**Study & Evaluation Scheme**

**of**

# Bachelor of Pharmacy

## B. Pharm.

**[Applicable w.e.f. Academic Session 2011-12 till revised]**


**TEERTHANKER MAHAVEER UNIVERSITY**

**N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001**

**Website: www.tmu.ac.in**

# TEERTHANKER MAHAVEER UNIVERSITY

**(Established under Govt. of U. P. Act No. 30, 2008)**

**Delhi Road, Bagarpur, Moradabad (U.P)**

# Study & Evaluation Scheme
# of
# Bachelor of Pharmacy

## SUMMARY

**Programme** : B. Pharm.
**Duration** : Four years (Eight Semester)
**Medium** : English
**Minimum Required Attendance** : 75 percent
**Credits**
**Maximum Credits** : **245**
**Minimum credits` required for getting degree** : **237**

**Assessment** :

| Internal | External | Total |
|---|---|---|
| 30 | 70 | 100 |

**Internal Evaluation (Theory Papers)** :

| Class Test-I | Class Test-II | Class Test-III | Continuous Evaluation | Total |
|---|---|---|---|---|
| Best two out of the three | | | 10 Marks | 30 Marks |
| 10 Marks | 10 Marks | 10 Marks | | |

**Internal Evaluation (Pratical Papers)** :

| Class Test-I | Class Test-II | Class Test-III | Continuous Evaluation | Total |
|---|---|---|---|---|
| 10 Marks | 10 Marks | 10 Marks | 10 Marks | 30 Marks |

**Duration of Examination** :

| Theory | | Practical | |
|---|---|---|---|
| **External** | **Internal** | **External** | **Internal** |
| 3 hrs. | 1.5 hrs. | 4 hrs. | 4 hrs. |

To qualify the course a student is required to secure a minimum 40% marks in aggregate in the end semester examination and teachers continuous evaluation (i.e. both internal and external). A candidate who secures less than 40% (**aggregate**) marks in a course shall be deemed to have failed in that course. The student should have overall 50% marks in a semester to clear the semester. In case a student has more than 40% in each course but less than 50% overall in a semester he/she shall re-appear in one or two course(s) to improve the percentage. There will be three Class Tests in a semester and an average of the marks obtained in best two tests will be computed (cumulatively) for the final result.

The class tests would comprise of five questions. Student shall have to answer three questions out of which one question will be compulsory. Each question would be of five marks.

***Question Paper Structure:***

| |
|---|
| 1. *The question paper shall consist of eight questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question No. 1 shall contain 8 parts representing all units of the syllabus and students shall have to answer any five (weightage 4 marks each).* |
| 2. *Out of the remaining seven questions, student shall be required to attempt any five questions. There will be minimum one and maximum two questions from each unit of the syllabus. The weightage of Question No. 2 to 8 shall be 10 marks each.* |

# Study & Evaluation Scheme
# Programme: B.Pharm.
## Semester I

| S. N. | Course Code | Subject | Periods | | | Credits | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal | External | Total |
| 1 | BPM101 or BPB101 | Fundamental Mathematics or Fundamental Biology | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 2 | BPH101 | Pharmaceutical Analysis - I | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 3 | BPH102 | Pharmaceutical Inorganic Chemistry | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 4 | BPH103 | Pharmaceutics-I (G. Pharmacy) | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 5 | BPH104 | Human Anatomy, Physiology and Pathophysiology - I | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 6 | BPH105 | Foundation English-I | 2 | - | 2 | 3 | 30 | 70 | 100 |
| 7 | BPH151 | Pharmaceutical Analysis – I (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | BPH152 | Pharmaceutical Inorganic Chemistry (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 9 | BPH153 | Pharmaceutics-I (G. Pharmacy) (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 10 | BPH154 | Human Anatomy, Physiology and Pathophysiology – I (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| | | **Total** | **17** | **10** | **18** | **31** | **300** | **700** | **1000** |

## Semester II

| S. N. | Course Code | Subject | Periods | | | Credits | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal | External | Total |
| 1 | BPH201 | Pharmaceutical Physical Chemistry | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 2 | BPH202 | Pharmaceutical Organic Chemistry – I | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 3 | BPH203 | Human Anatomy, Physiology and Pathophysiology – II | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 4 | BPH204 | Computer Fundamentals & Programming | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 5 | BPH205 | Advanced Mathematics | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 6 | BPH206 | Foundation English-II | 2 | - | 2 | 3 | 30 | 70 | 100 |
| 7 | BPH251 | Pharmaceutical Physical Chemistry (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | BPH252 | Pharmaceutical Organic Chemistry – I (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 9 | BPH253 | Computer Fundamentals & Programming (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| | | **Total** | **17** | **10** | **14** | **29** | **270** | **630** | **900** |

## Semester III

| S. N. | Course Code | Subject | Periods | | | Credits | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal | External | Total |
| 1 | BPH301 | Pharmaceutics – II (Unit Operation – I) | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 2 | BPH302 | Pharmaceutical Jurisprudence & Ethics | 3 | - | - | 3 | 30 | 70 | 100 |
| 3 | BPH303 | Pharmacognosy – I | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 4 | BPH304 | Pharmaceutical Organic Chemistry – II | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 5 | BPH305 | Pharmaceutics – III (Community Pharmacy) | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 6 | BPH306 | Human Anatomy, Physiology & Pathophysiology – III | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 7 | BPH351 | Pharmaceutics – II (Unit Operation – I) (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | BPH352 | Pharmacognosy – I(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 9 | BPH353 | Pharmaceutical Organic Chemistry – II (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 10 | BPH354 | Pharmaceutics – III (Community Pharmacy) (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| | | **Total** | **18** | **10** | **16** | **31** | **300** | **700** | **1000** |

## Semester IV

| S. N. | Course Code | Subject | Periods | | | Credits | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal | External | Total |
| 1 | BPH401 | Pharmaceutics – IV (Unit Operation – II) | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 2 | BPH402 | Pharmaceutical Microbiology | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 3 | BPH403 | Pharmacognosy – II | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 4 | BPH404 | Pharmaceutical Analysis – II | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 5 | BPH405 | Human Anatomy, Physiology & Pathophysiology – IV | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 6 | BPH406 | Technical Communication | 2 | - | 2 | 3 | 30 | 70 | 100 |
| 7 | BPH451 | Pharmaceutics – IV (Unit Operation – II (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | BPH452 | Pharmaceutical Microbiology (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 9 | BPH453 | Pharmacognosy – II(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 10 | BPH454 | Pharmaceutical Analysis – II(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| | | **Total** | **17** | **10** | **18** | **31** | **300** | **700** | **1000** |

## Semester V

| S. N. | Course Code | Subject | Periods | | | Credits | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal | External | Total |
| 1 | BPH501 | Pharmaceutical Biochemistry | 3 | - | - | 3 | 30 | 70 | 100 |
| 2 | BPH502 | Pharmaceutics – V (Pharmaceutical Technology-I) | 3 | - | - | 3 | 30 | 70 | 100 |
| 3 | BPH503 | Pharmacology – I | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 4 | BPH504 | Pharmaceutical Medicinal Chemistry-I | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 5 | BPH505 | Pharmaceutics – VI (Physical Pharmacy) | 3 | - | - | 3 | 30 | 70 | 100 |
| 6 | BPH506 | Technical Writing | 2 | - | 2 | 3 | 30 | 70 | 100 |
| 7 | BPH551 | Pharmaceutical Biochemistry (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | BPH552 | Pharmaceutics – V (Pharmaceutical Technology-I)(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 9 | BPH553 | Pharmacology – I(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 10 | BPH554 | Pharmaceutical Medicinal Chemistry-I (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 11 | BPH555 | Pharmaceutics – VI (Physical Pharmacy) (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| | | **Total** | **17** | **4** | **22** | **30** | **330** | **770** | **1100** |

## Semester VI

| S. N. | Course Code | Subject | Periods | | | Credits | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal | External | Total |
| 1 | BPH601 | Pharmaceutical Medicinal Chemistry-II | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 2 | BPH602 | Pharmaceutics – VII (Pharmaceutical Technology II) | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 3 | BPH603 | Pharmacology – II | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 4 | BPH604 | Pharmacognosy – III | 3 | 2 | - | 4 | 30 | 70 | 100 |
| 6 | BPH605 | Environment & Ecology | 3 | - | - | 3 | 30 | 70 | 100 |
| 5 | BPH606 | Communication Technique | 2 | - | 2 | 3 | 30 | 70 | 100 |
| 7 | BPH651 | Pharmaceutical Industrial Training | - | - | - | 2 | 50 | 50 | 100 |
| 8 | BPH652 | Pharmaceutical Medicinal Chemistry-II (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 9 | BPH653 | Pharmaceutics – VII (Pharmaceutical Technology-II(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 10 | BPH654 | Pharmacology – II(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| 11 | BPH655 | Pharmacognosy – III(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| | | **Total** | **17** | **8** | **18** | **32** | **350** | **750** | **1100** |

## Semester VII

| S. N. | Course Code | Subject | Periods | | | Credits | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal | External | Total |
| **1** | BPH701 | Pharmaceutical Analysis - III | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **2** | BPH702 | Pharmaceutics – VIII (Bio-pharmaceutics & Pharmacokinetics) | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **3** | BPH703 | Pharmacology – III | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **4** | BPH704 | Pharmaceutical Medicinal Chemistry-III | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **5** | BPH705 | Pharmacognosy – IV | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **6** | BPH706 | Pharmaceutical Industrial Management | 3 | - | - | 3 | 30 | 70 | 100 |
| | BPH707 | Corporate Communication | 2 | - | 2 | 3 | 30 | 70 | 100 |
| **7** | BPH751 | Pharmaceutical Analysis - III(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| **8** | BPH752 | Pharmaceutics – VIII (Bio-pharmaceutics & Pharmacokinetics) (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| **9** | BPH753 | Pharmacology – III (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| **10** | BPH754 | Pharmacognosy – IV (P) | - | - | 4 | 2 | 30 | 70 | 100 |
| | | **Total** | **20** | **10** | **18** | **34** | **330** | **770** | **1100** |

## Semester VIII

| S. N. | Course Code | Subject | Periods | | | Credits | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal | External | Total |
| **1** | BPH801 | Pharmaceutical Bio-technology | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **2** | BPH802 | Natural Products | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **3** | BPH803 | Hospital Pharmacy | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **4** | BPH804 | Pharmaceutical Research - I | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **5** | BPH805 | Pharmaceutical Research - II | 3 | 2 | - | 4 | 30 | 70 | 100 |
| **7** | BPH851 | Project Based on Pharmaceutical Research – I & II(P) | | 2 | 8 | 5 | 50 | 50 | 100 |
| **8** | BPH852 | Natural Products(P) | - | - | 4 | 2 | 30 | 70 | 100 |
| | | **Total** | **15** | **12** | **12** | **27** | **230** | **470** | **700** |

**Note:**

**L – Lecture** 1L = 1Hr

**T- Tutorial** 1T= 1 Hr

**P- Practical** 1P= 1 Hr

**C-Credits**
1C = 1Hr of Theory Paper
= 2 Hrs of Practical/Tutorial

# B. Pharm. – Semester I
# FUNDAMENTAL MATHEMATICS

**Course Code**: **BPM101** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with basic mathematical tools.

## Course Contents

**Unit-I**

**Algebra:** Equations reducible to quadratics, simultaneous equations (linear & quadratic). Determinants, Properties of determinants, solution of simultaneous equations by Cramer's rule, matrices, properties of matrices, solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices. **(8 Hours)**

**Unit-II**

**Measures of Central value:** Objectives and pre-requisites of an ideal measure, mean, mode and median. **(6 Hours)**

**Unit-III**

Measures of dispersion, Range, Quartile Range, Mean deviation, standard deviation, correlation, rank correlation, T-test, F-test, $X^2$ test, Standard error of means. T- Ratio of multiple, submultiples, allied and certain angles, application of logarithms in pharmaceutical computations.

**(10 Hours)**

**Unit-IV**

**Analytical Plain Geometry:** Certain co-ordinates, distance between two points, area of triangle, straight line, slope and intercept form, double intercept form normal (perpendicular form), slope-point and two point forms, general equation of first degree. **(8 Hours)**

**Unit-V**

**Calculus**: Differential: Limits and functions, definition of differential coefficient, differentiation of standard functions, including function of a function (chain rule).

Integral: Integration as inverse of differentiation indefinite integrals of standard form, integration by parts. **(8 Hours)**

**Recommended Books**


1. Gupta S.P., *Statistical Methods*, Sultan Chand and Co., New Delhi.
2. Loney S.L., *Plane Trigonometry*, AITBS Publishers.
3. Loney S.L., *The Elements of Coordinate Geometry*, AITBS Publishers.
4. Narayan Shanti, *Differential Calculus*, Shyamlal Charitable Trust, New Delhi.
5. Narayan Shanti, *Integral Calculus*, Sultan Chand & Co.
6. Prasad Gorakh, *Text book on Differential Calculus*, Pothishala Pvt. Ltd., Allahabad.
7. Prasad Gorakh, *Text book on Integral Calculus*, Pothishala Pvt. Ltd., Allahabad.


***Latest editions of all the suggested books are recommended.**

## Semester I
## FUNDAMENTAL BIOLOGY

**Course Code**: **BPB101** **L-3, T-2, P-0, C-4**

**Objective:** The main objective of this course is to get familiar with basic biology.

### Course Contents

**Unit-I**

General survey of Animal Kingdom. Structure and life history of parasites as illustrated by amoeba, entamoeba, trypanosome, plasmodium, taenia, ascaris, schistosoma, oxyuris and ancyclostoma. **(8 Hours)**

**Unit-II**

General structure and life history of insects like mosquito, house fly, mites and silk worm. **(8 Hours)**

**Unit-III**

Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed, modification of stems and roots. **(8 Hours)**

**Unit-IV**

Plant cell: Its structure and non living inclusions, mitosis and meiosis, different types of plant tissues and their functions. **(8 Hours)**

**Unit-V**

Classification of Plant Kingdom. **(8 Hours)**

**Recommended Books**


1. Dutta A.C., *Botany for Degree Students*, Oxford.
2. Marshall & Williams, *Text Book of Zoology*, CBS Publishers & Distributors, Delhi.
3. Fahn, *Plant Anatomy*, Aditya Books Private Limited, New Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester I
## PHARMACEUTICAL ANALYSIS – I

**Course Code**: **BPH101** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with titration fundamentals, volumetric analysis and different titrimetry methods.

### Course Contents

**Unit-1**

Significance of quantitative analysis in quality control different techniques of analysis, preliminaries and definitions, precision and accuracy. **(6 Hours)**

**Unit-II**

Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards. **(6 Hours)**

**Unit-III**

**Acid Base Titrations:**

Acid base concepts, role of solvent, relative strengths of acids and bases, ionization, law of mass action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Henderson-Hasselbach equation, buffer solution, neutralization curves, acid base indicators, theory of indicators, choice of indicators, mixed indicators, polyprotic system. **(10 Hours)**

**Unit-IV**

**Oxidation reduction Titrations:**

Concepts of oxidation and reduction, redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators, oxidation reduction curves, iodimetry and iodometry, titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate. **(10 Hours)**

**Unit-V**

**Precipitation Titrations:**

Precipitation reactions, solubility products, effect of acids, temperature and solvent upon the solubility of precipitate. Argentometric titrations and titrations involving ammonium or potassium thiocyanate, mercuric nitrate indicators, Gay-Lussac method, Mohr's method, Volhard's method and Fajan's method. **(8 Hours)**

**Recommended Books**


1. Conners K.A., *A Text book of Pharmaceutical Analysis*, Wiley Inter-science.
2. Beckett A.H. & Stenlake J.B., *Practical Pharmaceutical Chemistry*, Vol. I&II. The Atherden Press of the University of London.
3. Alexeyev V., *Quantitative Analysis*, CBS Publishers & Distributors.
4. Vogel's, *Text Book of Quantitative Chemical Analysis,* ELBS UK.
5. Varma R.M., *Analytical Chemistry*, CBS Publishers.
6. *Indian Pharmacopoeia*.


*** Latest editions of all the suggested books are recommended.**

# Semester I
# PHARMACEUTICAL INORGANIC CHEMISTRY

**Course Code**: **BPH102** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with Indian compendia, pharmaceutical aids, gastrointestinal agents, electrolytes and trace elements.

## Course Contents

**Unit-I**

**A.** Sources of impurities & their control, limit test for iron, arsenic, lead, heavy metals, chloride & sulphate.

**B.** An outline of methods of preparation, uses, sources of impurities, tests of purity and identification and special tests, if any, of the following classes of inorganic pharmaceuticals included in **Indian Pharmacopoeia. (1996)**

**Gases and Vapours:** Inhalants (oxygen), Anaesthetics (Nitrous oxide).

**Pharmaceutical aids and necessities**: water, purified water, Water for Injection, Sterile Water for Injection, pharmaceutical acceptable glass, acids and bases.

**Topical Agents:** Protectives (calamine, talc, kaolin), astringents (zinc oxide, zinc sulphate) and anti infectives (boric acid, hydrogen peroxide, povidone iodine, potassium permanganate).

**Dental Products:** Dentifrices- anti-caries agents (Sodium fluoride).

**(10 Hours)**

**Unit-II**

**Gastrointestinal Agents:** Acidifying agents (Dil. HCl), antacids (Aluminium hydroxide, calcium carbonate, magnesium hydroxide, light & heavy magnesium oxide, light & heavy magnesium carbonate), cathartics (Disodium hydrogen phosphate, magnesium sulphate), protective and adsorbents (activated charcoal, light kaolin, aluminium sulphate), **Miscellaneous Agents:** Expectorants (ammonium chloride, potassium iodide), antioxidants (sodium metabisulphite).

**(8 Hours)**

**Unit-III**

**Major Intra and extra- cellular electrolytes:** Physiological ions, Electrolytes used for replacement therapy, acid-base balance & combination therapy (calcium chloride, calcium gluconate, calcium lactate, sodium di-hydrogen phosphate, sodium acetate, sodium bi carbonate, sodium chloride, potassium chloride, magnesium chloride). Cationic and anionic components of inorganic drugs useful for systemic effects.

**(8 Hours)**

**Unit-IV**

**Essential and Trace Elements:** Transition elements and their compounds of pharmaceutical importance. Iron and haematinics (ferrous fumurate, ferrous sulphate, ferrous gluconate), mineral supplements (copper, zinc, chromium, manganese, sulphur, iodine).

**Co-ordination compounds and complexation**- study of such compounds used in therapy including poison antidotes (calcium folinate, sodium thiosulphate).

**(8 Hours)**

**Unit-V**

**Inorganic Radio-Pharmaceuticals:** Nuclear radio pharmaceuticals, nomenclature, methods of obtaining, standards and units of activity, measurement of activity, clinical application and dosage, hazards and precautions.

**(6 Hours)**

### Recommended Books


1. Block J.H., Roche E., Soine T. and Wilson C., *Inorganic, Medicinal & Pharmaceutical Chemistry*, Lea & Febigger.
2. Dischер C.A. et.al, *Modern Inorganic Pharmaceutical Chemistry*, Waveland press.
3. *Indian Pharmacopoeia*.
4. Atherden L.M., Bentley & Drivers, *Text Book of Pharmaceutical Chemistry*, Oxford University Press, London


*** Latest editions of all the suggested books are recommended**

## Semester I
## PHARMACEUTICS – I
## (GENERAL PHARMACY)

**Course Code**: **BPH103** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with history of pharmacy, pharmaceutical calculations, size reduction, mixing and extraction and galenicals.

