



UTTARAKHAND TECHNICAL UNIVERSITY
Dehradun, Uttarakhand

Syllabus

1st YEAR

[Effective from session 2009-10]

BACHELOR OF PHARMACY

UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN
STUDY AND EVALUATION SCHEME
[Effective from the session: 2009-10]

Course: B.Pharm.

Year – I, Semester - I

S.N.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total	Credits
			L	P	CT	TA	Total	ESE		
1	PHR- 101M	Remedial Mathematics OR	3	0	15	05	20	80	100	3
	PHR- 101B	Remedial Biology	3	0	10	10	20	80		
2	PHR- 102	Pharmaceutical Analysis – 1	3	0	15	05	20	80	100	3
3	PHR- 103	Pharmaceutical Chemistry - 1 (Inorganic Pharmaceutical Chemistry)	3	0	15	05	20	80	100	3
4	PHR- 104	Introduction to Pharmacy (Pharmaceutics-1)	3	0	15	05	20	80	100	3
5	PHR- 105	Anatomy, Physiology and Path physiology- 1	3	0	15	05	20	80	100	3
6	PHR- 106	Professional Communication- 1	3	0	15	05	20	80	100	3
Practical Day to Day Evaluation										
7	PHR- 101B(P)	Remedial Biology	0	4	--	--				
8	PHR- 102P	Pharmaceutical Analysis - 1	0	4	--	--	20	80	100	2
9	PHR- 103P	Pharmaceutical Chemistry-1 (Inorganic Pharmaceutical Chemistry)	0	4	--	--	20	80	100	2
10	PHR- 104P	Introduction to Pharmacy (Pharmaceutics-1)	0	4	--	--	20	80	100	2
11	PHR- 105P	Anatomy, Physiology and Path physiology- 1	0	4	--	--	20	80	100	2
			18	20	--	--	200	800	1000	

T.A. – Teacher Assessment, ESE – End Semester Examination, CT – Cumulative Test

Note:- Duration in Theory & Practical of ESE shall be 3 (three) hours and 4 (four) hours respectively

0.6 Credits – Sessional

2.4 Credits - ESE

UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN
STUDY AND EVALUATION SCHEME
[Effective from the session: 2009-10]

Course: B. Pharm.

Year – I, Semester - II

S.N.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total	Credits
			L	P	CT	TA	Total	ESE		
1	PHR- 201	Pharmaceutical Chemistry– II (Organic Chemistry- I)	3	0	15	05	20	80	100	3
2	PHR- 202	Physical Pharmacy- I (Pharmaceutics- II)	3	0	15	05	20	80	100	3
3	PHR- 203	Anatomy, Physiology and Path physiology- II	3	0	15	05	20	80	100	3
4	PHR- 204	Computer Fundamental & Programming	3	0	15	05	20	80	100	3
5	PHR- 205	Unit Operation- I (Pharmaceutics-III)	3	0	15	05	20	80	100	3

Practical Day to Day Evaluation

6	PHR- 201P	Pharmaceutical Chemistry– II (Organic Chemistry- I)	0	4	--	--	20	80	100	2
7	PHR- 202P	Physical Pharmacy- I (Pharmaceutics- II)	0	4	--	--	20	80	100	2
8	PHR- 204P	Computer Fundamental & Programming	0	4	--	--	20	80	100	2
9	PHR- 205P	Unit Operation- I (Pharmaceutics- III)	0	4	--	--	20	80	100	2
			15	16	--	--	180	720	900	-

T.A. – Teacher Assessment, ESE – End Semester Examination, CT – Cumulative Test

Note: - Duration in Theory & Practical of ESE shall be 3 (three) hours and 4 (four) hours respectively

0.6 Credits – Sessional

2.4 Credits - ESE

B.PHARM. I YEAR

SEMESTER-I

PHR-101M

REMEDIAL MATHEMATICS

Unit-1. 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. [08]

Unit-2. TRIGONOMETRY: Measurement of angle, T-ratio, addition, subtraction and transformation formulae, T-ratio of multiple, submultiples, allied and certain angles, application of logarithms in pharmaceutical computations. [08]

