SRI VENKATESWARA UNIVERSITY
DEPARTMENT OF BIO-CHEMISTRY
TIRUPATI – 517 502

BACHELOR OF PHARMACY
(B.PHARMACY)

CBCS-SEMESTER SYSTEM
(w.e.f. 2016 – 2017)

SCHEME AND SYLLABUS
INDEX:
1. Admission, instruction and attendance
2. Examinations: Sessional and Semester end examinations
3. Practical training.
4. Guidelines for paper setting and model papers.

1.1 The degree of Bachelor of Pharmacy of Sri Venkateswara University will be conferred on candidates who have satisfied the following conditions.

1.2 The candidate must have passed the Intermediate examination of the Board of Intermediate Education, Government of Andhra Pradesh, or Diploma in Pharmacy examination of the Dept. of Technical Education, Govt. of Andhra Pradesh or any other examination recognized by the academic senate as equivalent there to with Physics, Chemistry and Mathematics or Biology as group subjects and must have qualified in the Entrance Exams like EAMCET as prescribed by the University for being eligible to join I Year of B. Pharmacy course.

1.3.1 The candidate must have, after passing the qualifying examination pursued a regular course of study for not less than four academic years (three academic years in the case of diploma in Pharmacy holders who are admitted directly in to 2nd year-Ist semester of B.Pharma) and satisfied the academic requirements as prescribed thereafter. The scope of subject matter in each course and periods of study shall be as indicated in the syllabus and the scheme of instruction.

1.3.2 Instruction and examination in each academic year is spread over two semesters with a minimum of 90 working days in each semester (180 in any given academic year)

1.4 Each period of instruction is of 45 minutes duration. Eight periods of instruction are provided on each day and there are six working days in a week (Monday to Saturday).

1.5 Attendance Requirements: A regular course of study during an academic semester means a minimum of average attendance of 75% of all the courses of the semester computed by totaling the number of periods of lectures and practicals, as the case may be, held in every course. In special cases where sufficient causes were shown, the Vice-Chancellor may on the recommendation of the Principal and Head of the Department concerned condone the deficiency in the average attendance to an extent of 9% for reasons such as ill health, if the application for condonation is submitted at the time of actual illness and is supported by certificate of authorized Medical Officer approved by the Principal.
However, in the case of students, who participate in activities like N.S.S., N.C.C., Inter-Collegiate tournaments conducted by Sri Venkateswara University, Inter-University tournaments conducted by Inter-University Board and any such other activities involving the representation of the College/University with the prior approval of the principal, the candidate may be deemed to have attended the college during the period solely for the purpose of the examination.

1.6 A candidate who cannot satisfy the attendance requirements in clause 1.5 because of late admission under special circumstances reasonable and acceptable to the University on the basis of document, shall fulfill the following conditions; Average attendance: A candidate shall have attended at least a total of 90% of the periods-lectures/practicals as the case may be held from the date of admission and also shall attend at least 50% of the total working days during that academic semester (Late admission means, admissions made after 45 days from date of commencement of the academic semester for the course).

1.7 If any candidate fails to satisfy the regulation under 1.5 or 1.6 she/he shall not be allowed for the University Examinations at the end of the semester, and he/she shall not be allowed for promotion to the next higher class of study. He/she shall be required to repeat the regular course of study of that academic semester along with the next regular batch.

2.0 Assessment for the award of degree shall consists of (a) Internal evaluation for 20 marks in each of the theory courses separately except in course BPH 101 B. (b) Semester-end examination as detailed in the scheme of examination for 80 marks in each of the theory and practical, except for BPH 101 B and C Biology theory and practical.

2.1 Regulations concerning sessional examination: (a) There shall be two sessional examinations in each theory course and the average of the two shall be taken. The marks certificate issued to the candidate by the University shall show separately the sessional marks, the semester-end examination marks and the aggregate of both; (c) The teacher who teaches the subject shall ordinarily be the internal examiner, (d) There shall be no provision for the improvement of the sessional marks. Sessional Scripts shall be maintained in the Department until the results of the Semester are announced.

2.2 Regulations concerning semester-end examination: (a) there shall be one semester-end examination in each theory course based on the question paper set by an external paper setter and it shall be evaluated by an internal examiner. There shall be one semester-end examination in each practical course and the setting and evaluation shall be done jointly by two examiners, one internal and one external. The duration of the practical examination may be of 4 to 6 hours as prescribed. There shall be no supplementary examination except for the final semester-end examinations. A candidate shall not be allowed to appear for the IIIrd year II Semester end examination unless he passes in all the courses of the ISt year-end examinations and IIInd Year-end examinations and shall also not be allowed to write the IVth Year IIInd Semester-end examinations unless he passes in all the courses of the IIIrd year semester-end examinations.
3.1 A candidate shall be declared to have passed the examination in each semester if he obtains (i) not less than 40% marks in each theory and 40% in each practical of the semester-end examinations.