### Course Contents

**Unit-I**

**History of Pharmacy:** Origin & development of pharmacy, scope of pharmacy, introduction to pharmacopoeias with special reference to I.P, B.P., U.S.P.

**Pharmaceutical Additives:** Colouring, flavouring & sweetening agents, co-solvents, preservatives, surfactants & their applications, antioxidants. **(8 Hours)**

**Unit-II**

**Size Reduction :** Definition, factors affecting size reduction, principles, laws & factors affecting energy requirements, different methods of size reduction, study of mills & disintegrator, various methods & equipments employed for size separation.

**(8 Hours)**

**Unit-III : Pharmaceutical calculations :** Posology, calculation of doses for infants, adults and elderly patients; Enlarging and reducing prescriptions, percentage solutions, allegation, alcohol dilution, proof spirit.

**(8 Hours)**

**Unit-IV**

**Extraction & Galenicals:** Extraction processes, study of infusion, decoction, digestion, percolation, maceration & their modifications. Factors affecting selection of extraction processes.

**(8 Hours)**

**Unit-V**

**Mixing:** Theory of mixing, solid-solid, solid-liquid & liquid-liquid mixing equipments.

**Introduction to Pharmaceutical Dosage Forms:** A brief theory of Solutions, mixtures, spirits, aromatic waters, glycerine, paints, syrups, elixirs, mouth washes, mucilages, lotions, liniments, pastes, inhalations and powders.

**(8 Hours)**

**Recommended Books**


1. *Pharmacopoeia of India*, The Controller of Publications, Delhi.
2. *British Pharmacopoeia*, Her Majesty's Stationary Office, University Press, Cambridge.
3. Carter S.J., Cooper & Gunn's *Tutorial Pharmacy*, CBS Publishers, Delhi.
4. Rawlins E.A., Bentley's *Text Book of Pharmaceutics*, ELBS Bailliere Tyndall.
5. Lachman L., Liberman H.A. & Kanig J.L., *Theory and Practice of Industrial Pharmacy*, Leaand Febiger.
6. Cooper and Gunn's *Dispensing for Pharmaceutical Students*, CBS Publishers, New Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester I
## HUMAN ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY-I

**Course Code**: **BPH104** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with human body, organization, Anatomy & physiology of human body.

### Course Contents

**Unit –I**

a. Introduction to human body & organisation of human body.
b. Functional & structural characteristics of a cell.
c. Detailed structure of cell membrane & physiology of transport process.
Structural & functional characteristics of tissues- epithelial, connective, muscular and nervous.

**(8 Hours)**

**Unit-II**

**Skeletal system:** Structure, composition & functions of skeleton. Classification of joints, types of movements of joints. **(8 Hours)**

**Unit-III**

Anatomy & physiology of skeletal & smooth muscle, neurotransmission, physiology of skeletal muscle contraction, energy metabolism, types of muscle contraction, muscle tone. **(8 Hours)**

**Unit-IV**

Haemopoietic system: Composition & function of blood & its elements, erythropoiesis, blood groups, blood coagulation. **(8 Hours)**

**Unit-V**

Concepts of health & disease: Disease causing agents & prevention of disease.

**(8 Hours)**

**Recommended Books**


1. Guyton AC., Hall JE., *Text book of Medical Physiology*, WB Saunders Company.
2. Chatterjee C.C., *Human Physiology*, Medical Allied Agency, Calcutta.
3. Chaurasia B.D., *Human Anatomy, Regional & Applied,* Part I, II & III, CBS Publishers & Distributors, New Delhi.
4. Ross & Wilson, *Anatomy & Physiology in Health & Illness*, Churchill Livingstone.
5. Tortora G.J., & Anagnodokos N.P., *Principles of Anatomy & Physiology*, Harper & Row Publishers, New Delhi.


***Latest editions of all the suggested books are recommended.**

# FOUNDATION ENGLISH - I

**Course code: BPH105**
(Common with EHM101/BED105/BAL101/AR107/BHM101/BFS106/BCA106/BBA106/ BCH106/ BFA103)

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Course Contents:**

**Unit I**

**Functional Grammar:** Patterns & Parts of speech Subject, Predicate, Noun, Pronoun, Adjective, Adverb, Verb, Verb phrases, Conjunction, Interjection. **(10 Hours)**

**Unit II**

**Vocabulary:** Word formation, Prefix, Suffix, Compound words, Conversion, Synonyms, Antonyms, Homophones and Homonyms, How to look up a dictionary. **(10 Hours)**

**Unit III**

**Communication:** Meaning & importance of communication, Barriers to effective communication, Channels of communication, Language as a tool of communication. **(10 Hours)**

**Unit IV**

**Requisites of Sentence writing:** Fragmented sentences, A good sentence, expletives, Garbled sentences, Rambling sentences, Loaded sentences, Parallel Comparison, Squinting construction, Loose & periodic sentences. **(10 Hours)**

**Text Books:**


1. Martin & Wren - *High School English Grammar & Composition,* S.Chand & Co. Delhi.
2. Lewis Norman - *Word Power made easy,* W.R.Goyal. Publication & Distributors Delhi.
3. Better Your English- A Workbook for 1st year Students- Macmillan India, New Delhi.


**Reference Books:**


1. Raman Meenakshi & Sharma Sangeeta, *Technical Communication-Principles & Practice* – O.U.P. New Delhi. 2007.
2. Mohan Krishna & Banerji Meera, *Developing Communication Skills* – Macmillan India Ltd. Delhi.
3. Rosen Blum M., *How to Build Better Vocabulary* – Bloomsbury Publication. London.


**NOTE:**

**This syllabus has been designed to improve the oral and written communication skills of students. The faculty members should put emphasis on practical (oral) activities for generating students' interest in language learning.**

*** Latest editions of all the suggested books are recommended.**

## Semester I
## PHARMACEUTICAL ANALYSIS-I (PRACTICAL)

**Course Code**: **BPH151** **L-0, T-0, P-4, C-2**

**Objective:** The basic aim of this course is to make students familiar with titration fundamentals, volumetric analysis and different titrimetry methods including understanding of typical analytical balances, weights, uses & its care.

**Course Contents**

**1.** Standardization of analytical weights and calibration of volumetric apparatus.

**2. Acid Base Titrations**: Preparation and Standardization of acids and bases, official assay procedures, e.g. boric acid etc.

**3. Oxidation Reduction Titrations:** Preparation & standardization of some redox titrates e.g. potassium permanganate, potassium dichromate, iodine, sodium thiosulphate etc. Some exercises related to determinations of oxidizing & reducing agents.

**4. Precipitation Titrations:** Preparation and standardization of titrates like silver nitrate and ammonium thiocyanate.

**Recommended Books**


1. Conners K.A., *A Text book of Pharmaceutical Analysis*, Wiley Inter-science.
2. Beckett A.H. & Stenlake J.B., *Practical Pharmaceutical Chemistry*, Vol. I&II. The Atherden Press of the University of London.
3. *Indian Pharmacopoeia*.
4. Alexeyev V., *Quantitative Analysis*, CBS Publishers & Distributors.
5. Vogel's, *Text book of quantitative chemical analysis* ELBS UK, 5th Edition
6. Varma R.M., *Analytical chemistry*, CBS Publishers.


*** Latest editions of all the suggested books are recommended.**

## Semester I
## PHARMACEUTICAL INORGANIC CHEMSITRY (PRACTICAL)

**Course Code: BPH152** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with Indian Compendia, Pharmaceutical Aids, Gastrointestinal Agents, Electrolytes and Trace Elements.

**Suggested List of Experiments**

1. To perform Limit Test of Chloride, Sulphate, Iron, Heavy metal and Arsenic in the given sample.
2. Salt analysis.
3. Preparation of Compounds.

**Recommended Books**


1. Block, J.H. Roche, E, Soine, T and Wilson, C., *Inorganic, Medicinal & Pharmaceutical Chemistry*, Lea & Febiger.
2. Discher, C.A., et.al *Modern Inorganic Pharmaceutical Chemistry*, Waveland Press.
3. Indian Pharmacopoeia.
4. Atherden L.M., Bentley & Drivers' *Text Book of Pharmaceutical Chemistry*, Oxford University Press, London.


*** Latest editions of all the suggested books are recommended.**

## Semester I
## PHARMACEUTICS-I
## (GENERAL PHARMACY) (PRACTICAL)

**Course Code**: **BPH153** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with general pharmacy formulations.

**Suggested List of Experiments**

**I** Preparation of following classes of Pharmaceutical dosage forms (involving the use of calculations in metrology) as official in IP, BP, and USP/NF.

**1.** Aromatic Waters
- Chloroform water BP.
- Camphor Water BP.

**2.** Solutions
- Lysol solution IP.

**3.** Syrups
- Simple syrup BP.
- Simple syrup USP/NF.

**4.** Elixirs
- Aromatic Elixirs USP/NF.

**5.** Spirits
- Aromatic Ammonia spirit BP

**6.** Powders
- ORS Powder IP.

**7.** Lotions
- Calamine lotion IP.

**8.** Liniments
- Methyl salicylate liniment BP.

**9.** Mucilage
- Starch Mucilage IP.

**10.** Glycerine
- Kaolin Poultice BP.

**11.** Tinctures & Extracts
- Decoction of Ispaghula.
- Compound benzoin tincture BP.
- Strong Ginger tincture BP.

**II** Effect of size of balls, number of balls and time on the efficiency of ball mill.

**III** Solid-Solid mixing.

**Recommended Books**


**1.** *Pharmacopoeia of India*, The Controller of Publications, Delhi.
**2.** *British Pharmacopoeia*, Her Majesty's Stationary Office, University Press, Cambridge.
**3.** Carter S.J., Cooper & Gunn's *Tutorial Pharmacy*, CBS Publishers, Delhi.
**4.** Rawlins E.A., Bentley's *Text Book of Pharmaceutics*, ELBS Bailliere Tyndall.
**5.** Lachman L., Liberman H.A. & Kanig J.L., *Theory and Practice of Industrial Pharmacy*, Le & Febiger.
**6.** Cooper and Gunn's *Dispensing for Pharmaceutical Students*, CBS Publishers, New Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester I
## HUMAN ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY-I (PRACTICAL)

**Course Code**: **BPH154** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with Microscopic study of different Tissues and Clinical Analysis.

**Course Contents:**

1. Study of Human Skeleton.
2. Microscopic study of different Tissues.
3. Estimation of haemoglobin in blood, Determination of bleeding time, clotting time, R.B.C. Count, Total leukocyte count, D.L.C. and E.S.R.
4. Recording of body temperature, pulse rate and blood pressure, basic understanding of Electrocardiogram – PQRST waves and their significance.

**Recommended Books**


1. Guyton AC, Hall J. E., *Text Book of Medical Physiology*, WB Saunders Company.
2. Chatterjee C.C., *Human Physiology*, Medical Allied Agency, Calcutta.
3. Chaurasia B.D., *Human Anatomy, Regional & Applied* Part I, II & III, CBS Publishers & Distributors, New Delhi.
4. Ross & Wilson, *Anatomy & Physiology in Health & Illness*, Churchill Livingstone.
5. Toratora G.J., & Anagnodokos N.P., *Principles of Anatomy & Physiology*, Harper & Row Publishers, New Delhi.


***Latest editions of all the suggested books are recommended.**

## Semester II
## PHARMACEUTICAL PHYSICAL CHEMISTRY

**Course Code**: **BPH201** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with physical chemistry.

### Course Contents

**Unit-I**

**Behaviour of Gases:** Kinetic theory of gases, deviation from ideal behaviour and explanation.

**The Liquid State:** Physical properties (Surface tension, Parachor, Viscosity, Rheochor, Refractive Index, Optical Rotation, Dipole Moment) and chemical constituents.

**Amorphous and Crystalline Solids:** geometry & symmetry of crystals, Millers indices, types of crystals, Physical properties of crystals, crystal diffraction.

**Solutions:** Ideal and Real Solutions, Solutions of gases in liquids, Colligative Properties.

**(8 Hours)**

**Unit-II**

**Thermodynamics:** Fundamentals, first, second, third and zero$^{th}$ law, Joule-Thompson's effect, absolute temperature scale.

**Thermo Chemistry :** Definition & conventions, heat of reaction, heat of formation, heat of solution, heat of neutralisation, heat of combustion, Hess law of constant summation, Bomb calorimeter, bond energies, Kirchoffs equation. **(8 Hours)**

**Unit-III**

**Adsorption**: Physical absorption, chemical adsorption, Frendlich and Gibbs adsorption isotherm, Langmuir theory of adsorption. **(6 Hours)**

**Unit-IV**

**Electro Chemistry:** Faraday's Laws of Electrolysis, Electrolytic conductance & its measurement, molar & equivalent conductivity, its variation with dilution. Kohlrausch law, Arrhenius theory, Degree of ionisation & Ostwald dilution law. Transport number & migration of ion, Hittorfs theoretical device, theory of strong electrolytes (Debye Huckle theory).

**(8 Hours)**

**Unit-V**

**Chemical Kinetics:** Zero, first and second order reaction, complex reactions, elementary idea of reaction kinetics, characteristics of homogenous and heterogeneous catalysis, acid base and enzyme catalysis.

**Phase Equilibria:** Phase, component, degree of freedom, phase rule. Cooling curves & Phase diagrams for one & two component system involving eutectics, congruent & incongruent melting point. Distribution law & application to solvent extraction. **(10 Hours)**

**Recommended Books**


1. Bahl B.S., Tuli G.D. & Bahl Arun, *Essential of Physical Chemistry*, S. Chand & Co.
2. Negi A.S. & Anand S.C., *Textbook of Physical Chemistry*, Wiley Eastern Ltd.
3. Glasstone S. & Lewis D., *Elements of Physical Chemistry*, Macmillan Education.


*** Latest editions of all the suggested books are recommended.**

## Semester II
## PHARMACEUTICAL ORGANIC CHEMISTRY– I

**Course Code**: **BPH202** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with stereochemistry, organic reactions, aromatic and aliphatic compounds.

### Course Contents

**Unit-I**

Structure and Properties: Atomic structure, atomic orbital, molecular orbital, hybridization, sigma, pi bond, covalent, electrovalent, and co-ordinate bond, inductive effect, resonance, classification & Nomenclature of organic compounds.

**(8 Hours)**

**Unit-II**

Isomerism (Definition & classification), geometrical isomerism (R, S, & EZ erythro & threo Nomenclature) Stereochemistry including optical activity, stereoisomerism, specification of configuration and conformational analysis, conformation of cyclohexane.

**(8 Hours)**

**Unit-III**

Introduction to organic reactions, Classification of SN1 and SN2 reactions, important methods of preparation, reactions with special reference to mechanism of the following classes of compounds: Alkanes, alkenes, alkynes & dienes, free radical substitution reaction, alkyl halides, Alcohols (Monohydric & Dihydric).

**(8 Hours)**

**Unit-IV**

Aromatic compounds, aromatic character, structure of benzene, resonance, orientation of aromatic substitution, arenes, amines (aliphatic & aromatic), phenols, aryl halides, O, P directing & activating & deactivating groups.

**(8 Hours)**

**Unit-V**

Aldehydes and ketones (aliphatic & aromatic), carboxylic acids & their derivatives, di & tricarboxylic acids, hydroxyl acids, Organometallic Compounds- Grignard reagent, organolithium compounds, their preparation and synthetic application.

**(8 Hours)**

**Recommended Books**


1. Vogel A.I, *Textbook of Practical Organic Chemistry*, ELBS/Longman.
2. Morrison, R.T & Boyd R.N, *Organic Chemistry*, Prentice Hall of India Pvt. Ltd, New Delhi.
3. Final, I.L, *Organic Chemistry*, Vol.I & II, ELBS/ Longman.
4. Hendrikson, *Organic Chemistry*.


*** Latest editions of all the suggested books are recommended.**

## Semester II
## HUMAN ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY - II

**Course Code**: **BPH203** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with Autonomic and Central Nervous System, sense organs, lymphatic system and family planning.

### Course Contents

**Unit-I**

**Autonomic Nervous System:** Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission of the Autonomic and Central Nervous System.

**Central Nervous System:** Functions of different parts of brain and spinal cord, reflex action, electroencephalogram, specialized functions of the brain. Cranial nerves and their functions.

**(8 Hours)**

**Unit-II**

**Sense Organs:** Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell), and skin (superficial receptors).

**(8 Hours)**

**Unit-III**

**Lymphatic System:** Composition, formation and circulation of lymph, lymph node and spleen.

**(8 Hours)**

**Unit-IV**

**Demography and Family Planning:** Medical termination of pregnancy.

**First Aid:** Emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods.

**(8 Hours)**

**Unit-V**

**Communicable Diseases:** Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelitis, helminthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy, syphilis, gonorrhoea, and AIDS.

**(8 Hours)**

**Recommended Books**


1. Ranade V.G., *Text Book of Practical Physiology*, Pune Vidyarthi Griha Prakashan, Pune.
2. Guyton A.C., Hall JE., *Text book of Medical Physiology*, WB Saunders Company.
3. Chaurasia B.D., *Human Anatomy*, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
4. Ross & Wilson, *Anatomy & Physiology in Health & Illness*, Churchill Livingstone.
5. Chatterjee C.C., *Human Physiology*, Medical Allied Agency, Calcutta.
6. Tortora G.J., & Anagnodokos N.P., *Principles of Anatomy & Physiology*, Harper & Rave Publishers, New Delhi.
7. Parmar N.S., *Health Education & Community Pharmacy,* CBS Publishers, Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester II
## COMPUTER FUNDAMENTALS & PROGRAMMING

**Course Code**: **BPH204** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with computers and programming Language.

### Course Contents

**Unit-I:**

Basic computer organization functionality computer codes computer classification Boolean algebra, primary storage, secondary storage devices, input-output devices, computer software, computer languages, operating system, business data processing concepts, data communication and networks and advances.

**(8 Hours)**

**Unit-II**

Planning the computer program, algorithm, flowcharts, and decision tables.

**(8 Hours)**

**Unit-III**

Writing simple programs in 'C', Numeric constants and variables. Arithmetic Expressions, Input & Output in 'C' Programs, conditional statements, implementing loops in programs, arrays, logical expressions, and control statements such as switch, break and continue functions, processing character strings, files in 'C'.

**(8 Hours)**

**Unit-IV**

MS Office (Word, Excel, PowerPoint), Basic Database concept and classification, operations performed on database, using MS-Access. Internet Features.

**(8 Hours)**

**Unit-V**

Computer applications in Pharmaceutical and clinical studies.

**(8 Hours)**

**Recommended Books**


1. Sinha, R.K., *Computer Fundamentals*, BPB Publications.
2. Raja Raman, V, *Computer Programming in 'C'*, PHI Publication.
3. Hunt N & Shelley J., *Computers and Common Sense,* PHI Publication.


*** Latest editions of all the suggested books are recommended.**

## Semester II
## ADVANCED MATHEMATICS

**Course Code**: **BPH205** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with differential equations and statistics.

### Course Contents

**Unit-I**

**Differential Equation:** Revision of integral calculus, definition & information of different equations, equations of first order & first degree.

**(8 Hours)**

**Unit-II**

Definition & Importance of Statistics, collection of data, primary & secondary data, Merits and Demerits of statistical measures, sample, sampling, probability, Non-probability Sampling.

**(8 Hours)**

**Unit-III**

Linear differential equation of order greater than one with constant coefficients, complimentary function and particular integral, simultaneous pharmaceuticals applications.

**(8 Hours)**

**Unit-IV**

**Biometrics :** Significant digits and rounding off numbers, data collection, random and non random sampling methods, sample size, data organization diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams measures of central tendency, coefficient of variation, confidence (fiducially) limits.