Unit-3. ANALYTICAL PLAIN GEOMETRY: Certain co-ordinates, distance between two points, area of triangle, locus of a point, straight line, slope and intercept form, double intercept form normal (perpendicular form), slope-point and two point form, general equation of first degree. [08]

Unit-4. 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. [08]

Unit-5

Introduction to statistics: Mean, Types of means, Median, Mode-Measure of dispersion, Quartile, deviation, Mean deviation, Standard error of Mean (SEM) [08]

BOOKS RECOMMENDED: (Latest Edition)

1. **A textbook of Mathematics for XI-XII Students**, NCERT Publication Vol. I-IV.
2. Loney, S.L, **Plane Trigonometry** AITBS Publishers.
3. Loney, S.L, **The elements of coordinate geometry** AITBS Publishers.
4. Gupta S.P., **Statistical Methods**, Sultan Chand and Co., New Delhi
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.
9. Vishal Mehta, **Remedial Mathematics for Pharmacy**, Kamini Publication, Kanpur

PHR-101B

REMEDIAL BIOLOGY

Unit-1. Methods of classification of plants. [08]

Unit-2 Plant cell: It's detailed structure, mitosis, meiosis different types of plant tissues and their functions. An introduction to R.N.A and D.N.A. [08]

Unit-3. Simple and compound microscopes used in biology, section cutting, staining and mounting of sections. Morphology and histology of root, stem, bark, wood leaf, flower, fruit and seed. Modification of root and stem. [08]

Unit-4. General survey of animal kingdom; structure and life history of parasites illustrated by amoeba, Entamoeba, Trypanosoma, Plasmodium, Taenia, Ascaris, Schistosoma, Oxyuris and Ancylostoma. [08]

Unit-5. General structure of life history of insects including their relation to medicinal crops as illustrated by grasshopper, mite, silkworm and pests. [08]

PHR-101B(P)

**REMEDIAL BIOLOGY
(LAB)**

(The Practical is based on demonstration only)

Morphology of plant parts indicated in theory.

Care, use and type of microscope.

Study of slides of structure and life cycle of lower plants/animal mentioned in theory.

Morphology, Preparation and study of slides of stem, root and leaf of monocot and dicot plants.

Study of structure and life cycle of human parasites mentioned in theory with the help of specimens.

BOOKS RECOMMENDED

1. Dutta A.C. **Botany for Degree students** Oxford University Press, New Delhi
2. Marshall & Williams **Text Book of Zoology** CBS Publishers & Distributors, Delhi.
3. Fahn **Plant Anatomy** Aditya Books Private Limited, New Delhi.
4. Weiz, Paul B **Laboratory Manual in Science of Biology** Mc Graw-Hill Book Company.

Unit -1. GENERAL CONCEPT OF ANALYSIS: Significance of quantitative analysis in quality control, different techniques of analysis, preliminaries and definitions, precision and accuracy, Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards. [08]

Unit 2. ACID BASE TITRATION: 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. [08]

Unit 3. 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, potassium dichromate. [08]

Unit 4 (A). 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, Gaylussac methods, Mohr's method, Volhard's method and Fajan's methods.

(B). GRAVIMETRIC ANALYSIS: Precipitation techniques, Solubility products; Digestional washing of the precipitate, filtration, Filter papers and crucibles, Ignition, Thermogravimetric curves, Specific examples like barium as barium sulphate, aluminium as aluminium oxide, Organic precipitants. [08]

Unit 5. Complexometric titrations: Introduction, titration curves, types of EDTA titrations, titration of mixtures, metal ion indicators, standard EDTA solutions. [08]

Proposed list of experiments

1. To study the analytical balance and calibrate the weights provided in the weight box
2. To calibrate the given volumetric flask of 100ml. and 50ml.

Acid base titration

3. To prepare 1 N HCL and standardize it.
4. To prepare 0.1N H₂SO₄ and standardize it.
5. To prepare 0.1 N NaOH and standardize it against succinic acid / oxalic acid.
6. To prepare 0.1N H₂SO₄ and standardize it against previously standardize NaOH.
7. To perform the assay of Boric Acid.
8. To perform the analysis of mixture of boric acid and borax.
9. To perform the analysis of mixture of Sodium bi carbonate and Sodium carbonate.
10. To perform the analysis of mixture of Sodium carbonate and Sodium Hydroxide.