3.1a. A candidate may be permitted to improve his performance in semester-end examination of any semester only after completing the entire Four year course of study by appearing again for the whole examinations of that SEMESTER only during four subsequent years after completion of the study of the entire course. Such an improvement can be availed only once for each one of the semester examinations of the entire course of study. When considered in its totality the better of the two performances as whole at the 1st year(2semesters), IIInd year(2semesters), IIIrd year(2semesters), IVth year (2semesters) as the case may be shall be taken into consideration for the purpose of awarding the grade.

3.1b. The courses BPH 101A (Mathematics), BPH 101B (Biology theory) and BPH 101C (Biology practical) are bridge courses for candidates with only biology and with only mathematics background respectively at the intermediate level. Candidates with Diploma in Pharmacy have to take course 101 Mathematics. The respective candidates shall have to pass in these courses. The marks awarded in these courses shall not be considered for calculation of SGPA and CGPA.

3.2 Any candidate who carried a backlog at any stage will not be eligible for rank, medal or prizes to be awarded by the University. First attempt means appearance at the first examinations conducted for the particular batch.

4.0 Every candidate shall undergo practical training for at least one month in pharmaceutical factory at the end of the final semester of the course.

**Grading system:**

Appropriate letter grades are awarded in each theory and practical subject to only such candidates who have passed in the university examinations. Internal assessment marks and university examination marks put together will be taken into account for the letter grading system in each subject separately.

A candidate registered for the university examination but fails to appear or fails to score the minimum required 40% marks in the university examination will get a grade ‘F’, indicating failure or grade of incompletion.

A subject successfully completed cannot be repeated.

Final evaluation of each subject (theory and practical separately) will be carried out on a 10- point grading system corresponding to the marks obtained in that subject. Each subject letter grade is converted into a specific grade value associated with the letter grade as given below (Table).
Table: 10-Point grading system:

<table>
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<tr>
<th>S.No.</th>
<th>Range of marks</th>
<th>Grade</th>
<th>Grade points</th>
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<tbody>
<tr>
<td>1.</td>
<td>≥75%</td>
<td>O</td>
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<td>2.</td>
<td>65% - 74.9%</td>
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<td>9.0</td>
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<tr>
<td>3.</td>
<td>60% - 64.9%</td>
<td>B</td>
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<tr>
<td>4.</td>
<td>55% - 59.9%</td>
<td>C</td>
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<tr>
<td>5.</td>
<td>50% - 54.9%</td>
<td>D</td>
<td>6.0</td>
</tr>
<tr>
<td>6.</td>
<td>40% - 49.9%</td>
<td>E</td>
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<tr>
<td>7.</td>
<td>&lt; 40%</td>
<td>F(Fail)</td>
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<td>8.</td>
<td>The grade W represents failure due to insufficient attendance in the semester or year</td>
<td>W</td>
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<tr>
<td>9.</td>
<td>Incomplete (subsequently to be changed into pass or E or O or F grade in the same semester)</td>
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Semester Grade point average (SGPA):

The grade points are weighted in accordance with the number of credits assigned to a theory or practical subject and it is a product of credit and grade value. The semester grade point average (SGPA) is the weighted average of grade points awarded to a candidate.

\[
SGPA = \frac{\text{Total grade points of a particular semester}}{\text{Total number of credits of the semester}}
\]

Performance in the non credit courses in which a pass (i.e., 35% or more) is sufficient will not be considered for calculation of SGPA. SGPA (semester grade point average) for each semester will be calculated for those candidates who have passed all the subjects of that particular semester of the course. D.Pharm holders, who take direct admission to II B.Pharm, are exempted from First and second semester B.Pharm credits.

Cumulative Grade Point Average (CGPA):

The weighted average of SGPA’s of all Semesters that the student has completed at any point of time is the cumulative grade point average (CGAP) at that point of time.

CGAP up to a semester will be calculated only for those students who have passed all the subjects up to that semester. Generally, CGPA is calculated after the successful completion of the entire B.Pharm course.

\[
CGPA = \frac{\sum (SGAP \text{ of each semester } \times \text{corresponding number of credits})}{\text{Sum of the entire course credits}}
\]

After the results are declared grade cards will be issued to each student, which will contain the list of subjects for that semester and grades obtained by the student.
For Diploma holders, who take direct admission to II B.Pharm, only six semester course credits i.e., 3rd to 8th semesters of B.Pharm will be considered for CGPA calculation.
4.1 In each Semester every student who satisfies the attendance requirements should register for examination, failing which he/she shall not be promoted to the next semester. Any such student who has not registered for examination in a semester shall repeat that semester in the next academic year after obtaining the proceedings of the Principal.

4.2 To pass a course in UG Programme, a student has to secure the minimum grade of (P) in the UG Semester end Examinations. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination as supplementary candidate.

4.3 A student is eligible to improve the marks in a paper in which he has already passed, in with 4 years from the year of admission as and when it is conducted for the subsequent batches. This provision shall not be provided once the candidate is awarded Degree.

4.4 A student who has failed in a course can reappear for the End-Semester Examination as and when it is held in the normal course. The Sessional Marks obtained by the student will be carried over for declaring the result.

4.5 Whenever the syllabus is revised for a course, the semester a Examination shall be held in old syllabus three times. Thereafter, the students who failed in that course shall take the semester end Examination in the revised syllabus.