**(8 Hours)**

**Unit-V**

Probability and events, Bayes theorem, probability theorems, probability distributions, elements of binomial and Poisson distribution, normal distribution, curve and properties, kurtosis and skewness, method of least squares, statistical inference, application of statistical concepts in pharmaceutical sciences.

**(8 Hours)**

**Recommended Books**


1. Boltan's, *Pharmaceutical Statistics*, Practical and Clinical Application, Marcel Dekker, N.Y.
2. Gupta S.P., *Statistical Methods*, Sultan Chand and Co., New Delhi.
3. Greval B.S., *Higher Engineering Mathematics*, Khanna Publication, New Delhi.
4. Ayres Frank, *Theory & Problems of Differential Equations*, Mc Graw Hill Book Co., Singapore.
5. Narayan Shanti, *Integral Calculus*, Sultan Chand & Co.
6. Prasad Gorakh, *Text book on Differential Calculus*, Pothishala Pvt. Ltd., Allahabad.
7. Narayan Shanti, *Differential Calculus*, Shyamlal Charitable Trust, New Delhi.
8. Prasad Gorakh, *Text book on Integral Calculus*, Pothishala Pvt. Ltd., Allahabad.


*** Latest editions of all the suggested books are recommended.**

## Semester-II
## FOUNDATION ENGLISH - II

**Course code: BPH206**
(Common with EHM 201/BBA206/BCA206/BHM201/AR207/BCH206/BFA203)

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Unit I**
**Functional Grammar:** Articles, Preposition, Tenses: Functions, Synthesis, Transformation, Spotting errors and correction of sentences. **(10 Hours)**

**Unit II**
**Pre- Requisites of Technical written Communication**: One word substitution, Spelling rules, Words often confused & misused, Phrases. **(10 Hours)**

**Unit III**
**The Structure of sentences/ clauses**: Adverb clause, Adjective clause, Noun clause. Sentences: Simple, Double, Multiple and complex, Transformation of sentences: simple to complex & vice versa, simple to compound & vice-versa, Interrogative to assertive & to negative & vice-versa. **(10 Hours)**

**Unit IV**
**Technical Communication**: Nature, Origin and Development, Salient features, Scope & Significance, Forms of Technical Communication, Difference between Technical Communication & General writing, Objective Style vs. Literary Composition.
**(10 Hours)**

**Text-Books:**
1. Wren & Martin, *High School English Grammar & Composition* – S. Chand & Co. Delhi.
2. Raman Meenakshi & Sharma Sangeeta, *Technical Communication-Principles & Practice* – O.U.P. New Delhi. 2007.
3. Mitra Barum K., *Effective Technical Communication* – O.U.P. New Delhi. 2006.
4. Better Your English- A Workbook for 1st year Students- Macmillan India, New Delhi.

**Reference Books:**
1. Horn A.S., *Guide to Patterns & Usage in English* – O.U.P. New Delhi.

**NOTE:**
**This syllabus has been designed to improve the oral and written communication skills of students. The faculty members should put emphasis on practical (oral) activities for generating students' interest in language learning.**

*** Latest editions of all the suggested books are recommended.**

## Semester II
## PHARMACEUTICAL PHYSICAL CHEMISTRY (PRACTICAL)

**Course Code**: **BPH251** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with practical aspects of physical chemistry.

**Experiments:**

1. Determination of refractive index of given liquids.
2. Determination of rate constant of simple reaction.
3. Determination of surface tension.
4. Determination of partition co-efficient.
5. Determination of viscosity.
6. PH determination by different methods.
7. Determination of solubility.
8. Determination of specific rotation of sucrose at various concentrations and determine the intrinsic rotation.
9. Determination of cell constant, verify Ostwald dilution law and perform conductometric titration.

**Recommended Books**


**1.** Bahl B.S., Tuli G.D. & Bahl Arun, *Essential of Physical Chemistry*, S. Chand & Co.
**2.** Negi A.S. & Anand S.C., *Textbook of Physical Chemistry*, Wiley Eastern Ltd.
**3.** Glasstone S. & Lewis D., *Elements of Physical Chemistry*, Macmillan Education.


*** Latest editions of all the suggested books are recommended.**

## Semester II
## PHARMACEUTICAL ORGANIC CHEMISTRY-I (PRACTICAL)

**Course Code**: **BPH252** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with the techniques and methods for identification, purification and synthesis of compounds.

**Suggested list of Practicals**

1. Identification of elements and functional groups in given sample.
2. Purification of solvents like benzene, chloroform, acetone and preparation of absolute alcohol.
3. Synthesis of compounds involving benzoylation, acetylation, bromination, reduction, & oxidation.
4. Synthesis of following compounds picric acid, Aniline, Acetanilide, Aspirin, Hippuric acid, P-Bromo acetanilide, Iodoform, Oxalic acid.

**Recommended Books**


1. Vogel A.I, *Textbook of Practical Organic Chemistry*, ELBS/Longman.
2. Morrison, R.T & Boyd R.N, *Organic Chemistry*, Prentice Hall of India Pvt. Ltd, New Delhi.
3. Final, I.L, *Organic Chemistry*, Vol.I & II, ELBS/ Longman.
4. Hendrikson, *Organic Chemistry*.


*** Latest editions of all the suggested books are recommended.**

## Semester II
## COMPUTER FUNDAMENTALS & PROGRAMMING (PRACTICAL)

**Course Code**: **BPH253** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with computers and programming Language.

**Exercises based on the following are to be dealt:**

1. Computer operating system like DOS and Windows.
2. Simple Program in 'C' Language.
3. Introduction to MS-OFFICE (MS-Word, MS-Excel, Power Point).
4. Database development using MS access.

**Recommended Books**


**1.** Sinha R.K., *Computer Fundamentals*, BPB Publications.
**2.** Raman Raja, V, *Computer Programming in 'C'*, PHI Publication.
**3.** Hunt N and Shelley J., *Computers and Common Sense*, Prentice Hall of India.


*** Latest editions of all the suggested books are recommended.**

## Semester III
## PHARMACEUTICS – II (UNIT OPERATION – I)

**Course Code**: **BPH301** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with unit operations.

**Course Contents**

**Unit-I**

**Unit Operations-** Introduction, Fluid Flow: Types of flow, Reynolds's number, Viscosity, basic situations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure. **(8 Hours)**

**Unit-II**

**Water systems** – Purified Water, water for injection, Sterile water for injection, quality requirement and treatment of water. Cleaning of premises and standardisation of cleaning.

**Filtration and Centrifugation:** Theory of filtration, filter aids, filter media, industrial filters specially filter press, rotary filter. Factors affecting filtration, Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters. **(8 Hours)**

**Unit-III**

**Crystallization:** Characteristics of crystals, Solubility curves and calculation of yields. Material and heat balances around Swenson Walker Crystallizer. Super-saturation theory and its limitations, Nucleation mechanisms, crystal growth, Study of various types of Crystallizer, Tanks, agitated batch, Swenson Walker, Single vacuum, circulating magma and Krystal crystallizer, Caking of crystals and its prevention. **(8 Hours)**

**Unit – IV**

**Heating, Ventilation & AC Systems:** Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipment for dehumidification operations. Principles and applications of refrigeration and air conditioning. **(8 Hours)**

**Unit-V**

**Material of Construction:** General study of composition, Properties and applications of the materials of construction.

**Industrial Hazards and Safety Precautions:** Mechanical, Chemical, Electrical, fire and Dust hazards.

**(8 Hours)**

**Recommended Books**


1. Badger W.L. & Banchero J.T., *Introduction to Chemical Engineering,* Mc Graw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H., *Chemical Engineers Handbook*, Mc Graw Kogakusha Ltd.
3. McCabe W.L. & Smith J.C., *Unit Operation of Chemical Engineering,* Mc Graw Hill International Book Co., London.
4. Sambhamurthy, *Pharmaceutical Engineering*, New Age Publishers.
5. Gavhane, K.A., *Unit Operation-I*, Nirali Prakashan.


*** Latest editions of all the suggested books are recommended.**

## Semester III
## PHARMACEUTICAL JURISPRUDENCE & ETHICS

**Course Code**: **BPH302** **L-3, T-0, P-0, C-3**

**Objective:** The basic objective of this course is to get familiar with laws, rules and regulations related to the pharmaceutical industry and practices.

**Course Contents**

**Unit-1**

**Introduction** : Drugs & Pharmaceutical Industry – A brief review. Pharmaceutical Ethics. **(8 Hours)**

**Unit-II**

**An elaborated study of the following:** Pharmacy Act 1948, Drugs and Cosmetics Act 1940 and the amendments made in 1945. **(8 Hours)**

**Unit-III**

Medicinal & Toilet preparations (Excise duties Act 1955), Narcotic Drugs & Psychotropic Substances Act 1985 & Rules. Drugs Price Control Order 1995. **(8 Hours)**

**Unit-IV**

**A brief study of the following with special reference to the main provisions:** Poisons Act 1919, Drugs and Magic remedies (Objectionable Advertisements) Act 1954, Medical termination of Pregnancy Act 1970 & Rules 1975, Prevention of Cruelty to Animals Act 1961, States Shops & Establishments Act & Rules. **(8 Hours)**

**Unit-V**

A.I.C.T.E. Act 1987, Patents Act 1970, Weight and Measures Act, Package and Commodity Act, U.S Food and Federal D&C Act. **(8 Hours)**

**Note:** All the above Acts should cover the latest amendments.

**Recommended Books**


1. Jain N.K., *A Textbook of Forensic Pharmacy*, Vallabh Prakashan, N. Delhi.
2. Singh H., *History of Pharmacy in India*- Vol.-I, II & III, Vallabh Prakashan.
3. Mittal B.M., *Textbook of Forensic Pharmacy*, National Book Centre, Dr. Sundari Mohan Avenue, Calcutta.
4. *Relevant Acts & Rules,* Published by the Govt. of India.


*** Latest editions of all the suggested books are recommended.**

## Semester III
## PHARMACOGNOSY-I

**Course Code**: **BPH303** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with medicinal plants and their uses.

**Course Contents**

**Unit-I**

Definition history, scope & development of Pharmacognosy.

**Source of Drug:** Biological, marine, mineral and plant tissue cultures as source of drugs. Novel medicinal agents from marine sources.

**Classification of Drugs:** Alphabetical, Morphological, taxonomical, chemical & pharmacological.

**(8 Hours)**

**Unit-II**

**Plant Taxonomy :** Study of following families with special reference to medicinally important plants – Apocynacae, Solanacae, Rutaceae, Umbellifarae, Leguminasae, Rubiaceae, Liliaceae, Labiatae, Acanthaceae, Compositae, Papavereceae.

**(8 Hours)**

**Unit-III**

**Cultivation, Collection, Processing & Storage of Crude Drugs:**

A. Factors influencing cultivation of medicinal plants, Type of Soils & fertilizers of common use.

B. Pest Management & natural pest control agents.

C. Plant hormones and their applications.

D. Polyploidy, Mutation & hybridization with reference to medicinal plants.

E. Poly Houses/ Green Houses for cultivation.

**(8 Hours)**

**Unit-IV**

**Quality Control of Crude Drugs:** Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation including Quantitative microscopy. WHO guidelines for standardisation of medicinal plants.

**(8 Hours)**

**Unit-V**

**Systematic Pharmacognostic study of following:**

a) Carbohydrates & derived products: Agar, Guar gum, acacia, Honey, Isabgol, pectin, starch, sterculia & tragacanth.

b) Lipids – Beeswax, castor oil, Coca butter, Kokum butter, Hydnocarpus oil, Codliver oil, Sharkliver oil, Linseed oil, wool fat Rice-bran oil, Lard & Suet.

**(8 Hours)**

**Recommended Books**


1. Trease, G.E. & Evans, W.C., *Pharmacognosy*, Bailleire tindall East Bourne, U.K.
2. Wallis, T.E., *Text book of Pharmacognosy*, J.A. Churchill, Ltd.
3. Kokate, C.K., *Pharmacognosy*, Vallabh Prakashan, Delhi.
4. Schewer P.J., *Marine Natural Products*, Academic Press, London.


*** Latest editions of all the suggested books are recommended.**

## Semester III
## PHARMACEUTICAL ORGANIC CHEMISTRY – II

**Course Code**: **BPH304** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with chemistry of carbonyl, heterocyclic, carbohydrate, nucleic acid compounds.

**Course Contents**

**Unit-I**

α, β- Unsaturated carbonyl compounds, cycloaddition. Compounds containing active methylene group and their synthetic importance- Acetoacetic ester and malonic ester. Polynuclear hydrocarbons-Napthalene, anthracene and phenantherene. **(8 Hours)**

**Unit – II**

Heterocyclic Compound – Nomenclature, Chemistry, preparation, properties and pharmaceutical importance of pyrrole, furan, thiophen, pyridine, pyrimidine, imidazole, pyrazole, thiazole, benzimidazole, indole, phenothiazine.

**(8 Hours)**

**Unit-III**

Name reactions – Definition, reaction mechanism and synthetic application of Merwin –Pondorff, Verley reduction, Oppeneaur oxidation, Bechmann rearrangement, Mannich reaction, Diel's alder reaction, Michel, Reformatsky, Knoevanegal reaction, Benzoin condensation. Connizaro, witting, fries, sandmegr and bechmann.

**(8 Hours)**

**Unit-IV**

Classification, structure, reactions, structure elucidation, identification of Carbohydrates: Monosaccharide – Glucose and fructose, Disaccharides – Sucrose, lactose and maltose, Polysaccharides–Starch.

**(8 Hours)**

**Unit-V**

Classification, identification, general methods of preparation and reactions of amino acids and proteins. Structure of Nucleic Acids. Chemistry & identification of oils, fats and waxes.

**(8 Hours)**

**Recommended Books**


1. Mann P.G. & Saunders B.C., *Practical Organic Chemistry*, ELBS/ Longman, London.
2. Furniss B.S., Hannaford A.J., Smith P.W.G., and Tatehell A.R., *Vogel's Textbook of Practical Organic Chemistry*, The ELBS/ Longman, London.
3. Morrison, T.R. & Boyd, R.N., *Organic Chemistry*, Prentice Hall of India, Private Limited, New Delhi.
4. Finar, I.L., *Organic Chemistry* Vol. I & II, ELBS/Longman.
5. Jain, M.K. & Sharma S.C., *Organic Chemistry*, Shoban Lal Nagin Chand & Co., Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester III
## PHARMACEUTICS – III (COMMUNITY PHARMACY)

**Course Code**: **BPH305** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with community pharmacy and role of community pharmacist.

**Course Contents**

**Unit-I**

Definition, scope of community pharmacy, Roles and responsibilities of Community pharmacist, code of Ethics.

Community Pharmacy Management

1. Selection of site, Space layout, and design
2. Staff, Materials- coding, stocking
3. Legal requirements
4. Maintenance of various registers
5. Use of Computers.

**(8 Hours)**

**Unit-II**

Prescriptions- parts of prescription, legality & identification of medication related problems. Inventory control in community pharmacy. Definition, various methods of Inventory Control. ABC, VED, EOQ, Lead time, safety stock. **(8 Hours)**

**Unit-III**

Definition and Principles of Pharmaceutical care. Communication skills and Patient counselling need for good communication, Key communication skills. Strategies to overcome barriers Patient information leaflets- content, design, & layouts, advisory labels .Patient compliance Definition, Factors affecting compliance, role of pharmacist in improving the compliance. **(8 Hours)**

**Unit-IV**

Health screening services Definition, importance, methods for screening Blood pressure/ blood sugar/ lung function And Cholesterol testing. OTC Medication- Definition, OTC medication list & counselling. **(8 Hours)**

**Unit-V**

Health Education WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients. Role of Pharmacist in family planning, prevention of communicable diseases, nutrition. Pharmaco-epidemiology & Pharmaco-economics – the brief introduction to Rational drug therapy. **(8 Hours)**

**Recommended Books**


1. Carter S.J., Cooper and Gunn's *Dispensing for Pharmaceutical Students*, CBS Publishers, Delhi.
2. Ansel H.C., *Introduction to Pharmaceutical Dosage Forms*, K.M. Varghese & Co., Bombay.
3. Aulton M.E., *Pharmaceutics – The Science of Dosage Form Design*, ELBS/ Churchil Livingstone.
4. *Remington Pharmaceutical Sciences*, Mack Publishing Co., Pennsylvania.
5. *Indian Pharmacopoeia*, Govt of India Publication.
6. British *Pharmacopoeia*, Her Majesty's Stationary Office, Cambridge.


*** Latest editions of all the suggested books are recommended.**

## Semester III
## HUMAN ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY – III

**Course Code**: **BPH306** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with Anatomy, Physiology and Pathophysiology

**Course Contents**

**Unit I**

**Digestive system** –Parts of digestive system, their structure and functions. Various gastrointestinal secretions & their role.

**(8 Hours)**

**Unit II**

Pathology of disorders related to digestive system; Peptic Ulcer, Ulcerative colitis, Crohns disease, Zollinger- Ellison syndrome, Amoebiasis, typhoid, Hepatitis, Cirrhosis of liver, pancreatitis.

**(8 Hours)**

**Unit-III**

**Urinary System –** Anatomy & physiology of urinary system, physiology of urine formation, acid-base balance, Pathophysiology of renal feature, glomerulonephritis, Urinary tract infection.

**(8 Hours)**

**Unit-IV**

**Reproductive system**: Male & female reproductive system. Menstruation, Pathophysiology of sexually transmitted diseases, spermatogenesis, oogenesis, pregnancy.

**(8 Hours)**

**Unit V**

**Endocrine system –** Anatomy & Physiology of pituitary, thyroid, parathyroid, adrenal, pancreas, control of hormone secretion, pathophysiology of hypo & hyper secretion of endocrine glands & their disorders e.g. – Diabetes mellitus.

**(8 Hours)**

**Recommended Books**


1. Difore S.H., *Atlas of Normal Histology*, Lea & Febigger Philadelphia.
2. Chaurasia B.D., *Human Anatomy, Regional & Applied* Part I, II & III, CBS Publishers & Distributors, New Delhi.
3. Guyton A.C., Hall J.E., *Text book of Medical Physiology*, WB Saunders Company.
4. Chatterjee C.C., *Human Physiology*, Medical Allied Agency, Calcutta.
5. Ross & Wilson, *Anatomy & Physiology in Health & Illness*, Churchill Livingstone.
6. Tortora G.J., & Anagnodokos N.P., *Principles of Anatomy & Physiology*, Harper & Rave Publishers, New Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester II
## PHARMACEUTICS-II
## (UNIT OPERATIONS-I)
## (PRACTICAL)

**Course Code**: **BPH351** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with experimental aspects of unit operation techniques.

**Course Contents**

1. Measurement of rate of flow of fluids and pressure by: (a) Simple and differential manometers (b) Venturimeter (c) Orifice meter.
2. Determination of dry bulb and wet bulb temperatures and use of Psychometric charts.
3. Study of factors affecting rate of filtration: (a) Effect of different filter media Effect of viscosity of filtrate (c) Effect of pressure (d) Effect of thickness of cake (e) Effect of filter aids.
4. Study principle of centrifugation for :(a) Liquid –Liquid separation and stability of emulsions. Solid – liquid separation and stability of suspension.

**Recommended Books**


1. Badger W.L. and Banchero J.T., *Introduction to Chemical Engineering,* McGraw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H., *Chemical Engineers Handbook*, McGraw Kogakusha Ltd.
3. McCabe W.L. and Smith J.C., *Unit Operation of Chemical Engineering* McGraw Hill International Book Co., London.
4. Sambhamurthy, *Pharmaceutical Engineering*, New Age Publishers.
5. Gavhane, K.A., *Unit Operation-I*, Nirali Prakashan.