Oxidation – reduction titration

11. To prepare 0.1N KMnO_4 and standardize it against oxalic acid / sodium oxalate.
12. To perform assay of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
13. To prepare 0.1N $\text{Na}_2\text{S}_2\text{O}_3$ solution and standardize it.
14. To prepare and standardize 0.05N iodine solution.
15. Assay of ascorbic acid.

Precipitation and Complexometric methods

16. To prepare 0.1N AgNO_3 . And standardize it.
17. To prepare 0.1 N NH_4SCN / NaCl solution and standardize it against previously standardized AgNO_3 solution.
18. Preparation and standardization of 0.05M disodium EDTA solution.
19. Determination of the percentage of CaCO_3 / MgSO_4

BOOKS RECOMMENDED: (Latest Edition)

1. Beckett. A.H. and Stanlake, J.B. **Practical Pharmaceutical Chemistry**, Athilone Press, London.
2. Barner, J.D., Thomas, M.J.K., Mendham J. and Denney, R.C., Vogel's **Textbook of Quantitative Inorganic Analysis including Elementary Instrumental Analysis**. The ELBS and Longman London,
3. Atherden, I.M. Bentley and Driver's **Text book of Pharmaceutical Chemistry**. Oxford University Press, Delhi.
4. Gary, D.C. **Analytical Chemistry**. John Wiley and Sons, New York,
5. Alexeyev, V., **Quantitative Analysis** . Mir Publishers, Mocom.

PHARMACEUTICAL CHEMISTRY-1
(INORGANIC PHARMACEUTICAL CHEMISTRY)

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 the latest Indian Pharmacopoeia.

Gases and Vapors: Inhalants (Oxygen), Anaesthetics (Nitrous oxide).

Topical Agents : Protective (Calamine, titanium dioxide, talc, kaolin), astringents(Zinc oxide, Zinc Sulphate) and anti infective (Boric Acid, Hydrogen peroxide, Iodine, Povidone Iodine, Potassium permanganate, Silver nitrate).

Dental Products: Dentrifices- anti-caries agents (Sodium fluoride). [08]

Unit-2.Gastrointestinal Agents :Acidifying agents (Dilute Hydrochloric acid), antacids(Bismuth subcarbonate, Aluminium hydroxide, Calcium carbonate, Magnesium hydroxide, Magnesium oxide{ light and heavy}, Magnesium carbonate{ light and heavy}, Magnesium trisilicate), cathartics (disodium hydrogen phosphate, Magnesium sulphate and other Magnesium compounds), protective and adsorbents(Activated Charcoal, Light Kaolin, Aluminium sulphate. [08]

Unit-3. Major intra and extra- cellular electrolytes : Physiological ions, Electrolytes used for replacement therapy, acid-base balance & combination therapy(Calcium chloride, Calcium gluconate, Calcium lactate, Calcium levulinate, Sodium dihydrogen phosphate, sodium acetate, sodium bicarbonate, sodium chloride, potassium chloride, magnesium chloride). Cationic and anionic components of inorganic drugs useful for systemic effects. [08]

Unit-4. Essential and Trace Elements: Transition elements and their compounds of pharmaceutical importance. Iron and haematinics(Ferrous fumarate, Ferrous gluconate, Ferrous sulphate, Ferric Ammonium citrate), mineral supplements (Cu, Zn, Cr, Mn, Sb, S, I).

Miscellaneous Agents: Expectorants (Ammonium chloride, Potassium Iodide), antioxidants (Sodium metabisulphite, Sodium benzoate). [08]

Unit-5. 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.