5. Guidelines for paper setting and model papers.

5.1 Guidelines for paper setting:
1. The semester end question paper in each theory course is to be set for a total of 80 marks by an external paper setter as per the general model given below.
2.1 The question paper in each theory course is to be divided into parts A and B.
2.2 Part A consists of 8 short answer questions each carrying 4 marks out of which 5 questions are to be answered by the candidate. Thus the total of part A is 20 marks.
2.3 Part B consists of 4 long answer questions with internal choice, each carrying 15 marks, All questions are to be answered by the candidate. Thus the total of part B is 60 marks.
2.4 The question given in parts A and B should be spread over the entire syllabus in an even manner.
2.5 The question paper in each semester end practical examination is to be set jointly by two examiners, one external and one internal as per the general model provided below.

1. Amendment to the Regulations:
Sri Venkateswara University reserves the right to amend these regulations at any time in future without any notice. Further, the interpretation of any of the clauses of these regulations entirely rests with the University.

*****
### Appendix - ‘S’ to Item No: C-13

#### SCHEME OF INSTRUCTION AND EXAMINATION

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Periods per week</th>
<th>Examination hours</th>
<th>Marks Sessional</th>
<th>Senester End</th>
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<th>No of Credits</th>
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#### I B.PHARM- I SEMESTER

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### II B.PHARM- I SEMESTER

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### II B.PHARM- II SEMESTER

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**III B.PHARM- I SEMESTER**

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**III B.PHARM- II SEMESTER**

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SYLLABUS

I. B.PHARM- I SEMESTER

BPH 101A: MATHEMATICS (For Bi.P.C. Stream)

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.
5. Adams Dany Spencer Laboratory Mathematics Carrol & Graphs.
James R Barrante Applied Mathematics for Physical Chemistry (II ED.) Prentice Hall Incorporations
BPH 101B: BIOLOGY (For M.P.C. Stream)

UNIT I

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

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

REFERENCES
BPH 101C: BIOLOGY PRACTICALS (For M.P.C. Stream)

I. EXPERIMENTS:
   a. Care and uses of microscope
   b. Gross identification of permanent slides plants/animals mentioned in the theory syllabus.
   c. Morphology of plant parts indicated in theory.
   d. Preparation, Microscopic Examination of stem, root and leaf of mono and dicot leaves.
   e. 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.

REFERENCE:
Intermediate Botany/Zoology Text manuals printed and published by Telugu academy, himayatnagar, Hyderabad.
BPH 102: ENGLISH & SOFT SKILLS

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 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

Textbooks:
4. A handbook of English for professionals, 2nd edition by P. Eliah Published by Pharma book syndicate
BPH 103: PHARMACEUTICAL INORGANIC CHEMISTRY

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 trisilicate 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, anticaries 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)boron trifluoride e)ceric ammonium sulphate. Miscellaneous 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.
BPH 104: PHARMACEUTICAL ORGANIC CHEMISTRY-I

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

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, Markovnikov’s rule, peroxide effect, ozonolysis, introduction to alkadienes, stability of conjugated dienes, theory of resonance and hyperconjugation.

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 method 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.

TEXT BOOKS
1. Advanced pharmaceutical organic chemistry, Bahl & Bahl, S.Chand

REFERENCES
4. Organic chemistry, Pillai Orient Longman Publisher.
BPH 105: HUMAN ANATOMY AND PHYSIOLOGY

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

UNIT III:
Skeletal System

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:
2. Text Book of Human Anatomy, Ross & Willson, M.J.Mycek S.B Gerther and MMPER.

REFERENCES:
BPH 106: PHARMACEUTICAL INORGANIC CHEMISTRY PRACTICALS

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 permananganate, 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.
  12) 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.

REFERENCES
  2. Inorganic chemistry, Gary L.Miessler and Donald A.Tarr,3/e, Pearson education, New Delhi
LIST OF MINIMUM EQUIPMENTS REQUIRED
1. Analytical balances
2. Physical balances
3. Suction pumps
4. Oven
5. Hot plates
6. Water baths
7. Distillation unit
Limit test apparatus for arsenic
BPH 107: PHARMACEUTICAL ORGANIC CHEMISTRY-I PRACTICALS

I. Experiments:
   A. Introduction to Equipment & Glassware, Recrystallization method, details of M.P, 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
    Exercise on nomenclature of compounds, Knowledge on CAS, IUPAC, ACS, material safety data and different types of explosive, oxidizable substances.

REFERENCES

LIST OF MINIMUM EQUIPMENT REQUIRED
1. Triple beam balances
2. Physical balances
3. Melting point apparatus
4. Suction pumps
5. Oven
6. Hot plates
7. Water baths
8. Distillation unit
9. Refrigerator
Adequate glassware

BPH 108: HUMAN ANATOMY AND PHYSIOLOGY PRACTICALS

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

REFERENCES
2. Practical Biochemistry, Plummer.