***Latest editions of all the suggested books are recommended.**

## Semester III
## PHARMACOGNOSY – I (PRACTICAL)

**Course Code**: **BPH352** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmacognosy practicals.

**List of Experiments:**

1. Study of Plants belonging to family Solanacae.
2. Study of Plants belonging to family Rutacae.
3. Study of Plants belonging to family Umbilliferae.
4. Microscopical measurements of starch grains (Wheat, Maize).
5. Microscopical measurements of starch grains (Rice, Potato).
6. Various types of calcium-oxalate crystals, their study and microscopical measurements (Rhubarb, Senna, Liquorice etc.).
7. Study of various types of phloem fibres.
8. Determination of stomatal number with the help of camera lucida along with the working of instrument.
9. Determination of stomatal index.
10. Chemical Tests of Agar, Acacia, Sterulia and Tragacanth.
11. a) Chemical tests of Pectin, Starch and Honey.
    b) Swelling factor of Isapaghula husk.
    c) Average weight of Ispaghula husk.
12. Physical characteristics of Caster oil, Cod-liver oil, Shark-liver oil and Linseed oil.

**PROJECT WORK**

Preparation of Herbarium Sheets.

**Recommended Books**


**1.** Trease, G.E. & Evans, W.C., *Pharmacognosy*, Bailleire tindall East Bourne, U.K.
**2.** Wallis, T.E., *Text book of Pharmacognosy*, J.A. Churchill, Ltd.
**3.** Kokate, C.K., *Pharmacognosy*, Vallabh Prakashan, Delhi.
**4.** Schewer P.J., *Marine Natural Products*, Academic Press, London.


*** Latest editions of all the suggested books are recommended.**

## Semester III
## PHARMACEUTICAL ORGANIC CHEMISTRY-II (PRACTICAL)

**Course Code**: **BPH353** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with chemistry of carbonyl, heterocyclic, carbohydrate, nucleic acid compounds.

**Course Contents**

1. Identification of organic compounds with derivatization.
2. Synthesis of Organic Compounds involving two steps.
3. Workshop on molecular modelling of some organic molecules.

**Recommended Books**


**1.** Mann P.G. & Saunders B.C., *Practical Organic Chemistry*, ELBS/ Longman, London.
**2.** Furniss B.S., Hannaford A.J., Smith P.W.G., and Tatehell A.R., *Vogel's Textbook of Practical Organic Chemistry*, The ELBS/ Longman, London.
**3.** Morrison, T.R. and Boyd, R.N., *Organic Chemistry*, Prentice Hall of India, Private Limited, New Delhi.
**4.** Finar, I.L., *Organic Chemistry* Vol. I & II, ELBS/Longman.
**5.** Jain, M.K. & Sharma S.C., *Organic Chemistry*, Shoban Lal Nagin Chand & Co., Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester III
## PHARMACEUTICS – III (COMMUNITY PHARMACY) (PRACTICAL)

**Course Code**: **BPH354** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with community pharmacy practicals

**Course Contents**

1. Categorization and storage of Pharmaceutical products bases on legal requirements of labelling and storage.
2. Project report on visit to the nearby Community for Counselling on the rational use of drugs and aspects of health care.
3. Prescription handling and identification of drug interactions, incompatibilities.
4. Blood glucose determination (Glucometer).
5. Blood pressure (BP apparatus).
6. Lung function test (Peak flow meter).
7. Interpretation of various pathological reports of blood and urine.
8. Study of Over The Counter (OTC) medications: List & available brands.

**Recommended Books**


**1.** Carter S.J., Cooper & Gunn's, *Dispensing for Pharmaceutical Students*, CBS Publishers, Delhi.
**2.** Ansel H.C., *Introduction to Pharmaceutical Dosage Forms*, K.M. Varghese & Co., Bombay.
**3.** Aulton M.E., *Pharmaceutics – The Science of Dosage Form Design*, ELBS/ Churchil Livingstone.
**4.** *Indian Pharmacopoeia,* Govt of India Publication.
**5.** *British Pharmacopoeia,* Her Majesty's Stationary Office, Cambridge.
**6.** *Remington Pharmaceutical Sciences*, Mack Publishing Co., Pennsylvania.


*** Latest editions of all the suggested books are recommended.**

## Semester IV
## PHARMACEUTICS – IV (UNIT OPERATION – II)
## (INCLUDING ENGINEERING DRAWING)

**Course Code**: **BPH401** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with Unit Operation and Engineering Drawing.

**Course Contents**

**Unit I**

**Stoichiometry :** Unit processes material and energy balances, molecular units, mole fraction, tie substance, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, , dimensionless formulae, dimensionless groups, different types of graphic representation.

**(8 Hours)**

**Unit II**

**Evaporation:** Basic concepts of phase equilibria, factor affecting evaporation, evaporators.

**Engg. Drawing:** Elementary knowledge of engineering drawing including alphabets/letter writing, scale, orthographics projections i.e. first and third angle projection methods and simple isometric views.

**(8 Hours)**

**Unit III**

**Distillation** : Raoult' s law, Phase Diagrams, volatility, simple steam and flash distillations, principles of rectifications, Mccabe thiele method for the calculations of number of theoretical plates, Azeotropic and extractive distillation.

**(8 Hours)**

**Unit –IV**

**Drying :** Moisture content and mechanism of drying, rate of drying and time of drying calculations, classification and type of dryers, dryers used in pharmaceutical industries – Tray dryer, Fluidised bed dryer, spray dryer and special drying methods.

**(8 Hours)**

**Unit-V**

**Automated Process Control Systems:** Process variables, temperature, pressure, flow level and vacuum and their measurements. Elements automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM).

**(8 Hours)**

**Recommended Books**


1. Badger W.L. & Banchero J.T., *Introduction to Chemical Engineering*, Mc Graw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H., *Chemical Engineers Handbook*, Mc Graw Kogakusha Ltd.
3. McCabe W.L. & Smith J.C., *Unit Operation of Chemical Engineering*, Mc Graw Hill International Book Co., London.
4. Gavhane, K.A. *Unit Operation-II*, Nirali Prakashan.
5. Sambhamurthi, *Pharmaceutical Engineering*, New Age Publishers.


*** Latest editions of all the suggested books are recommended.**

## Semester IV
## PHARMACEUTICAL MICROBIOLOGY

**Course Code**: **BPH402** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical microbiology.

**Course Contents**

**Unit-I**

- Introduction to the scope of microbiology.
- Structure of bacterial cell.
- Classification of microbes and their taxonomy: Bacteria and viruses.

**(8 Hours)**

**Unit-II**

- Identification of Microbes: Stains and types of staining techniques, electron microscopy.
- Nutrition, cultivation & isolation of bacteria & viruses.

**(8 Hours)**

**Unit-III**

- Control of microbes by physical and chemical methods. **Disinfection:** factors influencing disinfection, dynamics of disinfection, disinfectants and antiseptics and their evaluation. **Sterilization**: different methods and its validation. Equipments used for sterilization.

**(8 Hours)**

**Unit-IV**

- Sterility testing as per I.P.
- Preservative efficacy.
- Personal microbiology.

**(8 Hours)**

**Unit-V**

- Aseptic techniques and clean area classification.
- Microbial assays of antibiotics, vitamin B12.
- Environmental microbiology.

**(8 Hours)**

**Recommended Books**


1. Pelczar & Reid, *Microbiology*, Tata Mc Graw Hill, Delhi.
2. Prescott L.M., Harley J.P. & Klien D.A., *Microbiology*, McGraw Hill.
3. Davis, Dulbetco & Eisen, *Microbiology*.
4. Stanier R.Y., Ingraham, J.L., Wheelis M.L. & Painter P.R., *General Microbiology*, Mac millanPress Limited.
5. Hugo and Russell, *Pharmaceutical Microbiology*, Black Well Scientific Publication, Oxford.
6. Ananthanarayan R. & Paniker C.K.J., *Textbook of Microbiology*, Orient Longman.
7. Sykes, *Disinfection & Sterilization*.
8. Virella G., *Microbiology & Infectious Diseases*.


*** Latest editions of all the suggested books are recommended.**

## Semester IV
## PHARMACOGNOSY - II

**Course Code**: **BPH403** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmacognosy of resins, volatile oils, phytochemical screening, fibres and tannins.

**Course Contents**

**Unit-I**

**Resins:** Study of drugs containing Resins and Resin Combination like Podophyllum, Cannabis, Capsicum, Shellac, Asafoetida, Balsam of tolu, Balsam of Peru, Benzoin, Turmeric, Ginger.

**(8 Hours)**

**Unit-II**

**Volatile oils :** General methods of obtaining volatile oils from plants, Study of volatile oils from Mentha, Coriander, Cinnamon, Jatamansi, Cumin, Black pepper, Cassia, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Spearming, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamon, Valerian, Musk, Palmarosa, Sandalwood.

**(8 Hours)**

**Unit-III**

**Phytochemical Screening :** An introduction to active constituents of drugs : Their isolation, classification and properties with Qualitative chemical tests of the followings – Alkaloids, Saponins, Cardenolides and bufadienolides, flavanoids , cynogenetic glycosides.

**(8 Hours)**

**Unit-IV**

**Fibres:** Study of fibres used in pharmacy such as cotton, silk, wool, nylon, glasswool, polyester and asbestos.

**Pharmaceutical aids:** Study of Pharmaceutical aids like Talc, Diatomite, Kaolin, Bentonite, Fullers earth, Gelatin and Natural Colors.

**(8 Hours)**

**Unit-V**

**Tannins:** Study of tannins & tannin containing drugs.

Utilization of aromatic plants & desired products will special reference to Sandalwood oil, Mentha oil, Lemon grass oil, Vetiver oil, Geranium oil & Eucalyptus oil.

**(8 Hours)**

**Recommended Books**


1. Trease G.E., & Evans W.C., *Pharmacognosy*, Balliere Tindall East Bourne U.K.
2. Tyler V.E. et al, *Pharmacognosy*, Lea & febiger, Philadelphia.
3. Wallis, T.E., *Text Book of Pharmacognosy*, J&A Churchill Ltd, London.
4. Kokate C.K. et al, *Pharmacognosy*, Nirali Prakashan, Pune.


*** Latest editions of all the suggested books are recommended.**

## Semester IV
## PHARMACEUTICAL ANALYSIS - II

**Course Code**: **BPH404** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with techniques and methods for analysis of pharmaceutical substances.

**Course Contents**

**Unit-I**

Theoretical considerations and application in drug analysis and quality control by the following analytical techniques (assays included in the Indian Pharmacopoeia 1996).

- Non-Aqueous Titration.
- Complexometric Titration.

**(8 Hours)**

**Unit-II**

**Miscellaneous methods of analysis:**

Diazotization titrations, Kjeldahl method of Nitrogen estimation, Karl- Fischer titration. Radioassays. Alcohol estimation in galenicals.

**(8 Hours)**

**Unit-III**

**Electro Chemistry –** Introduction, Dielectric cell, electrode potential, Nernst equation, salt bridge, standard potential, reference and indicator electrodes, measuring the relative voltage of cell.

- Potentiometry: General principles, instrumentation and applications.
- Conductometry: General Principles, instrumentation and applications.

**(10 Hours)**

**Unit-IV**

Principle, instrumentation and pharmaceutical applications, Paper Chromatography, column chromatography, TLC.

**(8 Hours)**

**Unit-V**

Basic Principles, Instrumentation and Applications of GLC & HPLC.

**(6 Hours)**

**Recommended Books**


1. Beckett, A.H. & Stenlake J.B, *Practical Pharmaceutical Chemistry*, Vol, I and II, The Athlone Press of the University of London.
2. *Pharmacopoeia of India*, published by The Controller of Publications, Delhi.
3. *British Pharmacopoeia*, Her Majesty's Stationary Office, University Press, Cambridge.
4. Connors K.A., *A Textbook of Pharmaceutical Analysis*, Wiley Interscience, New York.


***Latest editions of all the suggested books are recommended.**

## Semester IV
## HUMAN ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY – IV

**Course Code**: **BPH405** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with anatomy physiology and patho physiology.

**Course Contents**

**Unit-I**

**Respiratory System:** Anatomy & function of respiratory structures, Mechanism of respiration, regulation of respiration, pathophysiology of Asthma, Pneumonia, Bronchitis, Emphysema, Tuberculosis.

**(8 Hours)**

**Unit-II**

**Cardiovascular System –** Functional Anatomy of heart, conducting system of heart, cardiac cycle, ECG (Electro cardiogram). Pathophysiology of hypertension, Angina, CHF, myocardial infarction, cardiac arrhythmias, Ischemic heart disease, Arteriosclerosis.

**(8 Hours)**

**Unit-III**

**Cell injury & Adaptation –** Courses of cell injury, pathogenesis & morphology of cell injury.

**Cellular Adaptation –** Atropy, hypertropy, aplasia, metaplasia, & dysplasia, intracellular accumulation & pathophysiology of Neoplasm.

**(8 Hours)**

**Unit IV**

Basic mechanisms involved in the process of inflammation and repair Alterations in vascular permeability and blood flow, migration of WBC's, mediators of inflammation.

**(8 Hours)**

**Unit V**

**Pathophysiology of Joints disorder –** Arthritis, gout, myasthenia gravis.

**Pathophysiology of** anaemia, AIDS, hypersensitivity, allergic conditions, psychosis, epilepsy, Parkinson & Alzheimer's diseases, pathophysiology of cataract, glaucoma etc.

**(8 Hours)**

**Recommended Books**


1. Robbins S.L., Kumar V., *Basic Pathology*, WB Saunders.
2. Chaurasia B.D., *Human Anatomy, Regional & Applied* Part I, II & III, CBS Publishers & Distributors, New Delhi.
3. Guyton A.C., Hall J.E., *Text book of Medical Physiology*, WB Saunders Company.
4. Chatterjee C.C., *Human Physiology*, Medical Allied Agency, Calcutta.
5. Ross & Wilson, *Anatomy & Physiology in Health & Illness*, Churchill Livingstone.
6. Tortora G.J., & Anagnodokos N.P., *Principles of Anatomy & Physiology*, Harper & Rave Publishers, New Delhi.
7. Dipiro J.L., *Pharmacotherapy – A Pathophysiological Approach*, Elsevier.


*** Latest editions of all the suggested books are recommended.**

## Semester-IV
## TECHNICAL COMMUNICATION

**Course code: BPH406**
(Common with EHM401/BBA406/BCA406/BHM401/BCH406/BFA403)

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Course Contents:**

**Unit I**

**Communication:** Objectives of Communication, Need for Communication, Types of communication, written & Verbal communication, Formal and informal communication (The grapevine), upward and downward communication. **(10 Hours)**

**Unit II**

**Business communication**: Importance of written business correspondence, General principles and essentials of good commercial correspondence, Different types of commercial correspondence & their drafting, Types of Business letters, Official letters, electronic communication process. **(10 Hours)**

**Unit III**

**Project, Thesis and Dissertation writing:** Project Report, Thesis & Dissertation writing Structure of Thesis writing. **(10 Hours)**

**Unit IV**

**Modern Technology and Communication**: Globalization of Business, Role of Information Technology, Tele- communication, Internet, Tele-conferencing and Video-conferencing. **(10 Hours)**

**Text Books:**


1. Mishra Sunita & Muraliksishra C., *Communication Skills for Engineers* – Pearson Education, New Delhi.
2. Raman Meenakshi & Sharma Sangeeta, *Technical Communication-Principles & Practice* – O.U.P. New Delhi. 2007.
3. Chabbra T N, Business Communication, Sun India Pub. New Delhi.


**Reference Books:**


1. Mohan Krishna & Banerji Meera, *Developing Communication Skills* – Macmillan India Ltd. Delhi.
2. Mitra Barum K., *Effective Technical Communication* – O.U.P. New Delhi. 2006.


**NOTE:**

**This syllabus has been designed to improve the oral and written communication skills of students. The faculty members should put emphasis on practical (oral) activities for generating students' interest in language learning.**

*** Latest editions of all the suggested books are recommended.**

## Semester IV
## PHARMACEUTICS-IV
## (UNIT OPERATIONS-II)
## (PRACTICAL)

**Course Code**: **BPH451** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with Unit Operation and Engineering drawing.

**Course Contents**

1. Determination of overall heat transfer coefficient.
2. Study of factors affecting rate of evaporation:-
   - Effect of surface area.
   - Effect of temperature.
3. Study of factors affecting rate of drying, Surface area, Temperature.
4. Determination of rate of drying, free moisture content and bound moisture content.
5. Experiments based on Steam distillation, Extractive distillation, Azeotropic distillation.
6. Elementary knowledge of engineering drawing including alphabets/letter writing, scale, orthographics projections i.e. first and third angle projection method and simple isometric views.

**Recommended Books**


**1.** Badger W.L. & Banchero J.T., *Introduction to Chemical Engineering*, McGraw Hill International Book Co., London.
**2.** Perry R.H. & Chilton C.H., *Chemical Engineers Handbook*, McGraw Kogakusha Ltd.
**3.** McCabe W.L. & Smith J.C., *Unit Operation of Chemical Engineering*, McGraw Hill International Book Co., London.
**4.** Gavhane, K.A. *Unit Operation-II*, Nirali Prakashan.
**5.** Sambhamurthi, *Pharmaceutical Engineering*, New Age Publishers.


*** Latest editions of all the suggested books are recommended.**

## Semester IV
## PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)

**Course Code**: **BPH452** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical microbiology.

**List of Suggested Practicals**

1. Preparation of various types of culture media.
2. Subculturing of common bacteria, fungi, yeast.
3. Isolation of bacteria.
4. Identification and staining of bacteria.
5. Microbial assay of antibiotics as per IP.
6. Study of sterilization methods & equipments as Dry heat & Moist heat.
7. Test for sterility of pharmaceutical products as per Indian Pharmacopeia (IP).

**Recommended Books**


1. Pelczar & Reid, *Microbiology*, Tata McGraw Hill, Delhi.
2. Prescott L.M., Harley J.P. & Klien D.A., *Microbiology*, Tata McGraw Hill.
3. Stanier R.Y., Ingraham, J.L., Wheelis M.L. & Painter P.R., *General Microbiology*, Macmillan Press Limited.
4. Hugo & Russell, *Pharmaceutical Microbiology*, Black Well Scientific Publication, Oxford.
5. Ananthanarayan R. & Paniker C.K.J., *Textbook of Microbiology*, Orient Longman.
6. Sykes, *Disinfection & Sterilization*.
7. Virella G., *Microbiology & Infectious Diseases*.


***Latest editions of all the suggested books are recommended.**

## Semester IV
## PHARMACOGNOSY - II (PRACTICAL)

**Course Code**: **BPH453** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmacognosy identification, morphology and microscopy of resins, volatile oils, phytochemical screening, fibres and tannins.

**List of Suggested Practicals**

**1.** Morphology of Mentha, Lemongrass, Nutmeg and chenopodium.
**2.** Morphology of Turmeric, Ginger, Cannabis, Eucalyptus.
**3.** Morphology and microscopy of Coriander and Cinnamon.
**4.** Morphology and microscopy of Dill and Caraway.
**5.** Morphology and microscopy of Cardamom and Fennel.
**6.** Morphology and microscopy of Clove and to study its transverse section.
**7.** Study of Cotton, Silk and Wool along with their chemical Tests.
**8.** Tests for identification of flavonoids.
**9.** Morphology and microscopy of Bentonite, Gelatin and natural colours (Saffron).
**10.** To perform the chemical tests of Balsam (Tolu and Peru) and Asafoetida.
**11.** Preparation of reagents for the chemical tests of Alkaloids and to perform the chemical tests on any Alkaloid containing drug.
**12.** Test for identification of Glycosides (Saponin and Anthraquinone).
**13.** Test for identification of Tannins & steroids.