Pharmaceutical aids and necessities: water (purified water, Portable water, water for injection and sterile water for injection), pharmaceutical acceptable glass, acids and bases (Sodium hydroxide, phosphoric acid). [08]

**PHARMACEUTICAL CHEMISTRY-I
(INORGANIC PHARMACEUTICAL CHEMISTRY) - LAB**

Proposed list of experiments

1. To perform the limit test for chloride in the given sample (for e.g. Ammonium Carbonate calcium gluconate)
2. To perform the limit test for sulphate in the given sample (for e.g. Ammonium Chloride)
3. To perform the limit test for iron in the given sample (for e.g. calcium carbonate)
4. To perform the limit test for heavy metal in the given sample (for e.g. Calcium carbonate)
5. To perform the limit test for arsenic in the given sample (for e.g. Barium Sulphate)
6. To prepare Boric acid from borax and perform the limit test and identification test.
7. To prepare potash alum by using potassium sulphate and aluminum sulphate and perform the limit test and identification test.
8. To prepare calcium Carbonate by using calcium chloride and sodium carbonate and perform the limit test and identification test.
9. To prepare heavy magnesium carbonate by using sodium carbonate and magnesium sulphate and perform
the limit test and identification test.
- 10 To prepare zinc sulphate by using zinc and sulphuric acid and perform the limit test and
identification
test.

BOOKS RECOMMENDED: (Latest Edition)

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. The pharmacopoeia of India.
4. Atherden L.M., Bentley and Drivers' **Text Book of Pharmaceutical Chemistry**, Oxford University Press, London.
5. **Remington Pharmaceutical Sciences**, Mack Publishing Co., Pennsylvania

PHR-104

**INTRODUCTION TO PHARMACY
(Pharmaceutics-I)**

Unit-1. HISTORY OF PHARMACY: Origin & developments of pharmacy, scope of pharmacy, a brief review of development of Pharmaceutical Education and drugs, Pharmaceutical Industry in India, Pioneers who have contributed to the development of Pharmacy in India and Pharmaceutical legislations and ethics- a brief review. [08]

Unit-2. Introduction to pharmacopoeias with special references to I.P., B.P., U.S.P. & International Pharmacopoeia. including general notices [08]

Unit-3. PHARMACEUTICAL CALCULATIONS: Posology, Latin terms, calculation of doses for infants, adults and elderly patients; Enlarging and reducing recipes percentage solution, allegation, alcohol dilution, proof spirit. [08]

Unit-4. PHARMACEUTICAL ADDITIVES: Coloring, flavouring and sweetening agents, co-solvents, preservatives, surfactant and their applications, antioxidants. [08]

Unit-5. INTRODUCTION OF PHARMACEUTICAL DOSAGE FORMS –Definition, classification method of preparation, uses, advantages also including illustrative examples of marketed formulations of the following- solutions, aromatic waters, mixtures, spirits, syrups, elixirs, powders, lotions, liniments, pastes, mucilage, glycerin, paints, , mouth washes, and inhalations. [08]

PHR-104P

**INTRODUCTION TO PHARMACY
(LAB)**

The Practical based on the dosage forms ,at least two experiments from each category mentioned below.

1. Aromatic waters :

- Concentrated anise water BP.
- Concentrated Camphor Water BP
- Strong rose water USP/NF
- Peppermint water USP/NF

2. Syrups :

- Syrup BP
- Orange syrup BP
- Lemon syrup BP
- Acacia syrup USP/NF
- Ferrous sulphate syrup USP/NF

3. Linctus :

- Simple Linctus BP
- Pediatric Codeine Linctus BP

4. Sprits

- Compound orange spirit USP/NF
- Peppermint spirit BP
- Aromatic spirit of Ammonia BP
- Lemon spirit BP

5. Elixir

- Simple elixir BP
- Phenobarbital elixir BP
- Piperazine citrate elixir BP
- Ephedrine elixir IP
- Aromatic elixir USP/NF
- Compound benzaldehyde elixir USP/NF

6. Solutions :

A. Oral

- Theophylline oral solutions USP/NF
- Pediatric Ferrous sulphate solution BP
- Iodine oral solution aqueous BP
- Ascorbic acid oral solution USP/NF
- Paracetamol oral solution pediatric BP

B. Topical

- Hydrogen peroxide topical solution USP/NF
- Benzocaine topical solution USP/NF
- Strong ammonium acetate solution BP
- Calcium hydroxide solution BP
- Chloroxyleneol solution BP
- Povidone iodine solution IP
- Sodium hypochlorite solution USP/NF
- Sodium citrate and citric acid oral solution USP/NF