LIST OF MINIMUM EQUIPMENTS REQUIRED
1. Microscopes
2. Glass slides
3. Hemocytometer with micropipettes
4. Sahli’s hemoglobinometer
5. Huchinson’s spirometer
6. Sphygmomanometer
7. Stethoscope
8. Permanent slides for various tissues
9. Models for various organs and system
10. Specimen of various organ and system
11. Skeleton and bones
12. Clinical thermometers
13. ECG graphs.
14. Stop clocks
15. Different contraceptive devices and models.
I B.PHARM- II SEMESTER

BPH 109: GENERAL & DISPENSING PHARMACY

UNIT I Origin and History
Development of pharmacy, Evolution of Pharmacy education & Pharma industry in India. Origin and development 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 and purpose. Principles of dispensing, parts of prescription, handling of prescription, general dispensing procedures, source of errors in prescription and care required in dispensing procedures including labeling of dispensed products.

UNIT III Pharmaceutical calculations
Weights and Measures, introduction to Latin terms, Percentage calculations, alligation method, proof spirit calculations, displacement value and calculations of isotonicity adjustment. Posology - factors affecting selection of dose & dosage form and calculations of doses.

UNIT IV Principles involved and procedures adopted in dispensing of the following classes of preparations:
Incompatibilities: Introduction, classifications, methods to overcome incompatibility.

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

REFERENCES
1. Text Book of Pharmaceutics, E.A. Rawlins, Bentley’s ELBS publ.
2. Essential dosage calculations - Hospital Pharmacy. Lorria & William, William Hassan.
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 1°, 2° and 3° alcohols, Meerwein-Pondorff Verley 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, William’s synthesis, action of hydroiodic acid on ethers (Ziesel’s method).

UNIT - II:

Aromatic Hydrocarbons:
Kekule Structure of Benzene, Bond Length, Heat Of Hydrogenation, Stability, Molecular Orbital Picture Of Benzene, Aromaticity, Hückel'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, two important methods of preparation, decarboxylation, functional groups reactions and reduction of carboxylic acids.

Acid derivatives: (acid chlorides, anhydrides, esters and amides): Nomenclature, reactions like hydrolysis, 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 containing - hydrogens, reductive reactions of aromatic nitro compounds.


TEXT BOOKS
1. Advanced pharmaceutical organic chemistry, Bahl & Bahl, S.Chand.

REFERENCES
4. Organic chemistry, Pillai Orient Longman Publisher.
BPH 111: COMPUTER APPLICATIONS

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
BPH 112: PHARMACOGNOSY I

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:
3. Pharmacognosy by Robert, Tyler.

REFERENCE BOOKS:
1. WHO guidelines on good agricultural and collection practices (GACP)-WHO, Geneva
2. Cultivation & utilization of medicinal plants by Atal CR and Kapoor BM.
   Swain T; Chemical Plant taxonomy, Academic Press London
UNIT I

**a. Central Nervous System:** Functions of different parts of brain and spinal cord. Structure of blood brain 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 of neurohumoral transmission in the A.N.S.

UNIT II

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

**b. Reproductive Systems:** Male and Female reproductive systems and their hormones, physiology of menstruation, 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 detailed functioning.

UNIT IV


**b. Cancer:** Classification of tumours, difference between benign and malignant tumours, disturbances of 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:
3. Ross & Willson, Principles of anatomy and physiology, John wiley & Sons
4. C.C.Chatterjee, Human Physiology, Pub by Medical allied agency, Delhi, India.

REFERENCE BOOKS:
1. Robbins, SL & Kumar, Basic Pathology, 8th Edition Elsewier.
5. Joseph Dipiro, Pathophysiology and applied therapeutics
BPH 114: GENERAL & DISPENSING PHARMACY PRACTICALS

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 incompatibilities in a prescription, and dispensing of such 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).

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.
7. Adequate quantities of chemicals and glassware.

BPH 115: PHARMACEUTICAL ORGANIC CHEMISTRY-II PRACTICALS

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 dibenzalacetone 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.

III. Seminar/assignment/group discussion  
Exercise on nomenclature of compounds, Knowledge on Protection of groups by green chemical methods, microwave assisted synthesis.

REFERENCES  

LIST OF MINIMUM EQUIPMENT REQUIRED  
1. Triple beam balances  
2. Physical balances  
3. Melting point apparatus  
4. Suction pumps  
5. Oven  
6. Hot plates  
7. Water baths  
8. Distillation unit  
9. Refrigerator  
10. Adequate glassware
BPH 116: COMPUTER APPLICATIONS PRACTICALS

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.,

RECOMMENDED BOOKS:
1. basic computer programming- V.K Jain, pusthak mahal, Delhi
2. programming in basic by E.Balagurusami, tata mcgrawhill
3. programming in basic-Gottfried, tata mcgrawhill
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

BPH 117: PHARMACOGNOSY I PRACTICALS

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

**LIST OF MINIMUM EQUIPMENTS REQUIRED**

1. Microscopes with stage  
2. Heating mantle  
3. Water baths  
Adequate glass wares
II B.PHARM- I SEMESTER

BPH 201: PHYSICAL PHARMACY –I

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 third law 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, colligative properties (lowering of vapour pressure, depression in freezing point, elevation of boiling point and Osmotic pressure), molecular weight determinations.