**Recommended Books**


**1.** Trease G.E., & Evans W.C., *Pharmacognosy*, Balliere Tindall East Bourne U.K.
**2.** Tyler V.E. et al, *Pharmacognosy*, Lea & febiger, Philadelphia.
**3.** Wallis, T.E., *Text Book of Pharmacognosy*, J&A Churchill Ltd, London.
**4.** Kokate C.K. et al, *Pharmacognosy*, Nirali Prakashan, Pune.


***Latest editions of all the suggested books are recommended.**

## Semester IV
## PHARMACEUTICAL ANALYSIS – II (PRACTICAL)

**Course Code**: **BPH454** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with techniques and methods for analysis of pharmaceutical substances.

**Course Contents**

1. **Non-aqueous Titrations:** Preparation and standardization of perchloric acid and Estimation of some Pharmacopoeial products.
2. **Complexometric Titrations:** Preparation and standardization of EDTA solution some exercise related to Pharmacopoeial assays.
3. **Miscellaneous Determinations:** Exercise involving Diazotization, Kjeldahil, Karlfisher.
4. Determination of acid base dissociation constants and plotting of titration curves using pH meter.
5. Exercises involving conductometric titrations.
6. Exercises based on paper, column and thin- layer chromatography.
7. Estimation of some pharmacopoeial products using HPLC.

**Recommended Books**


1. Beckett, A.H. & Stenlake J.B, *Practical Phamaceutical Chemistry*, Vol, I and II, The Athlone Press of the University of London.
2. *Pharmacopoeia of India*, published by The Controller of Publications, Delhi.
3. *British Pharmacopoeia*, Her Majesty's Stationary Office, University Press, Cambridge.
4. Connors K.A., *A Textbook of Pharmaceutical Analysis*, Wiley Interscience, New York.


*** Latest editions of all the suggested books are recommended.**

## SEMESTER V
## PHARMACEUTICAL BIOCHEMISTRY

**Course Code**: **BPH501** **L-3, T-0, P-0, C-3**

**Objective:** The basic objective of this course is to get familiar with biochemistry.

**Course Contents**

**Unit-I**

**Enzymes: Nomenclature**, enzymes-kinetics and mechanism of action, mechanism of inhibition of enzymes and isoenzymes in chemical diagnosis. Assay and regulation (allostearic and feedback).

**Co-enzymes:** Vitamins as co-enzymes and their significance. Metals as co-enzymes and their significance.

**(8 Hours)**

**Unit-II**

**Carbohydrate metabolism:** Glycolysis, Gluconeogenesis and Glycogenolysis. Metabolism of galactose and galactosemia. Role of sugar nucleotides in biosynthesis and pentose phosphate pathway. The citric acid cycle, significance, reactions and energetics of the cycle.

**(8 Hours)**

**Unit-III**

**Lipid metabolism:** Oxidation of fatty acids-oxidation & energetics, Biosynthesis of ketone bodies and their utilization, Biosynthesis of saturated and unsaturated fatty acids, regulation of lipid metabolism, essential fatty acids.

**(8 Hours)**

**Unit-IV**

**Biological Oxidation:** The respiratory chains, its role in energy capture & control, Energetics of oxidative phosphorylation, mechanism of oxidative phosphorylation.

**(8 Hours)**

**Unit-V**

Biosynthesis of amino acids, catabolism of amino acids and conversion of amino acids to specialized products, biosynthesis of purine and pyrimidine, formation of deoxyribonucleotides.

Biosynthesis of RNA, DNA replication, Carcinogenesis & DNA repair mechanism, proteins types, functions biosynthesis, vitamin (types, biochemical function) co-enzyme, hormones (mechanism of action). **(8 Hours)**

**Recommended Books**


1. Stryer L., *Biochemistry*, WH, Freeman & Company, San Francisco.
2. Plummer. David J., *an Introduction to Practical Biochemistry*, Mc Graw Hill, New Delhi.
3. Singh S.P., *Practical Manual to Biochemistry*, CBS Publisher, New Delhi.
4. Harpers, *Review of Biochemistry*, Lange Medical Publication.
5. Conn E.E. & Stumph P.K., *Outline of Biochemistry*, John Willery & sons, New York.
6. Nelson D.L. & Cox M.M., *Lehninger Principles of Biochemistry*, Macmillan worth Publishers.


*** Latest editions of all the suggested books are recommended.**

## Semester V
## PHARMACEUTICS – V (PHARMACEUTICAL TECHNOLOGY-I)

**Course Code**: **BPH502** **L-3, T-0, P-0, C-3**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical technology.

**Course Contents**

**Unit-I**

**Preformulation studies:** Study of physical properties of drug and organoleptic properties and their effect on formulation, stability and bioavailability.

**(8 Hours)**

**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 & evaluation of clear liquids, suspensions and emulsions.

**(8 Hours)**

**Unit-III**

**Semisolid Dosage Forms :** Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection, General formulation of semisolids, clear gels & manufacturing procedure, evaluation and packaging.

**(8 Hours)**

**Unit-IV**

**Suppositories:** Ideal requirements, bases, manufacturing procedure, packaging and evaluation.

**Pharmaceutical Aerosols:** Definition, Propellants, general formulation, manufacturing and packaging methods, pharmaceutical applications.

**(8 Hours)**

**Unit-V**

**Cosmetology and cosmetic Preparations:** Structure of skin, formulation of cold cream, vanishing cream, cleansing cream, all purpose cream, protective cream, antiperspirants, deodorant, face powder. Hair structure, Shampoos, Conditioner, Shaving and after shaving products, Dentifrice & Mouthwash, Lipstick, Nail lacquer (preparations used on nails).

**(8 Hours)**

**Recommended Books**


1. *Remington's, Pharmaceutical Sciences*, Vol. I & Vol. – II, Mack Publishing Co., U.S.A.
2. Cooper J.W., & Gunn G., *Tutorial Pharmacy*, Petman Books Ltd., London.
3. Lachman L., Lieberman H.A., Kanig J.L., *Theory and Practice of Industrial Pharmacy*, Lea & Febigger, Philadelphia, U.S.A.
4. Ansel H.C., *Introduction to Pharmaceutical Dosage Forms*, Lea & Febigger, Philadelphia, U.S.A.
5. Thomssen E.G., *Modern Cosmetics*, Universal Publishing Corporation.
6. Mithal B.M. & Saha R.N., *A Handbook of Cosmetics*, Vallabh Prakashan.


*** Latest editions of all the suggested books are recommended.**

## Semester V
## PHARMACOLOGY – I

**Course Code**: **BPH503** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmacology.

**Course Contents**

**Unit-I**

**General Pharmacology:** Introduction to pharmacology, sources of drugs, dosage forms & routes of administration, mechanism of action, concept of receptors, combined effect of drugs, factors modifying drug action, tolerance & dependence, absorption, distribution.

**(8 Hours)**

**Unit-II**

Metabolism & excretion of drugs, principles of Clinical Pharmacokinetics. Adverse drug reactions & treatment of poisoning. ADME drug interactions, Bioassay of drugs & Biological standardization. Discovery & development of new drugs.

**(8 Hours)**

**Unit-III**

**Pharmacology of ANS:** Parasympathomimetic, Parasympatholytics, Sympathomimetics, adrenergic receptor & neuron blocking agents, ganglionic stimulants & blocking agents.

**(8 Hours)**

**Unit-IV**

**Pharmacology of CNS:** General Anaesthetics, Alcohols & disulfiram, Sedatives hypnotics, Anti-anxiety agents & centrally acting muscle relaxants. Psychopharmacological agents (antipsychotics), antidepressants. Antiepileptic drugs. Antiparkinsonism drugs, Narcotic Analgesics & antagonists., Drug Addiction & drug abuse.

**(8 Hours)**

**Unit-V**

**Drugs acting on PNS:** Neuromuscular blockers, Local anaesthetics. **(8 Hours)**

**Recommended Books**


1. Grover J.K., *Experiments in Pharmacy & Pharmacology*, CBS Publishers, New Delhi.
2. Rang M.P., Dale M.M., Riter J.M., *Pharmacology*, Churchill Livingstone.
3. Satoskar & Bhandarkar, *Pharmacology & Pharmacotheropeutics*., Popular Prakashan Pvt. Ltd. Bombay.
4. Barar F.S.K, *Text Book of Pharmacology*, Interpoint, New Delhi.
5. Goodman & Gilman, *The Pharmacological basis of Therapeutics*, Editors: J.G. Hardman, L.E. Limbird, P.B. Molinos, R.W. Ruddon and A.G. Gil, Pergamon press.
6. Katzung B.G., *Basic & Clinic Pharmacology*, Prentice Hall, International.
7. Laurence D.R., & Bennet P.N., *Clinical Pharmacology*, Churchill Livingstone.


*** Latest editions of all the suggested books are recommended.**

## Semester V

## PHARMACEUTICAL MEDICINAL CHEMISTRY-I

**Course Code**: **BPH504** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with medicinal compounds.

**Course Contents**

**Unit-I**

**Basic Principles of Medicinal Chemistry:** Physicochemical aspects (Optical, geometric and bioisosterism) of drug molecules and biological action. Drug-receptor interaction including transduction mechanism, concept of prodrug.

Mode of action, uses, structure activity relationship and synthetic of the following classes of drugs (synthetic procedures of individual mentioned drugs only).

**(8 Hours)**

**Unit-II**

**Drugs acting at Synaptic and neuro-effector junction sites:** Cholinergic, Anticholinergic & Anticholinesterases-Neostigmine, Physostigmine, Methacholine, Pilocarpine, Atropine. Adrenergic Drugs-Ephedrine, Isoproterenol, Amphetamine, Salbutamol, Terbutaline, Adrenaline.

**(8 Hours)**

**Unit-III**

**Drugs acting on the Central Nervous System**

| | | |
|---|---|---|
| General Anaesthetics | - | Thiopental, Ketamine, Methohexital. |
| Local Anaesthetics | - | Lignocaine, Benzocaine. |
| Hypnotics and Sedatives | - | Phenobarbitone, Pentobarbitone. |
| Opioid Analgesics | - | Pethidine, Methadone, Pentazocine. |

**(8 Hours)**

**Unit-IV**

| | | |
|---|---|---|
| Antitussives | - | Cramiphen, Dextromethorphen. |
| Anticonvulsants | - | Phenytoin, Carbamazepine, Ethosuximide, Valproic Acid. |
| Antiparkinsonism drugs | - | Carbidopa, Levodopa. |
| CNS Stimulants | - | Caffeine, Nikethamide. **(8 Hours)** |

**Unit-V**

**Psychopharmcological Agents**

| | | |
|---|---|---|
| Neuroleptiques | - | Meprobamate, Chlordiazepoxide, Diazepam. |
| Antidepressants | - | Imipramine, Amitryptyline |
| Antispasmodic & Antiulcer drugs | - | Dicyclomine, Ranitidine, Omeprazole. |
| Neuromuscular Blocking Agents | - | Gallamine Triethiodide, Mephenesin, Pancuronium. |

**(8 Hours)**

**Recommended Books**


1. Mann P.G. & Saunders B.C., *Practical Organic Chemistry*, ELBS/Longman, London.
2. Furniss B.A., Hannaford A.J., Smith P.W.G. and Tatehell A.R., Vogel's *Textbook of Practical Organic Chemistry*, The ELBS/ Longman, London.
3. *Pharmacopoeia of India*, Minsitry of Health, Govt. of India.
4. Wolff, Burger's *Medicinal Chemistry*, John Wiley & Sons, New York.
5. Nogrady T., *Medicinal Chemistry – A Biochemical Approach*, Oxford University Press, New York
6. Foye W.C., *Principles of Medicinal Chemistry*, Lea & Febiger, Philadelphia.
7. Singh Harkrishan and Kapoor V.K., *Organic Pharmaceutical Chemistry*, Vallabh Prakashan, Delhi.

**8.** Finar I.L., *Organic Chemistry*, Vol I & II, ELBS/ Longman, London.
**9.** *A Text book of Organic Medicinal Chemistry*, Wilson & Griswold.

***Latest editions of all the suggested books are recommended.**

## Semester V
## PHARMACEUTICS – VI
## (PHYSICAL PHARMACY)

**Course Code**: **BPH505** **L-3, T-0, P-0, C-3**
**Objective:** The basic objective of this course is to get familiar with physical pharmacy.

**Course Contents**
**Unit-I**
**Matter, properties of Matter:** States of matter change in the state of matter, latent heats and vapour pressure, sublimation critical point, Eutectic mixtures, gases, relative humidity, liquid complexes, liquid crystals, glassy state, solids-crystalline, amorphous and polymorphism.
**Kinetics and Drug Stability :** General considerations & concepts, Degradative path ways, half life determination, Influence of temperature, light, solvent, catalytic species and other factors, Accelerated stability study, expiration dating. ICH guidelines for stability.
**Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

**(8 Hours)**

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

**(8 Hours)**

**Unit-III**
**Surface and Interfacial Phenomenon :** Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, active agents, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid- gas and solid-liquid interfaces, complex films, electrical properties of interface.

**(8 Hours)**

**Unit-IV**
**Viscosity and Rheology:** Newtonian systems, Law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotrophy, thixotropy in formulation, determination of viscosity, capillary, falling ball, rotational viscometers.
**Complexation:** Classification of complexes, methods of preparation and analysis, applications.

**(8 Hours)**

**Unit V**
**Dispersion Systems :** Colloidal Dispersions : Definition, types, properties of colloids, protective colloids, application of colloids in pharmacy; Suspensions and Emulsions; Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations; Emulsions-types, theories, physical stability.

**(8 Hours)**

**Recommended Books**

**1.** Martin A., Bustamante P. & Chun A.H.C., *Physical Pharmacy*, Lea & Febiger, Philadelphia.
**2.** Shotten E. & Ridgaway K., *Physical Pharmaceutics*, Oxford University Press, London.

***Latest editions of all the suggested books are recommended.**

## Semester-V
## TECHNICAL WRITING

**Course code: BPH506**
(Common with EHM 501/ /BHM501)

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Course Contents:**

**Unit I**

**Forms of Technical Communication:** Report writing, Definition and characteristics, Steps towards report writing, Structure, style of Report writing, Types & forms of Reports, Presentation of Reports, Importance of Report writing. **(10 Hours)**

**Unit II**

**Technical Paper writing:** Definition and purpose, Essentials of a good technical paper/Article, Scientific Article writing, Difference between Technical paper/Article and scientific article, Methods of writing technical paper & Scientific article. **(10 Hours)**

**Unit III**

**Technical Proposal:** Definition and meaning of Technical Proposal, Significance of Proposal, Characteristics of a good Proposal, Format of Proposal, Uses of Proposals. **(10 Hours)**

**Unit IV**

**Writing Skills**: Reporting events, Writing newspaper reports, Essentials of essay writing –writing an essay of about 300 words on a given topic. Bio-Data Making, Writing of CV & Resumes, Difference between CV and Resume, Writing Job application etc. **(10 Hours)**

**Text Books:**

1. Raman Meenakshi & Sharma Sangeeta, *Technical Communication-Principles & Practice* – O.U.P. New Delhi. 2007.

**Reference Books:**

1. Monippally Matthukutty M., *Business Communication Strategies* – Tata- Mc Graw Hill Publications Company, New Delhi.
2. Mohan K. & Sharma R.C., *Business Correspondence of Report Writing* –TMH, New Delhi.

**NOTE:**

**This syllabus has been designed to improve the oral and written communication skills of students. The faculty members should put emphasis on practical (oral) activities for generating students' interest in language learning.**

*** Latest editions of all the suggested books are recommended.**

## Semester V
## PHARMACEUTICAL BIOCHEMISTRY (PRACTICAL)

**Course Code**: **BPH551** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with biochemistry practicals.

**List of Suggested Practicals**

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH.
2. Titration curve for amino acids.
3. Separation of amino acids by chromatography.
4. The separation of lipids by TLC.
5. Quantitative estimation of amino acids.
6. The determination of glucose by means of the enzyme glucose oxidase.
7. Enzymatic hydrolysis of glycogen by α & β amylase.
8. Qualitative analysis of inorganic as well as organic constituents of Urine.
9. Estimation of cholesterol in Blood.
10. Estimation of Glucose in blood & urine.
11. Estimation of Urea in blood.
12. Estimation of ketone bodies in blood.

**Recommended Books**


1. Stryer L., *Biochemistry*, WH, Freeman & Company, San Francisco.
2. Plummer, David J., *An Introduction to Practical Biochemistry*, Tata Mc Graw Hill, New Delhi.
3. Singh S.P., *Practical Manual to Biochemistry*, CBS Publisher, New Delhi.
4. Harpers, *Review of Biochemistry*, Lange Medical Publication.
5. Conn E.E. & Stumph P.K., *Outline of Biochemistry*, John Willery & Sons, New York.
6. Nelson D.L. & Cox M.M., *Lehninger Principles of Biochemistry*, Macmillan Worth Publishers.


*** Latest editions of all the suggested books are recommended.**

## Semester V
## PHARMACEUTICS-V
## (PHARMACEUTICAL TECHNOLOGY-I PRACTICAL)

**Course Code**: **BPH552** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical technology practicals.

**Preparation, Evaluation, and packing of:**

1. **Liquid Orals**
   - Solutions: Strong Sodium salicylate oral solution British Pharmacopeia (BP), Chloral hydrate BP.
   - Suspensions: Magnesium sulphate oral suspension BP, Milk of magnesia IP, hydroxide gel IP
   - Emulsions: Liquid paraffin oral emulsion BP.
2. **Semi Solid**
   - Ointments: Salicylic acid ointment BP, Whitfield ointment BP, Compound benzoic acid ointment.
3. **Suppositories**
   - Suppositories: Glycerin suppositories BP, Lactic acid suppositories BP.

**Preparation of cosmetic preparations (30 preparation = 10 labs)**

Cold cream, Cream shampoo, Vanishing cream, Cleansing cream, Shaving cream, Brushless shaving cream, Protective cream, After shave lotion, Foundation lotion, Hair fixer gel, Sunscreen lotion, Tooth powder, Face powder, Tooth paste, Body powder, Mouth wash, Hand cream, Hair conditioner, Face pack, Anti dandruff shampoo, Deodorant, Antiperspirant, Bleach cream, Shampoo- powder, Hair setting lotion, Oily shampoo, Tooth gel.

**Recommended Books**


1. *Remington's, Pharmaceutical Sciences*, Vol. I & Vol. – II, Mack Publishing Co., U.S.A.
2. Cooper J.W., & Gunn G., *Tutorial Pharmacy*, Petman Books Ltd., London.
3. Lachman L., Lieberman H.A., Kanig J.L., *Theory and Practice of Industrial Pharmacy*, Lea & Febiger, Philadelphia, U.S.A.
4. Ansel H.C., *Introduction to Pharmaceutical Dosage Forms*, Lea & Febiger, Philadelphia, U.S.A.
5. Harrys, Cosmetology
6. Thomssen E.G., *Modern Cosmetics*, Universal Publishing Corporation.
7. Mittal B.M. & Saha R.N., *A Handbook of Cosmetics*, Vallabh Prakashan.


*** Latest editions of all the suggested books are recommended.**

## Semester V
## PHARMACOLOGY- I
## (PRACTICAL)

**Course Code**: **BPH553** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmacology practicals.

**Course Contents**

1. Use of computer simulated CDs or Video cassettes for pharmacology practical whenever possible.
2. Study of different routes of administration of drugs in mice/rats.
3. To study the effect of hepatic microsomal enzyme inhibitors and induction on the pentobarbitone sleeping time in mice.
4. Recording of spontaneous motor activity, stereotype, analgesia, anticonvulsant activity, anti-inflammatory activity, and muscle relaxant activity of drugs using simple experiments.