7. Mixtures

- Aromatic Magnesium Carbonate Mixture BP
- Ammonium Chloride mixture BP
- Magnesium hydroxide mixture BP
- Magnesium sulphate mixture BP

8. Powders

- Oral rehydration salts BP
- Compound magnesium trisilicate oral powder BP
- Talc dusting powder BP
- Sodium bicarbonate oral powder USP/NF
- Absorbable dusting powder USP/NF

9. Pastes

- Compound zinc paste BP
- Magnesium sulphate paste BP
- Compound aluminium paste BP
- Salicylic acid and zinc paste USP/NF

10. Poultices

- Kaolin poultice BP

11. Liniments

- White liniment BP
- Methyl Salicylate liniment BP

12. Lotions

- Calamine lotion IP
- Zinc sulphate lotion BP
- Benzoyl peroxide lotion BP
- Benzyl benzoate lotion USP/NF

13. Mouth washes

- Compound sodium chloride mouth wash BP
- Hydrogen peroxide mouth wash BP
- Chlorhexidine mouth wash BP
- Povidone iodine mouth wash BP

14. Inhalations

- Benzoin inhalation BP
- Menthol and benzoin inhalation BP

PHR-105

HUMAN ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY-I

Unit-1. a. Introduction to human body & organisation of human body.

b. Functional & structural characteristics of cell.

c. Detailed structure of cell membrane & physiology of transport process. Structural & functional characteristics of tissues- epithelial, connective, muscle and nerve. **[08]**

Unit-2. Skeletal system: Structure, composition & functions of skeleton. Classification of joints, types of movements of joints. **[08]**

Unit-3. Anatomy & physiology of skeletal & smooth muscle, neurotransmission, physiology of skeletal muscle contraction, energy metabolism, types of muscle contraction, muscle tone. **[08]**

Unit-4. Haemopoietic system: Composition & function of blood & its elements, erythropoiesis, blood groups, blood coagulation. **[08]**

Unit-5. Lymphatic System: Composition, formation and circulation of lymph node and spleen. **[08]**

PHR-105P

***HUMAN ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION-I
[HAPHE-I] LAB***

Exp. 1 – 3 Study of Human Skeleton.

Exp. 4 – 6 Microscopic study of different tissues.

Exp. 7 – 10 Study of different systems of Human body with the help of charts & models.

Exp. 11 – 15 Estimation of Hemoglobin, and determination of clotting time & Bleeding time, RBC, WBC (Total)

DLC & ESR.

BOOKS RECOMMENDED: (Latest Edition)

1. Chatterjee, C.C, **Human Physiology**, Medical allied agency, Calcutta

2. Shalya, Subhas, **Human Physiology** CBS publisher Delhi

3. Ross and Wilson, **Human anatomy and Physiology**, Churchill Livingstone London.

4. Chaurasia, B.D, **Human anatomy, Regional and applied. Part-1**, CBS publisher New Delhi

PROFESSIONAL COMMUNICATION-I

Unit-1. Grammar: Sequences of tenses, voice, articles, direct and indirect speech; degrees of comparison and preposition. [08]

Unit-2. Letter writing, Précis and Essay writing Comprehension Speed reading, scanning & swimming. [08]

Unit-3. Role and importance of communication, verbal and non-verbal communication, Group communication, effective communication, barriers of communication, communication media, participating in discussions, conduct of seminars, conferences etc., interacting with learners and teachers, role of wit and humor in communication. [08]

Unit-4. Agreement and disagreements, how to use a dictionary; how to use a thesaurus; vocabulary development; synonyms; one word substitutes, use of appropriate words and vocabulary. [08]

Unit-5. Types and methods of learning and listening; learning and listening of knowledge, attitudes, skills, decision making, thinking, motivation and practices. [08]

BOOKS RECOMMENDED: (Latest Edition)

1. Wren P.C and Martin H., **High School Grammar and Composition**, S. Chand & Co.
2. Robbins, S **Organisational Behaviour** Prentice Hall of India New Delhi.
3. Raman, Meenakshi and Sharma Sangeeta, **Technical communication principles and practice** Oxford University Press, New Delhi..