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, buffer capacity, 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 (t\textsubscript{1/2}) determination, influence of temperature and Arrhenious theory, light, solvent, catalytic species and other factors. Accelerated stability studies, expiration dating

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

REFERENCE BOOKS:
4. L. Lachman, H. Lieberman The Theory And Practice Of Industrial Pharmacy J. L Kaniz Lee & Febiger Philadelphia, USA.
BPH 202: PHARMACEUTICAL ENGINEERING

Unit I
Introductory concepts: Unit operation / Unit processes, material and energy balance, equilibrium state, rate process.
Fluid Flow: Types of flow, Reynolds's number, Bernoulli's equation, viscosity, concept of boundary layer, 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 and measurement of humidity, application of humidity measurement, Equipments for dehumidification operations.
Refrigeration and air-conditioning: Principles and applications.

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.

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 and turbine mixer. Homogenizer, triple roller mill.

**Automated process control systems:**
Process variables, temperature, 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.

**REFERENCE BOOKS:**
1. E.A. Rawlin”s, Bentley’s Text Book of Pharmaceutics, 8th ed ELBS.
BPH 203: PHARMACEUTICAL ORGANIC CHEMISTRY – III

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.


UNIT II: Stereochemistry of Carbon compounds - Optical rotation, plane polarized light, optical activity, 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 analysis including 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:
5. O.P Agarwal, A Textbook of Organic Chemistry
7. Oraganic reactions,Stereo chemistry&mechanizam by PS Kalsi

REFERENCE BOOKS:
UNIT I: Cell Processes, Bioenergetic and Cellular Reactions
Biochemical organization of the cell, molecular constituents of membrane, active & passive transport process, sodium and potassium pumps, osmoregulation and hemostasis. The concept of free energy, 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 importance of enzymes in treatment and diagnosis.

UNIT III: Metabolism of carbohydrates
Metabolic pathway, regulation and significance of the following pathways and cycles: Metabolism of Carbohydrates: 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.

Clinical Biochemistry
Introduction to clinical biochemistry, Normal values of various biochemical parameters (Blood / or Urine: Glucose, VLDL, LDL etc. total proteins, urea, Minerals, Hormones… etc.) and their abnormal values in diagnosis. Liver function test and kidney function test, OGTT.

TEXT BOOKS:
4. J.L. Jain, Fundamentals of Biochemistry S.Chand

REFERENCE BOOKS:
3. West, Edward Text Book of Biochemistry; Freeman and company, Sanfransisco.
BPH 205: ENVIRONMENTAL STUDIES

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)


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


**Text Books:**

**References:**
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.
BPH 206: PHYSICAL PHARMACY – I PRACTICALS

I. EXPERIMENTS:
3. pKa Estimation by Half Neutralization 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.
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
**BPH 207: PHARMACEUTICAL ENGINEERING PRACTICALS**

**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.
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
BPH 208: PHARMACEUTICAL ORGANIC CHEMISTRY – III PRACTICALS

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 acetylilide
   12. Synthesis of Imidazole -4,5-dicarboxylic acid from tartaric acid
   13. Benzilic acid from benzene.

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.
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.
8. Estimation of Urea in Blood
11. Estimation of alkaline phosphatase, SGOT, SGPT in serum

NOTE: Collection of blood samples from human should be carried out by trained pathologist and subject 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 targeting

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
II B.PHARM- II SEMESTER

BPH 209: PHYSICAL PHARMACY –II

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

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

Coarse Dispersions:
Emulsions: Theories of emulsification, physical stability of emulsions.

TEXT BOOKS:
2. CVSSubhramanyam, Physical Pharmaceutics, Vallabhprakashan.

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
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 special reference 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 ion effect 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 2007 and 2010.

UNIT II
a) General principles, theory and examples of oxidation-reduction methods, permanganometry, ceriometry, iodometry, iodimetry indicators used in these titrations, self indicators.
b) General principles, theory and examples of Precipitation methods: Mohr’s method, volhard’s method, account of the indicators used in these titrations, Adsorption indicators.
c) Complexometric titration: Theory, types and application in pharmaceutical analysis. Indicators used, Masking and demasking and their applications.
Application of the above methods in the analysis of drugs, as under IP 2007 and 2010.

UNIT III
a) Potentiometry: Introduction to EMF, electrochemical cells and half cells, Electrodes, measurement of potential, pH curve, EMF curve, derivative curve in application to end point determination.
b) Conductometric titrations: Basic concepts, conductivity cell, different types of conductometric titrations.
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 in Pharmaceutical 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 Nephelometric turbidimeter, pharmaceutical application as specified in IP, determination chlorides and
sulphates.
a) Principle and applications of the following instruments and various grades of reagents 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:

REFERENCE BOOKS:
4. Connors, a Textbook of Pharmaceutical Analysis. Wiley India Pvt. Ltd
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 incompatibility 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 in pharmacopoeia.
Dry syrups: Requirements, formulation, methods of preparation, containers, evaluation.