**Recommended Books**


**1.** Grover J.K., *Experiments in Pharmacy & Pharmacology*, CBS Publishers, New Delhi.
**2.** Rang M.P., Dale M.M., Riter J.M., *Pharmacology*, Churchill Livingstone.
**3.** Satoskar & Bhandarkar, *Pharmacology & Pharmacotheropeutics*., Popular Prakashan Pvt. Ltd. Bombay.
**4.** Barar F.S.K, *Text Book of Pharmacology*, Interpoint, New Delhi.
**5.** Goodman & Gilman, *The Pharmacological basis of Therapeutics*, Editors: J.G. Hardman, L.E. Limbird, P.B. Molinos, R.W. Ruddon and A.G. Gil, Pergamon press.
**6.** Katzung B.G., *Basic & Clinic Pharmacology*, Prentice Hall, International.
**7.** Laurence D.R., & Bennet P.N., *Clinical Pharmacology*, Churchill Livingstone.


*** Latest editions of all the suggested books are recommended.**

## Semester V
## PHARMACEUTICAL MEDICINAL CHEMISTRY-I (PRACTICAL)

**Course Code**: **BPH554** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with synthesis of medicinal compounds.

**List of Suggested Practicals**

1. Synthesis of Methyl salicylate.
2. To establish pharmacopoeial standards of Methyl salicylate.
3. Synthesis of Paracetamol.
4. To establish pharmacopoeial standards of Paracetamol.
5. To synthesize Benzocaine.
6. To establish pharmacopoeial standards of Benzocaine.
7. Synthesis of Phenytoin.
8. To establish pharmacopoeial standards of Phenytoin.
9. Synthesis of Hydantoin.
10. To establish pharmacopoeial standards of Hydantoin.
11. Synthesis of Barbituric acid.
12. To establish pharmacopoeial standards of Barbituric acid.

**Recommended Books**


**1.** Mann P.G. & Saunders B.C., *Practical Organic Chemistry*, ELBS/Longman, London.
**2.** Furniss B.A., Hannaford A.J., Smith P.W.G. and Tatehell A.R., *Vogel's Textbook of Practical Organic Chemistry*, The ELBS/ Longman, London.
**3.** *Pharmacopoeia of India*, Ministry of Health, Govt. of India.
**4.** Wolff, Burger's *Medicinal Chemistry*, John Wiley & Sons, New York.
**5.** Nogrady T., *Medicinal Chemistry – A Biochemical Approach*, Oxford University Press, New York, Oxford.
**6.** Foye W.C., *Principles of Medicinal Chemistry*, Lea & Febiger, Philadelphia.
**7.** Singh Harkrishan & Kapoor V.K., *Organic Pharmaceutical Chemistry*, Vallabh Prakashan, Delhi.
**8.** Finar I.L., *Organic Chemistry*, Vol I & II, ELBS/ Longman, London.
**9.** *A Text book of Organic Medicinal Chemistry*, Wilson & Griswold.


***Latest editions of all the suggested books are recommended.**

## Semester V
## PHARMACEUTICS – VI
## (PHYSICAL PHARMACY PRACTICAL)

**Course Code**: **BPH555** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with physical pharmacy practical.

**List of Suggested Practical**

1. Determination of particle size, Particle size distribution and surface area using various methods of particle size analysis.
2. Determination of derived properties of powders like density, porosity, compressibility, angle of repose etc.
3. Determination of surface/ interfacial tension, HLB value and critical micellar concentration of surfactants.
4. Study of rheological properties of various types of systems using different Viscometers.
5. Studies of different types of complexes and determination of their stability constants.
6. Preparation of various types of suspensions and determination of their sedimentation parameters.
7. Preparation and stability studies of emulsions.
8. Accelerated stability testing, shelf-life determination and expiration dating of pharmaceuticals.
9. Experiments involving tonicity adjustments.

**Recommended Books**


1. Martin A., Bustamante P. & Chun A.H.C., *Physical Pharmacy*, Lea & Febiger, Philadelphia.
2. Shotten E. & Ridgaway K., *Physical Pharmaceutics*, Oxford University Press, London.


***Latest editions of all the suggested books are recommended.**

## Semester VI
## PHARMACEUTICAL MEDICINAL CHEMISTRY II

**Course Code**: **BPH601** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with medicinal chemistry.

**Course Contents**

**Unit - I**

**Principles of Drug Design:** Traditional analogs. Introduction to QSAR and mechanism based approaches, Computer –aided drug design and molecular modelling.

Mode of action, uses, structure activity relationship of the following classes of drugs (synthetic procedures of individually mentioned drug only).

**(8 Hours)**

**Unit- II**

**Cardiovascular Agents:** Antianginal & vasodilators, antiarrhythmics, antihypertensives, anticoagulants, antihyperlipidemics & cardiotonics – Nifedipine, Procainamide, Propranolol, Methyldopa, Captopril, Clofibrate, Warfarin, Phenidione.

**(8 Hours)**

**Unit-III**

**Autocoids**

**Antihistaminics:**

- H1 antagonists – Diphenhydramine, Promethazine, Cyproheptadine, Cetrizine.
- H2 antagonists – Ranitidine, Famotidine.

**Antineoplastics:** Chlorambucil, 5- Fluorouracil, Methotrexate.

**(8 Hours)**

**Unit-IV**

**Analgesics and Antipyretics:** Aspirin, Mefeanamic Acid, Ibuprofen, Diclofenac.

**Antibacterials:** Sulphamethoxazole, Sulphadiazine, Sulphacetamide, Nalidixic acid.

**(8 Hours)**

**Unit-V**

**Diuretics:** Acetazolamide, Chlorthiazide; Frusemide, Spironolactone.

**Diagnostic Aids:** Iopanoic Acid. **(8 Hours)**

**Recommended Books**


1. Mann P.G. & Saunders B.C., *Practical Organic Chemistry*, ELBS/Longman, London.
2. Furniss B.A., Hannaford A.J., Smith P.W.G. and Tatehell A.R., *Vogel's Textbook of Practical Organic Chemistry*, The ELBS/ Longman, London.
3. *Pharmacopoeia of India*, Minsitry of Health, Govt. of India.
4. Wolff ME. Ed. Burger's *Medicinal Chemistry*, John Wiley & Sons, New York.
5. Nogrady T., *Medicinal Chemistry – A Biochemical Approach*, Oxford University Press, New York, Oxford.
6. Foye W.C., *Principles of Medicinal Chemistry*, Lea & Febiger, Philadelphia.
7. Singh H. and Kapoor V.K., *Organic Pharmaceutical Chemistry*, Vallabh Prakashan, Delhi.
8. Finar I.L., *Organic Chemistry*, Vol I & II, ELBS/ Longman, London.


*** Latest editions of all the suggested books are recommended.**

## Semester VI
## PHARMACEUTICS – VII
## (PHARMACEUTICAL TECHNOLOGY – II)

**Course Code**: **BPH602** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical technology, formulation technique of different dosage forms and their evaluation.

**Course Contents**

**Unit-I**

**Capsules:** Advantages and disadvantages of capsule dosage form, material for production of hard gelatine capsule, size of capsules, methods of capsule filling, soft gelatine capsule shell and capsule content, importance of base absorption and minimum/gm factors in soft capsule, quality control, stability testing and storage of capsule dosage forms.

**Micro-encapsulation:** Types of microcapsule, importance of microencapsulation in pharmacy, microencapsulation by phase separation, co-acervation, multi orifice, spray drying, spray congealing, polymerisation, complex, formulation, emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules.

**(8 Hours)**

**Unit-II**

**Tablets:** Formulation of different types of tablets, granulation technology on large-scale by various techniques, physics of tablets making, different types of tablet compression machinery and the equipments employed, evaluation of tablets.

**Coating of Tablets:** Types of coating, film forming materials, formulation of coating solution, equipments for coating process, evaluation of coated tablet. Stability kinetics and quality assurance.

**(8 Hours)**

**Unit-III**

Approaches to Sustained and controlled release dosage forms. In-vitro methods of evaluation. Formulation and evaluation of Ophthalmic, Nasal and Ear products.

**(8 Hours)**

**Unit-IV**

**Parenteral Products:**

Preformulation factors, routes of administration, water for injection, pyrogenicity, nonaqueous vehicles. Formulation details, containers and enclosures and their selection.

Prefilling treatment, washing of containers and closures, preparation of solution and suspensions, filling and sealing of ampoules, vial, infusion fluids, lyophilization & preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products.

**(8 Hours)**

**Unit-V**

**Surgical Products:** Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc, bandages, adhesive type, protective cellulosic hemostasis, official dressings, absorbable and non absorbable sutures, ligatures and catguts.

**Packaging of Pharmaceutical Products:** Packaging component types, specifications and methods of evaluation, stability aspects of packaging equipments, factors influence choice of containers, legal and other official requirements for containers, package testing.

**(8 Hours)**

**Recommended Books**

1. *Remington: The Science and Practice of Pharmacy Pharmaceutical Sciences* Vol. I & III, Mack Publishing Company, U.S.A.

**2.** Avis R.E., *Pharmaceutical Dosage Forms: Parenteral Medication*, Vol-I, Marcel Dekker-Inc, New York & Basel.
**3.** Ansel H.C., *Introduction to Pharmaceutical Dosage Forms*, Lea & Febiger, Philadelphia, U.S.A.
**4.** Juliano R.C., *Drug Delivery Systems*, Oxford University Press, Oxford.
**5.** Herbert A. Liebermann & Leon Lachman, *Theory & Practice of Industrial Pharmacy*, Lea Febiger, Philadelphia, U.S.A.

*** Latest editions of all the suggested books are recommended.**

## Semester VI
## PHARMACOLOGY - II

**Course Code**: **BPH603** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmacology.

**Course Contents**

**Unit-I**

**Pharmacology of CVS:** Cardiac glycosides, Antihypertensive drugs, Antianginal drugs, Antiarrhythmics, Antihyperlipidemics, Therapy of Shock.

**(8 Hours)**

**Unit-II**

**Drug Acting on Hemopoeitic System**: Haematinics, Vit. K & anticoagulants, Fibrinolytics & antiplatelet drugs, Plasma Volume expanders.

**Drugs Acting on Respiratory System**: Anti-asthmatic drugs, Anti-tussives & Expectorants, Respiratory Stimulants.

**(8 Hours)**

**Unit-III**

**NSAIDS & Anti-gout Drugs, Diuretics**

**(8 Hours)**

**Unit-IV**

**Autocoids:** Histamine, 5HT and their antagonists, Prostaglandins, Thromboxans, Leukotrienes, Angiotensin and Bradykinin.

**(8 Hours)**

**Unit-V**

**Drugs acting on GIT**: Antacids and Antiulcer drugs, Laxatives and antidiarrhoeal Agents, Emetics and antiemetics.

**(8 Hours)**

**Recommended Books**


1. Rang M.P., Date M.M., Riter J.M., *Pharmacology*, Churchill Livingstone.
2. Katzung, B.G., *Basic & Clinical Pharmacology*, Prentice Hall, International.
3. Craig, C.R. & Stitzel R.R., *Modern Pharmacology*, Little Brown and Co., 1994.
4. Barar F.S.K., *Text Book of Pharmacology*, Interprint, New Delhi.
5. Goodman & Gilman, *The Pharmacological Basis of Therapeutics*, Editors:-J.G. Hardman, L.E. Limbird, P.B. Molinoss, R.W. Ruddon & A.G. Gil, Pergamon Press.
6. Satoskar & Bhandarkar, *Pharmacology & Pharmacotherapeutics*, Popular Prakashan Pvt. Ltd.,
7. Bombay.
8. Laurence D.R. & Bannet P.N., *Clinical Pharmacology*, Churchill Livingstone.
9. Tripathi K.D., *Essentials of Medical Pharmacology*, Jay Pee Publishers, New Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester VI
## PHARMACOGNOSY - III

**Course Code**: **BPH604** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmacognosy.

**Course Contents**

**Unit-I**

Study of the biological sources, cultivation, collection, Commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs containing.

**Glycosides:**

- **Saponins:** Liquorice, Ginseng, Dioscorea, Coleus species.
- **Cardioactive sterols**: Digitals, Squill, Stropanthus & Thevetia.
- **Anthraquinone Cathartics**: Aloe, Senna, Rhubarb & Cascara. **(8 Hours)**

**Unit-II**

**Others:** Psoralea, Ammi majus, Ammi visnaga, Gentian, Saffron, Chirata, Quassia and Andrographis paniculata. Utilization and production of Phytoconstituents such as sennsoides, Diosgenin, Solasodine & Podophyllotoxins.

**(8 Hours)**

**Unit- III**

**Studies of traditional drugs:** Common Vernacular name, Biological sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and toxicological activity of marketed formulations of following indigenous drugs: Amla, Kantkari, Satavari, Tylophora, Bhilwa, Kalijiri, Vach, Rasna.

**(8 Hours)**

**Unit-IV**

Punarnava, Chitrak, Apamarg, Gokhru, Shankhpushpi, Brahmi, Methi, Lehsun, Palash, Guggul, Gymnema, Shilajit, Tulsi, Nagarmotha, Majith, Malkanguni and Neem.

**(8 Hours)**

**Unit-V**

Brief Introduction and principals of Ayurvedic, Unani, Siddha and Homeopathic systems of medicines. Introduction to Herbal Pharmacopoeia with special reference to. Arishtas, Asavas, Gutikas, Tailas, Churnas, Lehyas and Bhasmas.

**(8 Hours)**

**Recommended Books**


1. Kokate C.K., Gokhale AS, Gokhale SB, *Cultivation of Medicinal Plants*, Nirali Prakashan.
2. Kokate C.K., et al, *Pharmacognosy*, Nirali Prakashan, Pune.
3. Trease G.E., & Evans W.C., Evans, W.C., *Pharmacognosy*, Bailliere Tindall east Baorne, U.K.
4. Tyler V.E. et al, *Pharmacognosy*, Lea & Febiger, Philadelphia.
5. Wallis. T.E., *Text Book of Pharmacognosy*, J&A Churchill Ltd. London.
6. Nadkarni A.K., *Indian Materia Medica* 1-2, Popular Prakashan (P) Ltd. Bombay.
7. *Medicinal Plants of India* I&II, Indian council of Medical Reasearch, New Delhi.
8. *Indian Herbal Pharmacopoeia*, Vol. I&II, ICMR & RRL, Jammu.


*** Latest editions of all the suggested books are recommended.**

## Semester VI
## ENVIRONMENT & ECOLOGY

**Course Code**: **BPH605** **L-3, T-0, P-0, C-3**

**Objective:** The basic objective of this course is to get familiar with Environment and Ecology.

**Course Contents**

**Unit-I**

**Environment studies** : Definition, scope & importance, natural resources–renewable & non renewable, use, utilization, exploitation and associated problems of forests, water resources, mineral resources, food resources, energy resources, land resources.

**(8 Hours)**

**Unit-II**

**Ecology & Ecosystem:** Introduction, elements of ecosystem, types of ecosystem, biotic interaction, food web, role of ecosystem & ecology in future. **(8 Hours)**

**Unit-III**

**Environmental Pollution**: Air, Water, Soil, Marine, Noise, Thermal, Nuclear- causes and control measures. **(8 Hours)**

**Unit IV**

**Contemporary Environmental Issues:** Population & environment, acid-rain, climate change & global warming, & sustainable development, urbanization and environmental pollution.

**(8 Hours)**

**Unit-V**

**Law related to Environmental Protection:** Air (Prevention and Control of Pollution) Act 1987, Water (Prevention & Control of Pollution) Act. 1974, Environnemental Protection Act, 1986 & other Legislative Measures including Civil Remédies.

**(8 Hours)**

**Books Recommended**


1. Manoharachary C., Reddy P. J., *Principles of Environmental Studies*, Pharma Book Syndicate, Hyderabad.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill Publishing Company Ltd.
3. Rajagopalan R, Environmental *Studies-From Crisis to Cure,* Oxford University Press.
4. Prakash S.M., *Environmental Studies*, Elite Publishers Mangalore.
5. *Relevant Acts & Rules* published by Govt. of India with latest amendments.


*** Latest editions of all the suggested books are recommended.**

## Semester-VI
## COMMUNICATION TECHNIQUE

**Course code: BPH606**
(Common with EHM601/BBA603/BCA604/BCH606/BHM601)

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Course Contents:**

**Unit I**
**Oral Communication:** Principles of effective oral communication, Features, Vitals of communication, Interpersonal communication, Persuasive communication. **(10 Hours)**

**Unit II**
**Presentation Strategies**: Purpose, Audience & Locale, Organizing contents, Preparing outlines. Audio- Visual aids, Body Language, Voice dynamics. **(10 Hours)**

**Unit III**
**Listening Skills:** The Listening process, Hearing & listening, Types of listening, Listening with a purpose, Barriers to listening, Telephonic conversation. **(10 Hours)**

**Unit IV**
**Speaking Skills:** Improving voice & speech, Art of public speaking, Using visual aids, Job interview being interviewed by the media, Dealing with the boss. Dealing with subordinates, How to run a meeting. **(10 Hours)**

**Text Book:**

1. Raman Meenakshi & Sharma Sangeeta, *Technical Communication-Principles & Practice* – O.U.P. New Delhi. 2007.


**Reference Books:**

1. Ruther Ford A., *Basic Communication Skills* – Pearson Education, New Delhi.
2. Mitra Barum K., *Effective Technical Communication* – O.U.P. New Delhi. 2006.


**NOTE:**
**This syllabus has been designed to improve the oral and written communication skills of students. The faculty members should put emphasis on practical (oral) activities for generating students' interest in language learning.**

*** Latest editions of all the suggested books are recommended.**

## Semester VI
## PHARMACEUTICAL INDUSTRIAL TRAINING

**Course Code**: **BPH651** **L-0, T-0, P-0, C-2**

**Objective:** The basic objective of this course is to make the students familiar with pharmaceutical manufacturing procedures and practices in a well established industry.

**Curriculum Details:**

1. The course will comprise of preparation of the training report for the industry wherein the training is imparted. The training will be done by the student after the V semester.
2. Students are required to have detailed knowledge of the technologies involved in each section of the formulation of dosage form or the quality control /quality assurance.
3. A report of the training in compiled form is to be submitted as per guidelines issued to the students by the supervisor/ teacher concerned.
4. A committee of senior faculties of the institute including supervisor(s) will finally evaluate the quality of the training and its relevance in the pharmaceutical field.

**Time allocation:** One month Pharmaceutical Industrial Training in production department of any pharmaceutical industry.

## Semester VI
## PHARMACEUTICAL MEDICINAL CHEMISTRY II (PRACTICAL)

**Course Code**: **BPH652** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with medicinal chemistry practical.

**Course Contents**

1. Synthesis of selected drugs from the course content involving two or more steps.
2. Establishing the Pharmacopoeial standards of the drugs synthesized.
3. Spectral analysis of the drugs synthesized.

**Recommended Books**


**1.** Mann P.G. & Saunders B.C., *Practical Organic Chemistry*, ELBS/Longman, London.
**2.** Furniss B.A., Hannaford A.J., Smith P.W.G. and Tatehell A.R., *Vogel's Textbook of Practical Organic Chemistry*, The ELBS/ Longman, London.
**3.** *Pharmacopoeia of India*, Minsitry of Health, Govt. of India.
**4.** Wolff ME. Ed. *Burger's Medicinal Chemistry*, John Wiley & Sons, New York.
**5.** Nogrady T., *Medicinal Chemistry – A Biochemical Approach*, Oxford University Press, New York, Oxford.
**6.** Foye W.C., *Principles of Medicinal Chemistry*, Lea & Febiger, Philadelphia.
**7.** Singh H. and Kapoor V.K., *Organic Pharmaceutical Chemistry*, Vallabh Prakashan, Delhi.
**8.** Finar I.L., *Organic Chemistry*, Vol I & II, ELBS/ Longman, London.