**B.PHARM. I YEAR
SEMESTER-II**

PHR-201

**PHARMACEUTICAL CHEMISTRY- II
(ORGANIC CHEMISTRY-I)**

Unit-1. Structure and Properties: Atomic Structure, atomic orbital, molecular orbital, hybridization, sigma and Pi bond, covalent, electrovalent and co-ordinate bond, inductive effect, resonance, Classification and Nomenclature of organic compounds. [08]

Unit-2. Isomerism, geometrical isomerism, Stereochemistry including optical activity, stereoisomerism, specification of configuration and conformational analysis. [08]

Unit-3. Important methods of preparation, reactions with special reference to mechanism of the following classes of compounds: Alkanes, alkenes, alkynes and dienes, free radical substitution reaction, alkyl halides, Alcohols. [08]

Unit-4. Aromatic Compounds, aromatic character, structure of benzene, resonance, orientation of aromatic substitution, arenes, amines (aliphatic & aromatic), phenols, aryl halides. [08]

Unit-5. Aldehydes and ketones (aliphatic & aromatic), carboxylic acids & their derivatives, di & tricarboxylic acids, hydroxy acids. Organometallic Compounds- Grignard reagent, organolithium compounds, their preparation & synthetic application. [08]

PHR-201P

**PHARMACEUTICAL CHEMISTRY- II
(ORGANIC CHEMISTRY-I) LAB**

1. Identification of elements and functional groups in given organic compounds.
2. Purification of solvents like Toluene Chloroform, Acetone and preparation of absolute Alcohol.
3. Synthesis of compounds involving benzylation and acetylation.
4. Synthesis of Picric acid, Aniline, Acetanilide, Aspirin, Hippuric acid, p- Bromo acetanilide, Iodoform and Oxalic acid.

BOOKS RECOMMENDED: (Latest Edition)

1. Mann, F.G, & Saunders, B.C., **Practical Organic Chemistry**, ELBS/ Longman.
2. Vogel A.I., **Textbook of Practical Organic Chemistry**, ELBS/Longman.
3. Morrison, R.T., and Boyd R.N., **Organic Chemistry**, Prentice Hall of India Pvt. Ltd, New Delhi.
4. Finar, I.L., **Organic Chemistry, Vol. I & II**, ELBS/Longman.
5. Jain, M.K. **Organic Chemistry**, Sohan Lal Nagin Chand & Co. 60 B, Bunglaw Road, Delhi.
6. Hendrikson, **Organic Chemistry**.
7. Godly, E.W. **Naming organic compounds**.
8. Kalsi, **Organic reactions Stereochemistry & Mechanism**

**PHYSICAL PHARMACY – I
(PHARMACEUTICS- II)**

Unit-1. MATTER, PROPERTIES OF MATTER: State of matter, change in the state of matter, latent heats and vapor pressure, sublimation critical point, Eutectic mixtures, gases, aerosols- inhalers, relative humidity, liquid complexes, liquid crystals, glassy state, solids crystalline, amorphous and polymorphism. [08]

Unit-2. SOLUBILITY AND DISTRIBUTION PHENOMENON: solute – solvent interactions, solubility of gases in liquids, solubility of liquids in liquids, solubility of solids in liquids, factors affecting solubility. [08]

Unit-3. BUFFERS: Buffers equations and buffer capacity in general buffers in pharmaceutical systems, preparation, stability buffered isotonic solutions measurements of tonicity, calculations and methods of adjusting isotonicity [08]

Unit-4. SOLUTIONS: Ideal and real solutions, solutions of gases in liquids, colligative properties, partition coefficient, conductance and its measurement Debye Huckel theory. [08]

Unit-5. CHEMICAL KINETICS: Zero, first and second order reactions, complex reactions, theories of reaction kinetics, characteristics of homogeneous and heterogeneous catalysis, acid base and enzyme catalysis. [08]