UNIT III
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 packaging methods, 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:

Reference Books:
1. Banker and Rhodes, Modern pharmaceutics, marcel dekker series.
BPH 213: PHARMACOGNOSY – II

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, Strophantus, 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 I a. Quinoline-Isquinoline-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.
   • Biogenesis of 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:
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:
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
**BPH 214: PHARMACOINFORMATICS & BASICS IN DRUG DISCOVERY**

**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**
BPH 215: PHYSICAL PHARMACY —II PRACTICALS

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.

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
BPH 216: PHARMACEUTICAL ANALYSIS – I PRACTICALS

I. Experiments:
1. Calibration of analytical glass ware.
2. Assay of Sodium carbonate by acid-base titration.
5. Assay of Sodium chloride by precipitation titration.
6. Assay of Calcium gluconate by complexometry.
10. Determination of refractive index of any sample by Abbe’s refractometer.
11. Determination of sucrose concentration by Polarimetry.

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 per I.P.2007.
2. What is the need of determination of moisture content, what is the limit of moisture in various natural and synthetic drugs?
BPH 217: PHARMACEUTICAL TECHNOLOGY–I PRACTICALS

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
BPH 218: PHARMACOGNOSY – II PRACTICALS

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.
### III B.PHARM- I SEMESTER

**BPH 301: PHARMACEUTICAL TECHNOLOGY-II**

**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, microcapsulation by coacervation phase separation, multi orifice centrifugal separation. 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 of apyrogenicity, 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.  
**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:**  

**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, Elbs publ
7. NK Jain, Pharmaceutical product development, CBS publishers.
BPH 302: MEDICINAL CHEMISTRY-I

UNIT I

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

UNIT III CNS system Depressants and Central dopaminergic signalling agents
Anti-Psychotics: Phenothiazines (Chlorpromazine*, Thoridazine, Fluphenazine), thioxanthenes (Thiothixene*), Butyrophenones (Haloperidol*, Droperidol, resperidone, penfluridol), Miscellaneous-Lithium salts, Clozapine and Olanzapine. SAR-Phenothiazinimetics, Butyrophenones.

UNIT IV
Buspirone, Mirtazapine and Bupropion. SAR- Tricyclic antidepressants, MAOIs. Miscellaneous: Psilocybin, Dimethyltryptamine, Mescaline, Lysergic acid and Tetrahydro cannabinol.

Anaesthetics


Reference Books:
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
BPH 303: PHARMACOLOGY-I

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. Pharmacodynamics
Mechanism of action with special emphasis on receptors, drug-receptor interaction theories, factors modifying drug action.
c. Pharmacokinetics
Drug 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.

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

Reference Books:
2. J. Crossland, Lewis,s Pharmacology, Church living stone.
BPH 304: PHARMACEUTICAL MICROBIOLOGY


UNIT II Nutrition and Growth of Microbes: Nutritional requirements, Types of Nutrient media and growth conditions and Nutritional types based on energy source. Isolation, cultivation (aerobic & anaerobic) and preservation of microorganisms, physiology of growth, bacterial growth curve, methods for determining bacterial numbers, mass and cell constituents. Exponential growth and generation time. Bacterial growth in batch and continuous culture (chemostat and turbidostat) synchronous growth.


UNIT IV
Epidemiology 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 and infective hepatitis. Diagnostic tests of Malaria, Typhoid, Cholera, TB, Leprosy.

Application of Microbes in Pharmaceutical Industry

Microbiological Assays: Principles and Methods involved in Assay of Antibiotics (penicillins, tetracyclines and streptomycins only) Vitamins (cyanocobalamin and riboflavin only), Amino acids (lysine and glutamic acid only) & Bio-Sensors in Analysis.

Text Books:
2. Anantha Narayan and Jayram Panikar, Text Book of Microbiology, Orient Longman, Delhi, Hyderabad.

Reference Books:
1. Pharmaceutical microbiology by Kishore Gujar, Himalaya publishing house.
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 counseling – maintenance of records.

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.
BPH 306: PHARMACEUTICAL TECHNOLOGY-II PRACTICALS

I. EXPERIMENTS:
1. Manufacturing 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)
4. Parenterals:
   a) Manufacturing of parenterals (Ampoule sealing (Pull sealing and tip sealing)
   b) Evaluation of parenterals (Clarity test, and leaking test).

II. DEMO/ WORKSHOP
Coating of tablets (sugar/film/enteric)

III. SEMINAR/ASSIGNMENT/GROUP DISCUSSION
1. Advances in granulation technology.
3. Excipients and their commercial names.
BPH 307: MEDICINAL CHEMISTRY-I PRACTICALS

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:

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 glasswares
BPH 308: PHARMACEUTICAL MICROBIOLOGY PRACTICALS

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 transfer 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).
III B.PHARM- II SEMESTER

BPH 309: MEDICINAL CHEMISTRY-II

UNIT I  Drugs acting on renal system


SAR- Carbonic anhydrase inhibitors, Thiazides, Loop diuretics, Phenoxy acetic acid derivatives.

UNIT II  Drugs acting on CVS

Antithrombotic agents- Aspirin, Dipyridamole, Clopidogrel* and Ticlopidine
Antifibrhythmic drugs: Quinidine, Procainamide*, Disopyramide, Lidocaine, Mexiletine*, Propafenone, 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, β-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, Anisindione

Synthetic 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,

Naloxone, Methylnaltrexone.


