preparation.
   c. Find out the strength of the given sample (e.g. Acetylcholine, Histamine, 5-HT. Oxytocin etc.) using a suitable isolated muscle preparation by
      i. Interpolation bioassay
      i. Matching or bracketing bioassay
      iii. Three point bioassay
      iii. Four point bioassay

2. Experiments on intact animals like

   a. Study of drug induced catatonia in rats

   b. Study of muscle relaxant activity (rotarod apparatus)

   c. Study of antipsychotic activity (pole climb response apparatus)

   d. Study of antianxiety activity (elevated plus maze)

   e. Study of analgesic activity (analgesiometer)

   f. Study of anti-inflammatory activity (plethysmometer)

   g. Study of antidepressant activity (swim test & tail suspension test)

   h. Study of anticonvulsant activity (electroconvulso meter)

i. Study of spontaneous motor activity and locomotor activity (actophotometer)

B. DEMO/ WORK SHOP

a. Screening of antiulcer activity

b. Invitro antioxidant activity

c. Screening of antihistaminic activity (histamine chamber)

C. SEMINAR/ ASSIGNMENT/ GROUP DISCUSSION

a. BABE studies

b. Invitro-invivo correlation studies

c. Pharmacovigilance

d. Biostatistics and its application

REFERENCES

1. Practicals in pharmacology By Dr.R.K.Goyal
2. Handbook of experimental pharmacology By S.K.Kulakarni
3. Experimental pharmacology By M.N.Ghosh
4. Experimental Pharamcology and Toxicology By Dr.B.M.VrushabendraSwamy and Prof.K.N.Jayaveera, S.Chand& Co.,

COURSE OUTCOMES

1. Demonstrate intraperitoneal and intramuscular routesof administration of drugs in animals and describe different anaesthetics used in laboratory animals

2. Identify and select laboratory appliances used in experimental pharmacology

3. Recommend the physiological salt solution for different isolated tissue preparations

4. Perform a bioassay procedure and create a Dose Response Curve 5. Demonstrate the screening of a drug for CNS activity

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 408	PHARMACOGNOSY-III PRACTICALS	04	04
Sessional Marks : 20		End Semester Examination Marks : 80	

COURSE OBJECTIVES

1. Define Pharmacognosy and describe its evolution

2. Explain the classification of crude drugs and discuss their primary and secondary metabolites

3. Discuss various parameters related to cultivation, collection, processing and storage of crude drugs

4. Analyse morphological and microscopical characters of crude drugs

5. Discuss the production, evaluation, uses and adulterants of crude drugs

6. Identify the market samples of drugs containing proteins, carbohydrates and lipids

I.EXPERIMENTS:

1.Determinationofmoisture content.

2.DeterminationofAsh values, water soluble ash, acid insoluble ash.

3. Determination of extractive values.

4. Isolation of quinine from Cinchona

5. Isolation of vasicine from Vasakaleaves.

6. Preparation of herbal formulations like, herbal syrups,

7. TLC of any one alkaloid and one glycoside.

8. Preparation and evaluation of any one herbal cosmetic.churnasandthe like.

9. Preparation and evaluation of any one Ayurvedic formulation.

10. Phytochemical screening of a plant material.

11. Paper chromatography of any one type of phytoconstituents.

II.DEMO/WORKSHOP:

Column chromatography of plant extract, estimation of any one phytoconstituentby Modern

chromatographic methods.