*** Latest editions of all the suggested books are recommended.**

## Semester VI
## PHARMACEUTICS-VII
## (PHARMACEUTICAL TECHNOLOGY - II) (PRACTICAL)

**Course Code**: **BPH653** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical technology, formulation of different dosage forms and their evaluation.

**Preparation, Evaluation, Packing of the following dosage forms:**

- Capsules: Chloramphenicol capsules IP.
- Microcapsules: Coacervation Phase separation (Temperature change).
- Tablets: Uncoated – Paracetamol tablets IP, Film coated – Ibuprofen tablets IP, Enteric coated – Aspirin tablets.
- Parenteral: Disodium EDTA injection IP (vials), Dextrose – NaCl IV infusion IP (Infusion boilers), Water for infection IP (Ampoule).
- e) Eye drops: Zinc sulphate IP, Eye ointment: Sulphacetamide Sodium IP.

**Formulation and evaluation of sustained release dosage forms – Aspirin Extended release**

**Evaluation of Packages – Containers & Closures.**

**Recommended Books**


1. *Remington: The Science and Practice of Pharmacy Pharmaceutical Sciences* Vol. I & III, Mack Publishing Company, U.S.A.
2. Avis R.E., *Pharmaceutical Dosage Forms: Parenteral Medication*, Vol-I, Marcel Dekker-Inc, New York & Basel.
3. Ansel H.C., *Introduction to Pharmaceutical Dosage Forms*, Lea & Febiger, Philadelphia, U.S.A.
4. Juliano R.C., *Drug Delivery Systems*, Oxford University Press, Oxford.
5. Herbert A. Liebermann & Leon Lachman, *Theory & Practice of Industrial Pharmacy*, Lea Febiger, Philadelphia, U.S.A.


*** Latest editions of all the suggested books are recommended.**

## Semester VI
## PHARMACOLOGY-II (PRACTICAL)

**Course Code**: **BPH 654** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmacology practicals.

**Course Contents**

1. To record the dose response curve of Acetylcholine using ileum of rat.
2. To study the parallel shift of dose response curve in presence of competitive antagonist on dose response curve of Ach using rat ileum.
3. To study effect of physostigmine on dose response curve of each on rat ileum.
4. To study the dose response curve of histamine on guinea pig on ileum preparation & study the effect of antihistaminics.

**Recommended Books**


**1.** Rang M.P., Date M.M., Riter J.M., *Pharmacology*, Churchill Livingstone.
**2.** Katzung, B.G., *Basic & Clinical Pharmacology*, Prentice Hall, International.
**3.** Craig, C.R. & Stitzel R.R., *Modern Pharmacology*, Little Brown and Co., 1994.
**4.** Barar F.S.K., *Text Book of Pharmacology*, Interprint, New Delhi.
**5.** Goodman & Gilman, *The Pharmacological basis of Therapeutics*, Editors:-J.G. Hardman, L.E. Limbird, P.B. Molinoss, R.W. Ruddon & A.G. Gil, Pergamon Press.
**6.** Satoskar & Bhandarkar, *Pharmacology & Pharmacotherapeutics*, Popular Prakashan Pvt. Ltd.,
**7.** Bombay.
**8.** Laurence D.R. & Bannet P.N., *Clinical Pharmacology*, Churchill Livingstone.
**9.** Tripathi K.D., *Essentials of Medical Pharmacology*, Jay Pee Publishers, New Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester VI
## PHARMACOGNOSY - III (PRACTICAL)

**Course Code**: **BPH655** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmacognosy.

**Course Contents**

1. Morphology and microscopy (powder) of Liquorice along with its chemical tests.
2. Morphology of Aloe and chemical tests on Aloe-extracts.
3. Morphology and microscopy (powder) of Rhubarb.
4. Morphology of Psoralia, Ammimaus, Saffron and Chirata.
5. Morphology of Amla, Kantkari, Shatavari and Vach.
6. Morphology of Punarnava, Apamarg, Gokhru, and Shankhpushpi.
7. Morphology of Brahmi, Methi, Lehsun and Palash.
8. Morphology of Nagarmotha and Neem.
9. To study the following standards
   - Loss on drying
   - Extractive values
   - Ash values.
10. To perform above studies (exp. 10) in any liquid Ayurvedic formulation.

**REPORT**
A report on marketed preparations based on traditional drugs mentioned in theory.

**Recommended Books**

**1.** Kokate C.K., Gokhale AS, Gokhale SB, *Cultivation of Medicinal Plants*, Nirali Prakashan.
**2.** Kokate C.K., et al, *Pharmacognosy*, Nirali Prakashan, Pune.
**3.** Trease G.E., & Evans W.C., Evans, W.C., *Pharmacognosy*, Bailliere Tindall east Baorne, U.K.
**4.** Tyler V.E. et al, *Pharmacognosy*, Lea & Febiger, Philadelphia.
**5.** Wallis. T.E., *Text Book of Pharmacognosy*, J&A Churchill Ltd. London.
**6.** Nadkarni A.K., *Indian Materia Medica* 1-2, Popular Prakashan (P) Ltd. Bombay.
**7.** *Medicinal Plants of India* I&II, Indian council of Medical Reasearch, New Delhi.
**8.** *Indian Herbal Pharmacopoeia*, Vol. I&II, ICMR & RRL, Jammu.


*** Latest editions of all the suggested books are recommended.**

## Semester VII
## PHARMACEUTICAL ANALYSIS - III

**Course Code**: **BPH701** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical analysis.

**Course Contents**

**Unit-I**

**Ultraviolet and Visible Spectrophotometry:** Electronic, excitation, quantitative laws, deviation from Beer's law, and graphical presentation of data. Chromophores photometric error, instrumentation, single and double beam spectrophotometer.

**Colorimetric methods:** Chemistry of colorimetry, instrumentation, application (direct methods and indirect methods). Nephelometry & turbidimetry and densitometry. **(8 Hours)**

**Unit-II**

**Infra Red Spectrophotometry :**Theory, characteristics absorbance, bands of organic functional groups, interpretation of infrared absorption spectra, preparation of sample, sample cells, IR instrumentation qualitative and quantitative applications in pharmaceutical analysis.

**Flourimetric Analysis :**Theory, quantitative description, experimental factors affecting fluorescence intensity, factors affecting IC and F directly, relationship of fluorescence to molecular structure, instrumentation, correction of spectra, pharmaceutical applications. **(8 Hours)**

**Unit-III**

**Nuclear Magnetic Resonance Spectroscopy:** An introduction to the theory of 1H-NMR, chemical shift & spin-spin coupling, interpretation, Raman spectroscopy, Radio chemical assay, G.M. Counter and scintillation counter. **(8 Hours)**

**Unit-IV**

**Mass Spectrometry**: Introduction to mass spectra, molecular ion peak, fragmentation peaks, mass spectra of some simple compounds.

**Flame Photometry:** Origin of spectra, atomization and ionization, instrumentation, background emission, interference, qualitative & quantitative applications in pharmaceutical analysis. **(8 Hours)**

**Unit-V**

**Theory, instrumentation and applications of:** Emission Photometry, Atomic absorption spectroscopy

(**8 Hours)**

**Recommended Books**


1. *Pharmacopoeia of India*, Ministry of Health, Govt of India.
2. Becket A.H. & Stenlake J.B., *Practical Pharmaceutical Chemistry* Vol. I and II, the Athlone Press of the University of London.
3. Chatten L.G., *A text book of Pharmaceutical Chemistry* Vol. I & II Marcel, Dekker, New York.
4. Willard H.H. & Merrit L. Jr, and Dean J.A., *Instrumental Methods of Analysis,* Van Nostrand Renhold, New York.
5. Silver stein R.M. & Webster F.X., *Spectrometric Identification of Organic Compounds*, John Wiley & Sons.
6. Skoog V., *Principles of Instrumental Analysis*, Holler-Neimen


*** Latest editions of all the suggested books are recommended.**

## Semester VII
## PHARMACEUTICS -VIII
## (BIO-PHARMACEUTICS & PHARMACOKINETICS)

**Course Code**: **BPH702** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with bio-pharmaceutics and pharmacokinetics.

**Course Contents**

**Unit I**

**Introduction** to Biopharmaceutics and Pharmacokinetics and their role in formulation, development and clinical setting.

**Biopharmaceutics:**

- Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis). Factors influencing absorption – Physicochemical, physiological and pharmaceutical.
- Drug distribution in the body, plasma protein binding. **(8 Hours)**

**Unit-II**

**Pharmacokinetics:**

- Significance of plasma drug concentration measurement. Compartment model and Non-compartment model, Definition and Scope.
- Pharmacokinetics of drug absorption – zero order and first order absorption rate constant using Wagner – Nelson, Loo-Reigelman method.

**(8 Hours)**

**Unit-III**

- Volume of distribution and distribution coefficient.
- Compartment kinetics – One compartment and Preliminary information of multicompartment models. Determination of pharmacokinetic parameters from plasma and urine data after drug administration by intravascular and oral route.
- Clinical Pharmacokinetics: Definition and scope. **(8 Hours)**

**Unit-IV**

- Dosage adjustment in patients with and without renal and hepatic failure. Pharmacokinetic drug interactions and their significance in combination therapy.

**(8 Hours)**

**Unit V**

**Bioavailability and Bioequivalence:**

- Measures of bioavailability, C-max, and area under the curve (AUC). Review of regulatory requirements for conduction of bioequivalent studies. **(8 Hours)**

**Recommended Books**


1. Notari, R.E., *Biopharmaceutics and Pharmacokinetics – An introduction*, Marcel Dekker Inc. N.Y.
2. Rowland M., & Tozer T.N., *Clinical Pharmacokinetics*, Lea and Febriger, N.Y.
3. Wagner J.G., *Fundamentals of Clinical Pharmacokinetics*, Drugs Intelligence Publishers, Hamilton.
4. Wagner J.G., *Pharmacokinetics for the Pharmaceutical Scientist*, Technomic Publishing A.G. Basel, Switzerland.


*** Latest editions of all the suggested books are recommended.**

## Semester VII
## PHARMACOLOGY - III

**Course Code**: **BPH703** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmacology.

**Course Contents**

**Unit-I**

**Pharmacology of Endocrine System**: Hypothalamic & pituitary hormones, Thyroid hormones & Thyroid Drugs, Parathyroid, Calcitonin & Vitamin D, Insulin, oral hypoglycaemic agents & glucagon.

**(8 Hours)**

**Unit-II**

ACTH & Cortico steroids, Androgens & anabolic steroids, Estrogens, Progesterone & Oral Contraceptives, Drugs acting on uterus. **(8 Hours)**

**Unit-III**

**Chemotherapy**:General Principles of Chemotherapy, Sulphonamides, Cotrimoxazole, Quinolines, Antibiotics – Penicillins, Cephalosporins, Chloramphenicol, Tetracyclines, Macrolides.

**(8 Hours)**

**Unit-IV**

Chemotherapy of Parasitic infections, Tuberculosis, Leprosy, Malaria, Fungal infections, viral diseases, Introduction to Immuno modulators and Chemotherapy of Cancer. **(8 Hours)**

**Unit-V**

**Principles of Toxicology**: Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous & atropine poisoning, Heavy metal Antagonists. **(8 Hours)**

**Recommended Books**


1. Goodman & Gilman, *The Pharmacological basis of Therapeutics*, Pergamon Press.
2. Katzung, B.G., *Basic & Clinical Pharmacology*, Prentice Hall, International.
3. Rang M.P., Dale M.M., Riter J.M., *Pharmacology,* Churchill Livingstone.
4. Barar F.S.K., *Text Book of Pharmacology*, Interprint, New Delhi.
5. Laurene, D.R. & Bennet P.N., *Clinical Pharmacology*, Churchill Livingstone.
6. Tripathi, K.D., *Essentials of Medical Pharmacology*, Jay Pee Publishers, New Delhi.
7. Satoskar & Bhandarkar, *Pharmacology & Pharmacotherapeutics*, Popular Prakashan Pvt. Ltd., Bombay.
8. Kulkarni S.K., *Hand Book of Experimental Pharmacology*, Vallabh Prakashan, Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester VII
## PHARMACEUTICAL MEDICINAL CHEMISTRY – III

**Course Code**: **BPH704** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with medicinal chemistry. Mode of action, uses, structure- activity relationship of the following classes of drug (synthetic procedures of individually mentioned drug only).

**Course Contents**

**Unit-I**

**Steroids and related drugs:** Introduction, Classification, Nomenclature & Stereochemistry.

- Androgens and Anabolic steroids – Testosterone, Stanozolol. Estrogens and Progestational agents – Progesterone, Estradiol.
- Adrenocorticoids – Prednisolone, Dexamethasone, Betamethasone.

**(8 Hours)**

**Unit-II**

**Antibiotics:** Penicillins, Semi-synthetic, penicillins, streptomycin, tetracyclines, Cephalosporins, Chloramphenicol, Fluroquinolones.

**Antimycobacterial Agents:** PAS, Ethambutol, Isoniazid, Dapsone

**(8 Hours)**

**Unit III**

**Antimalarials:** Cholroquine, Primaquine, Pyrimethamine.
**Antiamoebics:** Metronidazole, Tinidazole, Diloxanide.
**Antiseptics & Disinfectants:** Benzalkonium chloride.
**Anthelmintics:** Mebendazole.
**Antifungals.**

**(8 Hours)**

**Unit-IV**

**Anti-HIV agents:** Zidovudine, Zalcitabine, Saquinavir.
**Antivirals**: Amantadine, Acyclovir, Lamivudine.
**Prostaglandins:** Misoprostol, Carboprost. **(8 Hours)**

**Unit-V**

**Thyroid and Antithyroids:** Carbimazole, Levothyroxine, Propylthiouracil, Methimazole. Insulin & Oral
**Hypoglycemics:** Chlorpropamide, Metformin, Tolbutamide, Glybenclamide. **(8 Hours)**

**Recommended Books**


1. *Pharmacopoeia of India*, Ministry of Health, Govt. of India.
2. Wolff M.E., Ed. *Burger's Medicinal Chemistry*, John Wiley & Sons, New York.
3. Delagado J.N., & Remers W.A.R., Eds., Wilson And Gisvold's, T*ext book of Organic Medicinal and Pharmaceutical Chemistry*, J. Lippincott Co., Philadelphia.
4. Foye W.C., *Principles of Medicinal Chemistry*, Lea & Febiger, Philadelphia.
5. Singh Harkrishan & Kapoor V.K., *Organic Pharmaceutical Chemistry*, Vallabh Prakashan, Delhi.
6. Nogrady T., *Medicinal Chemistry – A Biochemical Approach*, Oxford University Press, New York, Oxford.
7. Finar I.L., *Organic Chemistry*, Vol. I & II, ELBS/ Longman, London.


*** Latest editions of all the suggested books are recommended.**

## Semester VII
## PHARMACOGNOSY – IV

**Course Code**: **BPH705** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmacognosy.

**Course Contents**

**Unit I**

Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic & microscopic features & specific chemical tests of following alkaloid containing drugs.

**Pyridine-piperidine :** Tobacco, Areca & Lobelia.

**Tropane:** Belladona, Hyoscyamus, Datura, Coca & Withania.

**Quinoline & Isoquinoline :** Cinchona, Ipecac & Opium..

**Indole :** Ergot, Rauwolfia, Catharanthus & Nux-vomica. **(8 Hours)**

**Unit-II**

**Imidazole:** Pilocarpus ,**Steroidal:** Veratrum & Kurchi , **Alkaloidal amine:** Ephedra & Colchicum, **Glycoalkaloid:** Solanum, **Purines:** Coffee & Tea ,**Quinazoline:** Vasaka **(8 Hours)**

**Unit-III**

Worldwide trade in Medicinal plants & derived product. Tropane alkaloids containing drugs, Cinchona, Ipecac, Rauwolfia, Taxol. Diosgenin, Digitalis, Liquorice, Papain, Ginseng, Aloe, Valerian, & plant laxatives. Role of Medicinal & aromatic plants in National Economy.

**(8 Hours)**

**Unit-IV**

**Biological sources, preparation, Identification tests and uses of following enzymes:** Diastase, papain, Penicillinase, Hyalluronidase, Streptokinase. Plant Bitters & Sweeteners.

**(8 Hours)**

**Unit-V**

**Introduction:** classification & study of different chromatographic methods. Application of chromatographic techniques in evaluation of herbal drugs. Historical development of plant tissue culture, type of culture, Nutritional requirement, growth & their maintenance. Application of plant tissue culture in Pharmacognosy.

**(8 Hours)**

**Recommended Books**


1. Kokate C.K., Gokhale AS, Gokhale SB, *Cultivation of Medicinal Plants*, Nirali Prakashan.
2. Trease, G.E., & Evans W.C., Evans, W.C., *Pharmacognosy*, Bailliere Tindall east Baorne, U.K.
3. Tyler V.E., et al, *Pharmacognosy*, Lea & Febiger, Philadelphia.
4. Wallis. T.E., *Text Book of Pharmacognosy*, J&A Churchill Ltd. London.
5. Nadkarni A.K., *Indian Materia Medica* 1-2, Popular Prakashan (P) Ltd. Bombay.
6. *Medicinal plants of India* I&II, Indian council of Medical Reasearch, New Delhi.
7. *Indian Herbal Pharmacopoeia*, Vol. I&II, ICMR & RRL, Jammu.
8. Clarke E.C.G., *Isolation & Identification of Drugs*. The Pharmaceutical Press, London.


*** Latest editions of all the suggested books are recommended.**

# Semester VII
## PHARMACEUTICAL INDUSTRIAL MANAGEMENT

**Course Code**: **BPH706** **L-3, T-0, P-0, C-3**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical industrial management.

**Course Contents**

**Unit-I**

**Concept of Management:** Administrative Management (Planning, Organizing Staffing Directing and Controlling). Entrepreneurship development, Operative Management, Principles of Management, Identification of key points to give maximum thrust for development and perfection.

**(8 Hours)**

**Unit-II**

**Economics:** Principles of economics with special reference to the Laws of demand and supply, demand curves labour welfare, general principles of insurance and inland and foreign trade, procedure of exporting and importing goods.

**Accountancy :** Principles of Accountancy, Ledger posting and book entries preparation of trial balance, columns of a cash book, Bank reconciliation statement, rectification of errors, profits and loss account, balance sheet, purchase, book keeping and pricing of stocks.

**(8 Hours)**

**Unit-III**

**Pharmaceutical Marketing:** Functions, buying, selling, transportation, channels of distribution, wholesale, retail, department store.

**Salesmanship:** Principle of sales promotion, advertising, ethics of sales, merchandising, literature, detailing, Recruitment, training, evaluation, compensation to the pharmacist.

**(8 Hours)**

**Unit-IV**

**Market Research: Measuring & Forecasting Market Demand -** Major concept in demand measurement, estimating current demand Geo-demo-graphic analysis. Market segmentation & Market targeting.

**(8 Hours)**

**Unit-V**

**Materials Management:** A brief exposure of basic principles of management major areas, scope, purchase, stores, inventory control and evaluation of materials management.

**Production Management :** A brief exposure of the different aspects of Production Management Visible and Invisible inputs, Methodology of Activities Performance Evaluation Technique Process Flow, Process Know-how, Maintenance Management.