Antibiotics

**Text Books:**
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

**Reference Books:**
   D. Lednicer, Organic drug synthesis, Vol, 1 – 6, J.Wiley N.Y.
BPH 310: PHARMA COLOGY-II

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 antagonists
a. Insulin, Oral hypoglycemic 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. Tripathi, Essentials of Medical Pharmacology, Jaypee Brother”s, Latest Edition

Reference Books:
3. J. Crossland, Lewis”s Pharmacology, Church living stone.
BPH 311: PHARMACEUTICAL ANALYSIS II

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, Woodwards Fiesher rules for calculation of $\text{A}_\text{max}$, 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
$\text{H}^1$-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.


HPLC: Principle, Vandeeemter equation, Instrumentation - mobile phase, degassing, pumps, injectors, columns, detectors. Isocratic and gradient elution in RP-HPLC.

Text Books:

Reference Books:
5. Pharmacopoeia (IP, BP, USP).
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
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, Carcinogenicity, 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

Reference Books:
7. J. Crossland, Lewis,s Pharmacology, Church living stone.

Ruth Woodrow, Essentials of Pharmacology for Health Occupations. Delmar Cenage Learning
BPH 312 C: INDUSTRIAL. PHARMACY & COSMETIC TECHNOLOGY

UNIT-1
2. Formulation Development: Factors involved,

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.
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

References:

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
BPH 314: PHARMACOLOGY-II PRACTICALS

I. EXPERIMENTAL PART (To use appropriate softwares 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.
BPH 315: PHARMACEUTICAL ANALYSIS II PRACTICALS

I. EXPERIMENTS
1. Determination of $\lambda_{\text{max}}$ of KMnO₄ (Visible)
2. Determination of $\lambda_{\text{max}}$ of ciprofloxacin (any one drug) (UV)
3. Determination of isobestic point of any 2 drugs.
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
UNIT I

UNIT II

UNIT III

UNIT IV

Basic concepts of Drug Design and discovery Concept on ligand, targets, lead molecules, Pharmacophore. Basis of structure based and ligand based drug 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
3. An Introduction to Medicinal Chemistry by Graham. L. Patrick, Oxford University publishers.

Reference Books:
4. Daniel lednicer, Strategies for Organic Drug Synthesis and Design
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, opioid, organophosphorous and atropine poisoning.
- c. Heavy metals and heavy metal antagonists. LD$_{50}$, ED$_{50}$ and therapeutic index
- d. Principles of bioassays and errors in bioassays.
   - d. Study of bioassay methods for the following drugs
     - i. Digitalis
     - ii. d-tubocurarine
     - iii. Oxytocin
     - iv. Insulin
     - v. HCV

(a) **Text Books:**
3. Illerated Pharmacology by Lippincotts

(b) **REFERENCES**
1. Tripathi, Essentials of Medical Pharmacology, Jaypee Brother’s, Latest Edition
UNIT I
A) Phytochemical Screening: Preparation of extracts, screening of alkaloids, saponins, cardiac glycosides, flavonoids, tannins and anthraquinones in 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 of traditional drugs –ommonand vernacular names, sources, chemical constituents and uses of Kantakari, Malkanguni, Shatavari, Tylophora, Bilva, Kalijerei, 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:
4. Pharmacognosy by Robert, Tyler.

ReferenceBooks:
1. WHOguidelines on goodagriculturaland collectionpractices(GACP)-WHO, Geneva
2. Cultivation &utilizationofmedicinalplants by Atal CR and Kapoor BM.
3. TextbookofPharmacognosybyWallis.
4. Pharmacognosy byTreaseand Evans,latestedition.
5. USP, IP andBP. Ayurvedic Pharmacopoeia of India.
6. Ayurvedic Pharmacopoeia of India, Published by Govt of India.
8. PeachKandTraceyMV,ModernmethodsofPlantanalysis,Narosepublishinghouse,NewDelhi
9. Ayurvedic Formulary of India, Govt of India Publication.
11. HarborneJB; Phytochemicalmethods, Champmanand Hall.
12. PlantTissue cultureBy Razdan
BPH 404: BIOPHARMACEUTICS & PHARMACOKINETICS

UNIT – I

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- Menten equation and its significance.

**Text Books:**
3. DM Brahmkar and SB Jaiswal, biophamaceutics and pharmacokinetics - a treatise, vallabh prakasham, Delhi.

**Reference Books:**
2. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, marcel dekker inc., NY
3. Basic pharmacokinetics by Hedaya, CRC press
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, Edmann etc) 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 tropine alkaloids. Homatropine.
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-terpenoeol and ionones. Conversion and interconversion of camphor into camphoric acid, camphoronic acids, p-cymene, Borneol, isoborneol.

UNIT IV
**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.