III.SEMINAR/ASSIGNMENT/GROUP DISCUSSION:

Related to theory syllabus

Text Books:

1PracticalPharmacognosy.-C.K.KokateNiraliPrakashan

2. *PracticalPharmacognosy-IyengarManipalpress limited*

LISTOFMINIMUMEQUIPMENTSREQUIRED

1.Waterbath

2. Hotplates

3.Soxhletextractor

4.Microsocopes

5.Glassslides

6.Mufflefurnace

COURSE OUTCOMES

1. Identify cell wall constituents and cell inclusions

2. Identify the crude drugs by its morphological characteristics and study the anatomical characters by preparing slides

3. Perform chemical tests to identify unorganized crude drugs and lipids

4. Conduct planned experiments and prepare laboratory report in a standard format.

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 409	BIOPHARMACEUTICS & PHARMACOKINETICS PRACTICALS	04	04
Sessional Marks : 20		End Semester Examination Marks : 80	

COURSE OBJECTIVES

1. Discuss biopharmaceutics, pharmacokinetics, pharmacodynamics with their applications
2. Explain the mechanisms and factors affecting ADME processes
3. Discuss the significance of pharmacokinetics in the design and evaluation of dosage forms
4. Identify and select the right pharmacokinetic model for drugs administered by different routes

I. EXPERIMENTS

1) Analysis of biological samples for drug content and estimation of the pharmacokinetic parameters.

2) In vitro evaluation of tablet/capsule for drug release

3) Drug-protein binding studies.

4) Statistical treatment of pharmaceutical data.

5) Problems related to pharmacokinetics – determination of PK Parameters

6) Problems related to bioavailability and bioequivalence.

II. DEMO/ WORKSHOP

1. Absorption studies – in vitro.

2. Experiments designed for the estimation of various pharmacokinetic parameters.

III. **SEMINAR/ASSIGNMENT/GROUP DISCUSSION**

Chronopharmacokinetics.

Text Books:

1. L. Shargel and ABC Yu, textbook of applied biopharmaceutics & Pharmacokinetics, 4th edn, Appleton – centuary – crofts, Connecticut, 2004.

3. Milo Gibaldi, Biopharmaceutics and clinical pharmacokinetics 4/Edn. Pharma Book

Syndicate.Hyderabad.

4. DM Brahmankar and SB Jaiswal, biophamaceutics and pharmacokinetics- a treatise, vallabhprakasham, Delhi.

Reference Books:

1. Ronald & trouser. Clinical pharmacokinetics concepts & applications. 3rd ed, wolterskluwer Pvt Ltd., 2007.

2. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, marcel dekkerinc., NY

3. Basic pharmacokinetics by Hedaya, CRC press.

COURSE OUTCOMES

1. Compare the in-vitro drug release profile of different marketed products
2. Perform the solubility enhancement techniques for improvement of drug release of poorly water-soluble drugs
3. Estimate the bioavailability (absolute and relative) and bioequivalence from the given clinical data
4. Calculate the drug content in blood sample using Area Under Curve approach

CO-PO Mapping

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

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

IV B.PHARM- II SEMESTER

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 410:	NOVEL DRUG DELIVERY SYSTEMS	04	04
Sessional Marks : 20		End Semester Examination Marks : 80	

COURSE OBJECTIVES

1. The various approaches for development of novel drug delivery systems.
2. The criteria for selection of drugs and polymers for the development of NTDS

The formulation and evaluation of novel drug delivery systems

Course Contents:

UNIT I

Concepts of controlled release, sustained release, extended release, timed release and delayed release.Rationale behind the design of above delivery systems. Factors influencing the design andperformance of sustained and controlled release dosage forms.

UNIT II

Oral Control Drug Delivery Systems: Fundamentals, Dissolution Controlled, Diffusion Controlled,Ion Exchange Resins, Osmotic based systems, pH Independent Systems , altered density systems anduse of polymers in controlled drug delivery.

UNIT III

Targeted Drug Delivery Systems: Fundamentals and applications, formulation and evaluation of nano particles, resealed erythrocytes and liposomes and niosomes.

UNIT IV

Transdermal Drug Delivery Systems: Fundamentals, permeation of drugs across the skin, types ofTDDS, Materials employed and Evaluation of TDDS.

Mucoadhesive Delivery Systems: Mechanism of bioadhesion, mucoadhesive materials, formulationand evaluation of Buccal and Nasal drug delivery systems.