PHR-202P

**PHYSICAL PHARMACY – I
(PHARMACEUTICS- II) LAB**

1. To determine the distribution coefficient (partition coefficient) of iodine between carbon tetrachloride and water.
2. To plot the mutual solubility curve of phenol-water system and report the critical solution temperature.
3. Determination of rate constant of simple reaction.
4. To determine the percent w/v composition of a sugar solution using polarimeter.
5. To compare theoretical pH values (using Henderson- Hasselbalch equation) with the experimental values (using ph meter).
6. Determine the pH given solution using universal indicator system.
7. To determine dissociation constant (k_a or pK_a) of a weak acid (acetic acid) using conductivity meter
8. To determine the molecular weight of a nonvolatile substance by ebullioscopic method (Landsberger's method)
9. To determine the molecular weight of a substance using the principle of freezing point depression method (Rast- Camphor method).
10. To determine solubility of solids (benzoic acid) at different temperatures and to determine the molar heat of fusion of benzoic acid.
10. To determine solubilities of three liquids co-existing together (co-solvency effect).
11. To prepare buffer solution as given IP.

BOOKS RECOMMENDED: (Latest Edition)

1. Martin A, Bustamante P. & Chun A.H.C- **Physical Pharmacy**, Lea & Febiger, Philadelphia
2. Pali S.R., and Prabartak, S.K.D.E., **Practical Physical Chemistry**, Haltone Limited, Calcutta.
3. Shoemaker, D.P. Garland, C.W., **Experiments of Physical Chemistry**, MC Graw Hill Book Co.
4. Bahl B.S., Tuli G.D. & Bahl Arun, **Essential of Physical Chemistry**, S. Chand & Co.
5. Negi A.S. & Anand S.C. **Textbook of Physical Chemistry** Wiley Eastern Ltd.
6. Glasstone S. & Lewis D, **Elements of Physical Chemistry**, Macmillan Education.
7. Atkins P & Paula, J.D. **Atkins Physical Chemistry** Oxford University Press.

PHR-203

HUMAN ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION-II
[HAPHE-II]

Unit-1. ENDOCRINE SYSTEM: Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid, Adrenals, Pancreas, Testes and ovary, their hormones and functions. [08]

Unit-2. URINARY SYSTEM: Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid-base balance. [08]

Unit-3. REPRODUCTIVE SYSTEM: Male and female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization, Sex differentiation, spermatogenesis and oogenesis demography and family planning. [08]

Unit-4. SENSE ORGANS: Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell) and skin (superficial receptors). [08]

Unit-5. a) Concepts of health & disease, agents causing communicable diseases & prevention of disease.
b) Classification of food requirements, Balanced diet, Nutritional deficiency disorders, their treatment & prevention, specification for drinking water. [08]

BOOKS RECOMMENDED: (Latest Edition)

1. Ranade VG, **Text Book of Practical Physiology**, Pune Vidyarthi Griha Prakashan, Pune.
2. Difore SH, **Atlas of Normal Histology** Lea & Febiger Philadelphia.
3. Guyton AC, Hall JE., **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 GJ, & Anagnostikos NP, **Principles of Anatomy & Physiology**, Harper & Row Publishers, New Delhi.
7. Parmar N.S., **Health Education & Community Pharmacy** CBS Publishers, Delhi.
8. Shalya Subhash, **Human Physiology**, CBS Publishers & Distributors.
9. Keele, C.A., Niel, E and Joels N, Samson Wright's **Applied Physiology**, Oxford University Press.

**COMPUTER FUNDAMENTALS AND
PROGRAMMING**

Unit-1. Definition and Overview of Computer, Computer classification, Computer Organization, Computer code, computer classification of Boolean algebra. Input Devices Out put devices, Storage devices. Computer Software, Types of software. Overview of Computer Networks, LAN, MAN, WAN, Internet, Intranet, network topology. Internetworking: Bridges, Repeaters and Routers. [08]

Unit-2. Introduction: Operating system and function, Evolution of operating system, Batch, Interactive, Time sharing and Real Time System. Single User Operating System and Multi-user Operating system, Compare MS-DOS vs. UNIX, Various window features. Internal and External commands in MS-DOS. [08]

Unit-3. Introduction to MS-OFFICE-2003, word 2003 Document creation, Editing, formatting table handling, mail merge, Excel-2003, Editing, working Retrieval, Important functions, short cut keys used in EXCEL. [08]