**Reference Books:**
1. RT Morrison and R.N Boyd, Organic chemistry, Allyn and Bacon, inc., boston
3. F.G. Mann & B. Saunders, Practical Organic chemistry Longmans green & Co. Ltd., UK.
4. RM. Acheson, an introduction to the chemistry of heterocyclic compounds, Interscience NY.
5. Duquesn & others, Practical pharmacognocy, CBS Publ.
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 information 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, layout, 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.
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
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 ortho iodo 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 Sulpha methoxazole (anti bacterial)
11. Assay of Glibenclamide (hypoglycaemic agent)
12. Assay of Metronidazole (antiprotzoal)
13. Assay of Isoniazid (anti tubercular)
14. Assay of Diethylcarbamazine (anti helmintic)
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:

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
BPH 407: PHARMACOLOGY-III PRACTICALS

A. EXPERIMENTAL PART
1. Experiments on Isolated Preparations:
   a. Calculate the PA₂ value of atropine using acetylcholine as an agonist on rat ileum preparation.
   b. Calculate the PA₂ 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
         - Matching or bracketing bioassay
         - Three point bioassay
         - 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. In vitro antioxidant activity
   c. Screening of antihistaminic activity (histamine chamber)

C. SEMINAR/ ASSIGNMENT/ GROUP DISCUSSION
   a. BABE studies
   b. In vitro-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 Pharmacology and Toxicology By Dr.B.M.VrushabendraSwamy and Prof.K.N.Jayaveera, S.Chand& Co.,
BPH 408: PHARMACOGNOSY-III PRACTICALS

I. EXPERIMENTS:
1. Determination of moisture content.
2. Determination of Ash values, water soluble ash, acid insoluble ash.
3. Determination of extractive values.
4. Isolation of quinine from Cinchona
5. Isolation of vasicine from Vasaka leaves.
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. churnas and the 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 phytoconstituent by Modern chromatographic methods.

III. SEMINAR/ASSIGNMENT/GROUP DISCUSSION:
Related to theory syllabus

Text Books:
1. Practical Pharmacognosy.-C.K.KokateNiraliPrakashan
2. Practical Pharmacognosy-Iyengar Manipal press limited

LIST OF MINIMUM EQUIPMENTS REQUIRED
1. Waterbath
2. Hotplates
3. Soxhlet extractor
4. Microscopes
5. Glass slides
6. Muffle furnace
7. Incinerator
8. Crucible
9. Colorimeter
10. Analytical balance
11. Heating mantle
12. Adequate glassware
BPH 409: BIOPHARMACEUTICS & PHARMACOKINETICS PRACTICALS

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
2. Experiments designed for the estimation of various pharmacokinetic parameters.

III. SEMINAR/ASSIGNMENT/GROUP DISCUSSION
Chronopharmacokinetics.

Text Books:
3. DM Brahmankar and SB Jaiswal, biopharmaceutics and pharmacokinetics- a treatise, vallabh prakasham, Delhi.

Reference Books:
2. Robert E notary, Biopharmaceutics and pharmacokinetics – an introduction, marcel dekker inc., NY
IV B PHARM- II SEMESTER

BPH 410: NOVEL DRUG DELIVERY SYSTEMS

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 and performance of sustained and controlled release dosage forms.

UNIT II

UNIT III

UNIT IV
Transdermal Drug Delivery Systems: Fundamentals, permeation of drugs across the skin, types of TDDS, Materials employed and Evaluation of TDDS.

Text Books:
Reference Books:
2. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
3. E.A Rawlkins, Bentley’s Text Book of Pharmaceutics, Elbspubl
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, humatrop, activase, intron a, monoclonal antibodies by hybridoma technique, recombivax HB (hepatitis b). Stem cells and their applications.

UNIT III

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. Wulf Crueger and Anneliese Crueger, Biotechnology, 2 nd Ed, Publ- Panima publication cooperation, New Delhi.

Reference Books:
2. K. Kielsliched “Biotechnology” Vol 6, Verlegchemic, Switzerland.
5. Alexande M Moo-young, Comprehensive Biotechnology, Pergamon Press, New York
BPH 412: CLINICAL PHARMACY & THERAPEUTICS

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.

BPH 413: COMPREHENSIVE VIVA VOCE

BPH 414: PROJECT WORK & SEMINAR
SRI VENKATESWARA UNIVERSITY
B. PHARMACY SYLLABUS
Choice based credit system (CBCS): w.e.f. 2016-17.

MODEL PAPERS

Model question paper for practical course

B.PHARMACY - SEMESTER
Title of the Paper
Max marks 80M

Time 3 Hrs

1. Synopsis 10 marks
2. Major experiment 40 marks
3. Minor experiment 30 marks
4. Viva voce 10 marks
5. Record 10 marks

Total: 100 marks

Model question paper for theory course

B.PHARMACY - SEMESTER
Title of the Paper
Max marks 80M

Time 3 Hrs

Attempt any five from part A (5 x 4 = 20 marks) and all from Part B (4 x 15 = 60 marks)

PART A (5 x 4 = 20 marks)

1. Unit 1
2. Unit 1
3. Unit 2
4. Unit 2
5. Unit 3
6. Unit 3
7. Unit 4
8. Unit 4

PART B (4 x 15= 60 Marks)

9. Unit 1 a or b
10. Unit 2 a or b
11. Unit 3 a or b
12. Unit 4 a or b

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