**(8 Hours)**

**Recommended Books**


1. Beri, *Market Research* – Tata Mc Graw Hill
2. Chary S.N., *Production and Operative Management*, Tata Mc Graw Hill.
3. Massie L. Joseph, *Essentials of Management*, PHI.
4. Barthwal R.R., *Industrial Economics*, New Age International.
5. Shreenivasan K.R., *An Introduction to Industrial Management*, Vikas.
6. Daver Rustam S., *Salesmanship and Publicity*, Vikas.


*** Latest editions of all the suggested books are recommended.**

## Semester-VII
## CORPORATE COMMUNICATION

**Course code: BPH707** (Common with EHM701)

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 2 | 3 |

**Course Contents:**

**Unit I**
Corporate behavior, Corporate expectation, Office etiquettes, Telephonic conversation & etiquette. **(10 Hours)**

**Unit II**
**Communication:** Press communication, press-note, notification, e-mail, inviting tenders, writing advertisements, writing notices, Agenda for the meeting, writing minutes of the meeting. **(10 Hours)**

**Unit III**
**Interview skills:** Concept & Process, Preparing for the Interview, Dressing sense, Self-awareness – Meaning & scope, Self- image, self-concept, self confidence. **(10 Hours)**

**Unit IV**
Group Discussion (G.D), Tips and Style. **(10 Hours)**

**Recommended Books:**

1. Raman Meenakshi & Sharma Sangeeta, *Technical Communication-Principles & Practice* – O.U.P. New Delhi. 2007.
2. Newstron John W., *Organizational Behaviour: Human Behaviour at work* – Tata McGraw Hill.
3. Luthans Fred, *Organizational Behaviour* – Tata McGraw Hill.


**NOTE:**
**This syllabus has been designed to improve the oral and written communication skills of students. The faculty members should put emphasis on practical (oral) activities for generating students' interest in language learning.**

*** Latest editions of all the suggested books are recommended.**

# Semester VII
## PHARMACEUTICAL ANALYSIS -III (PRACTICAL)

**Course Code**: **BPH751** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical analysis.

**Course Contents**

1. Assay of at least 10 official formulation containing single and more active ingredients using instrumental techniques.
2. Interpretation of a few spectra.

**Recommended Books**


1. *Pharmacopoeia of India*, Ministry of Health, Govt of India.
2. Becket A.H. & Stenlake J.B., *Practical Pharmaceutical Chemistry,* Vol. I and II, the Athlone
3. Press of the University of London.
4. Chatten L.G., *A Text Book of Pharmaceutical Chemistry,* Vol. I & II Marcel, Dekker, New York.
5. Willard H.H. and Merrit L. Jr, and Dean J.A., *Instrumental Methods of Analysis,* Van Nostrand
6. Renhold, New York.
7. Silver stein R.M. & Webster F.X., *Spectrometric Identification of Organic Compounds*, John Wiley & Sons.
8. Skoog V., *Principles of Instrumental Analysis*, Holler-Neimen.


*** Latest editions of all the suggested books are recommended.**

## Semester VII
## PHARMACEUTICS-VIII
## (BIO-PHARMACEUTICS & PHARMACOKINETICS) (PRACTICAL)

**Course Code**: **BPH752** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with biopharmaceutics and pharmacokinetics practical.

**List of Suggested Practical**

1. In-vitro drug release study of the given powder dosage form using various dissolution media.
2. In-vitro drug release study of the given uncoated tablet dosage form using different dissolution media.
3. In-vitro drug release study of the given capsule dosage form using various dissolution media.
4. To study the in-vitro drug- drug interaction.
5. In-vitro dissolution study of the given sustained release dosage form.
6. In-vitro dissolution study of the given fast release (M.D, Dispersible etc.) dosage form.
7. To study the effect of hardness of tablet on dissolution rate.
8. To study the effect of various diluents on dissolution rate of dosage form (Tablets, Capsules, Ointment etc.).
9. To study the passive diffusion of the given drug using egg or goat membrane.
10. To determine the % protein binding of the given drugs.
11. To determine the effect of protein binding on drug bioavailability.
12. To calculate various Pharmacokinetic parameters from the given zero order drug release data.

**Recommended Books**


1. Notari, R.E., *Biopharmaceutics and Pharmacokinetics – An introduction*, Marcel Dekker Inc. N.Y.
2. Rowland M., & Tozer T.N., *Clinical Pharmacokinetics*, Lea and Febriger, N.Y.
3. Wagner J.G., *Fundamentals of Clinical Pharmacokinetics*, Drugs Intelligence Publishers, Hamilton.
4. Wagner J.G., *Pharmacokinetics for the Pharmaceutical Scientist*, Technomic Publishing A.G. Basel, Switzerland.


*** Latest editions of all the suggested books are recommended.**

## Semester VII
## PHARMACOLOGY- III (PRACTICAL)

**Course Code**: **BPH753** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with pharmacology practicals.

**List of Suggested Practical**

1. To calculate the $pA_2$ value of Atropine & chlorpheniramine.
2. Bioassay of Acetylcholine, histamine & oxytocin on suitable isolated preparations using matching assay, bracketing assay, three point assay & four point assay.

**Recommended Books**


1. Goodman & Gilman, *The Pharmacological basis of Therapeutics*, Pergamon Press.
2. Katzung, B.G., *Basic & Clinical Pharmacology*, Prentice Hall, International.
3. Rang M.P., Dale M.M., Riter J.M., *Pharmacology,* Churchill Livingstone.
4. Barar F.S.K., *Text Book of Pharmacology*, Interprint, New Delhi.
5. Laurene, D.R. & Bennet P.N., *Clinical Pharmacology*, Churchill Livingstone.
6. Tripathi, K.D., *Essentials of Medical Pharmacology*, Jay Pee Publishers, New Delhi.
7. Satoskar & Bhandarkar, *Pharmacology & Pharmacotherapeutics*, Popular Prakashan Pvt. Ltd., Bombay.
8. Kulkarni S.K., *Hand Book of Experimental Pharmacology*, Vallabh Prakashan, Delhi.


*** Latest editions of all the suggested books are recommended.**

## Semester VII
## PHARMACOGNOSY -IV (PRACTICAL)

**Course Code**: **BPH754** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with Pharmacognosy Practical.

**List of Suggested Practical**

1. To study the morphology and microscopy of Withania.
2. To study the morphology and microscopy of Rauwolfia.
3. To study the morphology and microscopy of Nux-vomica.
4. To study the morphology and microscopy of Ephedra and Kurchi.
5. To study the morphology and microscopy of Solanum and Vasaka.
    - Morphology of Colchicum.
    - Transverse section of Kurchi bark.
6. To study the TLC profile of volatile oil of alkaloid containing drug.
7. Chemical test of Tea, Tobacco, Datura and Withania.
8. To grow callus in any defined media.

**Recommended Books**


1. Kokate C.K., Gokhale AS, Gokhale SB, *Cultivation of Medicinal Plants*, Nirali Prakashan.
2. Trease, G.E., & Evans W.C., Evans, W.C., *Pharmacognosy*, Bailliere Tindall east Baorne, U.K.
3. Tyler V.E., et al, *Pharmacognosy*, Lea & Febiger, Philadelphia.
4. Wallis. T.E., *Text Book of Pharmacognosy*, J&A Churchill Ltd. London.
5. Nadkarni A.K., *Indian Materia Medica* 1-2, Popular Prakashan (P) Ltd. Bombay.
6. *Medicinal Plants of India* I&II, Indian council of Medical Research, New Delhi.
7. Clarke E.C.G., *Isolation & Identification of Drugs*. The Pharmaceutical Press, London.
8. *Indian Herbal Pharmacopoeia*, Vol. I&II, ICMR & RRL, Jammu.


*** Latest editions of all the suggested books are recommended.**

## Semester VIII
## PHARMACEUTICAL BIO-TECHNOLOGY

**Course Code**: **BPH801** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with Pharmaceutical Bio-Technology**.**

**Course Contents**

**Unit-I**

**Immunology and Immunological preparations:** Principles, Antigen and haptens, immune system, Cellular, humoral immunity, immunological tolerance, antigen-antibody reactions and their applications, standardization and storage of BCG.

**(8 Hours)**

**Unit-II**

**Genetic Recombination**: Transformation, conjugation, transduction, protoplast fusion and gene cloning and their applications, development of hybridoma for monoclonal antibodies, study of drugs produced by biotechnology such as activase, humulin, Humatrope.

**(8 Hours)**

**Unit-III**

**Antibiotics:** Historical development of antibiotics, Antimicrobial spectrum and methods used for their standardization. Screening of soil for organisms producing antibiotics fermenter, its design, and control of different parameters.

**(8 Hours)**

**Unit-IV**

**Microbial Transformation:** Introduction, types of reactions mediated by microorganisms, Design of Bio-transformation process, selection of organisms, biotransformation processes and its improvements with special reference to steroids. **(8 Hours)**

**Unit-V**

**Enzyme immobilization:** Techniques of immobilization of enzymes, factors affecting enzyme kinetics, study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodaranse, amylases and proteases Immobilization of Bacteria and plant cells.

**(8 Hours)**

**Recommended Books**


1. Vyas S.P. & V.K. Dixit, *Pharmaceutical Biotechnology*, CBS Publication, New Delhi.
2. Prescott & Dunn's, *Industrial Microbiology*, 4th Ed, 1987, CBS Publishers and Distributors, Delhi.
3. Stanbury P.F. & A. Ahhitar, *Principles of Fermentation Technology*.
4. Kieslich K. Ed., *Biotechnology,* Vol. 69 Verleg Chernie Switzerland 1984.
5. Standury P.F. & Whitaker A. & Hall S.J., *Principles of Fermentation*, Aditya Book Private Limited, NewDelhi.


*** Latest editions of all the suggested books are recommended.**

## Semester VIII
### NATURAL PRODUCTS

**Course Code**: **BPH802** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with natural products.

**Course Contents**

**Unit-I**

- Chemical & Spectral approaches to simple molecules of natural origin.
- Biogenetics Investigations and basic metabolic pathways, (alkaloids, terpenes, steroids) Brief introduction to biogenesis of secondary metabolites of Pharmaceutical importance.

**(8 Hours)**

**Unit-II**

Extraction, Isolation & Chemistry of –

- **Glycosides**
- **Lignans**
- **Quassinoids**
- **Flavonoids (Quercitain)**

**(8 Hours)**

**Unit-III**

**Alkaloids:** Atropine & related compounds, quinine, reserpine, ergot, and Vinca Alkaloids. Natural Allergens, Photosensitizing agents and fungal toxins.

**(8 Hours)**

**Unit-IV**

Extraction, Isolation & Chemistry of – Terpenoids- Camphor, Menthol, Citral, β- Carotene, α –Tocopherol.

**(8 Hours)**

**Unit-V**

Herbal Cosmetics and their formulation.

**(8 Hours)**

**Recommended Books**


1. Tyler V.E., et.al. , *Pharmacognosy*, Lea & Febiger Philadelphia.
2. Kokate, C.K., *Pharmacognosy*, Nirali Prakashan, Pune.
3. Trease G.E. & Evan, W.C., *Pharmacognosy*, Bailleire Tindall East Bourne, U.K.
4. Stahl E., *Thin Layer Chromatography*, A Laboratory Hand Book, Springer Verlag, Berlin.
5. Harborne, J.B. *Phytochemical Methods,* Chapman & Hall, International Ed, London.
6. *Pharmacopoeia of India*.
7. Finar I.L., *Organic Chemistry*, Vol. I & II ELBS, London.
8. Agarwal O.P., *Chemistry of Organic Natural Product*, Vol. I & II Goel Pub. House, Meerut.


*** Latest editions of all the suggested books are recommended.**

## Semester VIII
## HOSPITAL PHARMACY

**Course Code**: **BPH803** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with hospital pharmacy and management.

**Course Contents**

**Unit-I**

**Organization and Structure:** Organization of a hospital and hospital pharmacy, Responsibilities of a hospital pharmacist. Pharmacy and therapeutic committee, Budget preparation and implementation.
**Hospital Formulary:** Contents, preparation and revision of hospital formulary.

**(8 Hours)**

**Unit-II**

**Drug Store Management and Inventory Control:** Organization of drugs. Types of materials stocked, storage conditions.
**Purchase and Inventory control:** Principles, purchase procedures, purchase order, procurement and stocking.

**(8 Hours)**

**Unit-III**

**Central Sterile Supply Unit and their Management:** Types of materials for sterilization, packing of materials prior to sterilization, sterilization equipments, Supply of sterile materials.
**Manufacturing of Sterile and Non sterile Products:** Policy making of manufacturable items, demand and costing, personnel requirements, manufacturing practice, Master formula card, Production control, Manufacturing records.

**(8 Hours)**

**Unit-IV**

**Drug information service:** Sources of information on drugs, treatment schedules, procurement of information, computerized services (e.g. MEDLINE), Retrieval of information, Medication error.
**Records and Reports:** Prescription filling drug profile, Patient medication profile, case on drug interaction & adverse reactions, idiosyncratic cases etc.

**(8 Hours)**

**Unit-V**

**Drug distribution systems in Hospitals:** Out-patient dispensing, methods adopted, Dispensing of drugs to in-patients. Types of drug distribution systems charging Policy, labelling, Dispensing of drugs to ambulatory patients, Dispensing of controlled drugs.
**Nuclear Pharmacy:** Introduction to Radio-pharmaceuticals- radio-active half life, Units of radioactivity. Production of radio pharmaceuticals, methods of isotonic tagging, preparation of radioisotopes in laboratory using radiation dosimetry, radio-isotope generators, permissible radiation dose level, Radiation hazards and their prevention, specifications for radio-active laboratory.

**(8 hours)**

**Recommended Books**


1. Hasan, *Hospital Pharmacy*, Lea & Febiger, Philadelphia.
2. Merchant H.S. & Qadry J.S., *Text Book of Hospital Pharmacy*, B.S. Shah Prakashan, Ahmadabad.


*** Latest editions of all the suggested books are recommended.**

# PHARMACEUTICAL RESEARCH - I

**Course Code**: **BPH804** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical research methodologies related to the extraction, analysis and formulations of herbal drugs, packaging development and evaluation.

**Course Contents**

**Unit-I**

Methods of extraction and modern techniques for the isolation, purification, separation estimation and characterization of active constituents obtained from plant.

**(8 Hours)**

**Unit-II**

Analysis of official formulations derived from crude drugs including some ayurvedic preparations.

**(8 Hours)**

**Unit-III**

Concepts of conformational analysis and its role in design and development of new drug molecules. Principles of drug design: Analogous synthesis versus rational design; discovery of lead compounds. QSAR and introduction to molecular modelling, Computer Aided Drug Design.

**(8 Hours)**

**Unit-IV**

Package systems, package design research. Packaging materials with special reference to polymers, metals, glass and plastics, control of packaging materials. Pharmacopoeial tests and specifications.

**(8 Hours)**

**Unit-V**

Corrugated fibre board materials, Pointing requirements, label and leaflets preparation, Legal Requirement. Stability of package and packaging material. Sterilization of packaging materials.

**(8 Hours)**

**Recommended Books**


1. Trease, G.E., Evans W.C., *Pharmacognosy*, ELBS.
2. Wallis T.E., *Text book of Pharmacognosy*.
3. E.J, Ariens, *Drug Design*, Academic Press, New York (1975).
4. M.E. Wolff, *Burger's Medical Chemistry*, John Willey and Sons, New York.
5. Harburn, *Quality-Control of Packaging Materials in Pharmaceutical Industry*.
6. Joseph D.O. Brien, *Medical Device Packaging Handbook*.
7. Ross, *Packaging of Pharmaceuticals*.


*** Latest editions of all the suggested books are recommended.**

## Semester VIII
## PHARMACEUTICAL RESEARCH - II

**Course Code**: **BPH805** **L-3, T-2, P-0, C-4**

**Objective:** The basic objective of this course is to get familiar with pharmaceutical research methodologies related to the methodologies of novel drug delivery systems, regulatory requirements for documentation and validation.

**Course Contents**

**Unit-I**
Theory of controlled release drug delivery systems. Oral Sustained Release Systems.

**(8 Hours)**

**Unit-II**
Transdermal drug delivery systems: Theory, formulation and evaluation, nanoparticles, liposomes, neosomes, pharmacosomes and erythrocytes.

**(8 Hours)**

**Unit-III**
Advances in drug delivery systems. An Introduction to buccal, nasal, ocular, pulmonary colonic delivery, etc.

**(8 Hours)**

**Unit-IV**
Documentation- Protocols, Forms and maintenance of records in Pharmaceutical industry. Preparation of documents for new drug approval and export registration. Sources and control of quality variation- raw materials, containers, closures, personnel, environment etc.

**(8 Hours)**

**Unit-V**
Validation of manufacturing and analytical equipment, Process validation in manufacturing dosage formulations, applications of process validation.

**(8 Hours)**

**Recommended Books**


1. Robinson, *Sustained and Controlled Drug Delivery Systems.*
2. Chien, *Novel Drug Delivery Systems.*
3. OPPI, *Quality Assurance*.
4. Loftus and Nash, *Pharmaceutical Process Validation.*
5. Garfield, *Quality Assurance Principles for Analytical Laboratories*.


*** Latest editions of all the suggested books are recommended.**

## Semester VIII
## PROJECT BASED ON PHARMACEUTICAL RESEARCH – I & II (PRACTICAL)

**Course Code**: **BPH851** **L-0, T-2, P-8, C-5**

**Objective:** The basic objective of this course is to make the students familiar with the techniques and methodologies for the formulation of the pharmaceutical research products.

**Curriculum Details**

1. The course will be comprised of idea to develop the research aptitude in students with regards to various parameters concerns with different formulations and design the dosage forms.
2. A preliminary experimentation will be performed by the students and the scope of future research will be determined.
3. Students are required to have detailed knowledge of the technologies involved in each section of the formulation of dosage forms including those obtained from plant and animal sources.
4. A Project on the experimental findings will be compiled and submitted by the students as per guidelines issued to the students by the supervisor/ teacher concerned.
5. A committee of senior faculties of the institute including supervisor(s) will finally evaluate the quality of the work and its relevance in the pharmaceutical field for 50 marks.
6. External evaluation will be done based on the performances in presentation and viva voce for the remaining 50 marks.

## Semester VIII
## NATURAL PRODUCTS (PRACTICAL)

**Course Code**: **BPH852** **L-0, T-0, P-4, C-2**

**Objective:** The basic objective of this course is to get familiar with natural products.

**Course Contents**

1. Isolation of caffeine from Tea leaves.
2. Isolation of piperine from Black Pepper.
3. Isolation of Hesperidin from Orange Peel.
4. Isolation of Clove oil from clove.
5. Isolation of Caraway oil from caraway.
6. Isolation of cumin oil from cumin.
7. To study the TLC profile of extracted oils.
8. To performs the column chromatography of any available herb.
9. Quantitative determination of Ascorbic acid present in Amla. (Fresh/ Dry).

**Recommended Books**


**1.** Tyler V.E., et.al. , *Pharmacognosy*, Lea & Febiger Philadelphia.
**2.** Kokate, C.K., *Pharmacognosy*, Nirali Prakashan, Pune.
**3.** Trease G.E. & Evan, W.C., *Pharmacognosy*, Bailleire tindall East bourne, U.K.
**4.** Stahl E., *Thin Layer Chromatography*, A Laboratory Hand Book, Springer Verlag, Berlin.
**5.** Harborne, J.B. *Phytochemical Methods,* Chapman & Hall, International Ed, London.
**6.** Finar I.L., *Organic Chemistry*, Vol. I & II ELBS, London.
**7.** Agarwal O.P., *Chemistry of Organic Natural Product*, Vol. I & II Goel Pub. House, Meerut.
**8.** *Pharmacopoeia of India.*


*** Latest editions of all the suggested books are recommended**.