Unit-4. MS-Power point 2003-Job Profile, Elements of Power point , ways of delivering Presentation, concept of Four P's (Planning , Preparation, Practice and Presentation) ways of handling presentations e.g. creating, saving slides show controls, Adding formatting, animation and multimedia effects. Database system concepts, Data models schema and instance , Database language, Introduction to MS-Access 2003, main components of Access tables, Queries, Reports, Forms table handling, working on Query and use of database. [08]

Unit-5. Computer applications in Pharmaceutical and clinical studies, uses of Internet in Pharmaceutical Industry. [08]

PHARM- 204P

COMPUTER FUNDAMENTALS AND PROGRAMMING (LAB)

Software Lab to be used for the following:-

1. Windows, Managing Windows, Working with Disk , Folders and files.
2. MS-Office 2003 (MS Word, MS Power point, MS Excel, MS Access).
3. Computer Operating System Like DOS and Windows.
4. Internet Features (E-mail, Browser etc.)

BOOKS RECOMMENDED: (Latest Edition)

1. Sinha, R.K., **Computer Fundamentals**, BPB Publications.
2. Raja Raman, V, **Computer Programming** in 'C', PHI Publication.
3. Hunt N and Shelley J. **Computers and Common Sense** Prentice Hall of India.
4. G.N.Rao, **Biostatistics & computer Applications** .Pharmamed Press Hyderabad.

UNIT OPERATION- I
(Pharmaceutics-III)

Unit-1. 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. [08]

Unit-2. Basis of Unit Operations: Mechanism of Fluid flow, Significance of Reynolds Number, Distribution of Velocities across the Tube, Heat Transfer, Methods of Heat Transfer, Combination of Heat Transfer Methods, Mass Transfer, Solid / Fluid Mass Transfer, Application in Unit Operation. [08]

Unit-3. (A) Size Reduction: Objectives, Factors Affecting, Energy Requirements, Mechanisms, Methods of Size Reductions. Equipments used- Principle, material of construction , Applications advantages and disadvantages of cutter mill, hammer mill, roller mill, ball mill, fluid energy mill, wet grinding .

(B) Size Separation: Standards for Powders, Pharmacopoeal classification , Sieves, Materials used for Sieves, Sieving Methods, Fluid Classification Methods, Sedimentation and Elutriation, Equipments used: Principle, material of construction , Applications advantages and disadvantages of cyclone separator, sedimentation tank . [08]

Unit-4. Mixing: Definition and objectives, Type of Mixtures, Liquid Mixing, powder Mixing, Semi solids, mixing equipment: Principle, material of construction, Applications advantages and disadvantages of shaker mixer, propeller mixer, turbine mixer ,paddle mixer, planetary mixer, double cone mixer, V mixer, sigma mixer and colloid mill, ultrasonic mixer. [08]

Unit-5. Filtration: Factors Affecting, Rate of Filtration, Properties of the filter medium and filter cake, Mechanism of Filtration, Filter Media and aids, Principle, material of construction , Applications advantages and disadvantages of Industrial Filters, Filter Leaf, Filter Press, Rotary Filter ,membrane filter,ultra filter, Edge Filter and filters for gases .

Centrifugation: principle, factor affecting , Principle, material of construction , Applications advantages and disadvantages of perforated basket centrifuge , tubular bowl centrifuge conical disc centrifuge , ultra centrifuge [08]

UNIT OPERATION- I (LAB)

PRACTICAL

1. Measurement of rate of flow of fluids and pressure by:

- a) Simple and differential manometers
- b) Venturimeter
- c) Orifice meter

2. Determination of Reynold Number.

3. Study of factors affecting rate of filtration

- a) Effect of different filter media
- b) 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.
- b) Solid – liquid separation and stability of suspension.

5. Experiments to illustrate principles of size reduction using Ball Mill. Effect of size of balls, number of balls and time on the efficiency of ball mill

6. Experiments to illustrate mixing efficiency. Solid-Solid mixing.
7. Particle size analysis by sieving and microscopy.

BOOKS RECOMMENDED: (Latest Edition)

1. Badger W.L. and 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. and 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.
6. Cooper and Gunn's **Tutorial Pharmacy**, CBS Publishers, New Delhi