Text Books:

1. Robinson JR and Vincent HL lee. Controlled drug delivery fundamentals and applications, 2ed, marcel dekker 2005.

2. YiewChien, Novel drug delivery systems, 2nded, marcel dekker 2003.

Reference Books:

1.N.K. Jain, Advances in Control & Novel drug delivery, CBS Publishers.

2.Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences

3.E.ARawlkins, Bentley‟s Text Book of Pharmaceutics, Elbspubl

COURSE OUTCOMES

1. The use raw data and derive the pharmacokinetic modelsand parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
2. The critical evaluation of biopharmaceutic studies involving drug product equivalency.
3. The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
4. The potential clinical pharmacokinetic problems and application of basics of pharmacokinetics.

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 411	**PHARMACEUTICAL BIOTECHNOLOGY (THEORY)**	**04**	**04**
Sessional Marks : 20		**End Semester Examination Marks : 80**	

Objectives:

1 . To know the development of processes and methodologies for biotechnology research.

2. To train professionals able to develop and apply biotechnology process in order to solve needs and problems related to agriculture, forestry, fishery, health, pharmacy and environment.

3. For participation in multidisciplinary research projects to generate new knowledge.

4. To develop gene surgery and gene therapy to cure genetic disease.

5. To develop industrial processes for production of antibiotics, enzymes etc.

Course Content:

UNIT I Fermentation Technology: Isolation, Selection, Screening of Industrially important microbes, Strain improvement. Types, design & operation of Bioreactor. Types of fermentations, optimization of fermentation process, Principle and Procedure involving in downstream process and effluent treatment. Specific Fermentations: Selection of organism, fermentation & purification of antibiotics (penicillin, streptomycin, tetracycline, and erythromycin), vitamins (riboflavin and cyanocobalamine), lactic acid, alcohol and acetone.

UNIT II Recombinant DNA Technology: Introduction to r-DNA technology and genetic engineering, steps involved in isolation of enzymes, vectors, recombination and cloning of genes. Production of bio technology derived therapeutic proteins like Humulin, hemitrope, activase, intron a, monoclonal antibodies by hybridoma technique, recombivax HB (hepatitis b). Stem cells and their applications.

UNIT III Immunology & Immunological Preparations: Principles of Immunity, Humoral immunity, cell mediated immunity, antigen – antibody reactions, hypersensitivity and its applications. Active & passive immunizations vaccine preparation, standardization & storage of BCG, cholera, smallpox, polio, typhus, tetanus toxoid, immuno serum & diagnostic agents.

UNIT IV Enzyme Technology: Techniques of immobilization of enzymes, factors affecting enzyme kinetics, advantages of immobilization over isolated enzymes. Study of enzymes such as hyaluronidase, penicillinase, streptokinase, streptodornase, amylase, protease etc. immobilization of bacteria & plant cells. Introductory study & applications of bioinformatics, proteomics and genomics, Nanobiotechnology, Gene therapy.

Text Books:

1. WulfCrueger and AnnelieseCrueger, Biotechnology, 2 nd Ed, Publ- Panima publication cooperation, New Delhi.
2. P. F. Stanbury& A. Whitaker, Principles of fermentation technology, Pergamon Press.
3. J. D. Watson, Recombinant DNA technology. 2 nd Edition, W.H. Freemann1992.
4. S.P.Vyas and Dixit, Pharmaceutical Biotechnology, CBS Publishers New Delhi.

Reference Books:

1. Prescott and Dunne, “Industrial Microbiology” MC Graw Hill Book Company.
2. K. Kielsliched “Biotechnology” Vol 6, Verlegchemic, Switzerland.
3. PF Standury& A. Whitaker, “Principles of fermentation Technology” Pergamon Press, Oxford.
4. A. Wiseman, Handbook of enzyme biotechnology. 3rdEdition Elis Horwood.
5. Alexande M Moo-young, Comprehensive Biotechnology, Pergamon Press, New York

Course outcomes

1. To illustrate the use of fermenter for the production of fermentation products and purification by downstream process.
2. To understand the method of genetic engineering for production of rDNA products including monoclonal antibodies.
3. To clarify application of geetic engineering in animals.
4. To understand enzymes and their uses by immobilization.

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 412:	**CLINICAL. PHARMACY &THERAPEUTICS**	04	04
Sessional Marks : 20		**End Semester Examination Marks : 80**	

COURSE OBJECTIVES

1. The students would appreciate the knowledge on the clinical research.
2. They would get a better understanding in the regulatory requirements for conducting clinical trial.
3. They would have understood the types of clinical trial designs.

They would have studied the responsibilities of key players involved in clinical trials

Course Content:

UNIT-1

General concept: Clinical pharmacokinetics, drug interactions, adverse drug reactions, parenteral nutrition, Pharmacoeconomics, Pharmacogenomics, Pharmacovigilance, Therapeutic drug monitoring, Neutraceuticals, essential drugs and rational drug usage.

Age related drug therapy: concept of posology, drug therapy for neonates, pediatrics and geriatrics. Drugs used in pregnancy and lactation.

UNIT-2

Drug therapy in gastrointestinal, hepatic, renal, cardiovascular and respiratory disorders.

Drug therapy for neurological and psychological disorders.

UNIT-3

Drug therapy in infections of respiratory system, urinary system, infective meningitis, TB, HIV, malaria and filaria.

Drug therapy for thyroid and parathyroid disorders, diabetes mellitus, menstrual cycle disorders, menopause and male sexual dysfunction.

UNIT-4

Drug therapy for malignant disorders like leukemia, lymphoma and solid tumors.

Drug therapy for rheumatic, eye and skin disorders.

COURSE OUTCOMES

1. Ability to apply the concepts of Pharmacokinetics to individualize the drug dosage regimen in clinical settings.
2. Ability to design a dosage regimen of a drug based on its route of administration
3. Ability to design and implement pharmacokinetic services
4. Intravenous to Oral conversion of dosage regimens

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 413:	**COMPREHENSIVE VIVA VOCE**	00	02

Sessional Marks : 0	End Semester Examination Marks : 50

COURSE OBJECTIVES

1. Demonstrate knowledge in the program domain.
2. Present his views cogently and precisely

Exhibit professional etiquette suitable for career progression.

COURSE OUTCOMES

1. There shall be a Comprehensive Viva-Voce in IV-year II semester. The Comprehensive Viva-Voce will be conducted by a committee consisting of Head of the Department and two Senior Faculty members of the Department.
2. The Comprehensive Viva-Voce is intended to assess the students understanding of the subjects he studied during the B. Tech. course of study.
3. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.
4. This necessarily introduces the dimension of workload management into the program to enable completion of a large, relatively unstructured "assignment" over the course of the semester.

CO-PO Mapping

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

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

Course Code	Course Title	No of Hours Per week	No of Credits
BPH 414:	PROJECT WORK &SEMINAR	00	04
Sessional Marks : 0		End Semester Examination Marks : 100	

COURSE OBJECTIVES

1. After successful completion of this course students will be able to:
2. Work in team and undertake a project in the area of Pharmacy
3. Apply concepts of pharmaceutical sciences for executing the project
4. Apply appropriate research methodology while formulating a project
5. Define specifications, synthesize, analyse, develop and evaluate a project
6. Present, exhibit and document the project work
7. Develop a project report

COURSE OUTCOMES

1. Final Year Projects represent the culmination of study towards the Bachelor of Pharmaceutical sciences degree.
2. Projects offer the opportunity to apply and extend material learned throughout the program.
3. Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.
4. In contrast to the majority of courses studied elsewhere in the program, projects are undertaken individually or in small groups.

CO-PO Mapping

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

3=High, 2=Medium, 1=Low