Pharm. D. (Doctor of Pharmacy) (1st Year)

Year 1st		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MPHD1-101	Human Anatomy and Physiology	3	1	-	40	60	100	4
MPHD1-102	Pharmaceutics	2	1	-	40	60	100	3
MPHD1-103	Medicinal Biochemistry	3	1	-	40	60	100	4
MPHD1-104	Pharmaceutical Organic Chemistry	3	1	-	40	60	100	4
MPHD1-105	Pharmaceutical Inorganic Chemistry	2	1	-	40	60	100	3
MPHD1-106	Remedial Mathematics#/ Biology*	3	1	-	40	60	100	4
MPHD1-107	Human Anatomy and Physiology (P)	-	-	4	60	40	100	2
MPHD1-108	Pharmaceutics (P)	-	--	4	60	40	100	2
MPHD1-109	Medicinal Biochemistry (P)	-	-	4	60	40	100	2
MPHD1-110	Pharmaceutical Organic Chemistry (P)	-	-	4	60	40	100	2
MPHD1-111	Pharmaceutical Inorganic Chemistry (P)	-	-	4	60	40	100	2
MPHD1-112	Biology* (P)	-	-	4	60	40	100	2
Total		**16**	**6**	**20# / 24***	**540# / 600***	**560# / 600***	**1100# / 1200***	**32# / 34***

Note: 102 refers to subject of 1st year having code 02.

*Applicable ONLY for the students who have studied Mathematics/Physics/Chemistry at HSC and appearing for Remedial Biology (RB) course.

#Applicable ONLY for the students who have studied Physics/Chemistry/Botany/Zoology at HSC and appearing for Remedial Mathematics (RM) course.

Year 2nd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MPHD1-213	Pathophysiology	3	1	-	40	60	100	4
MPHD1-214	Pharmaceutical Microbiology	3	1	-	40	60	100	4
MPHD1-215	Pharmacognosy & Phytopharmaceuticals	3	1	-	40	60	100	4
MPHD1-216	Pharmacology-I	3	1	-	40	60	100	4
MPHD1-217	Community Pharmacy	2	1	-	40	60	100	3
MPHD1-218	Pharmacotherapeutics-I	3	1	-	40	60	100	4
MPHD1-219	Pharmaceutical Microbiology (P)	-	-	2	60	40	100	1
MPHD1-220	Pharmacognosy & Phytopharmaceuticals (P)	-	--	2	60	40	100	1
MPHD1-221	Pharmacotherapeutics-I (P)	-	-	2	60	40	100	1
MPHD1-222	Pharmacology-I (P)	-	-	2	60	40	100	1
Total		**17**	**6**	**8**	**500**	**500**	**1000**	**27**

Note: 213 refers to subject of 2nd year having code 13.

HUMAN ANATOMY AND PHYSIOLOGY

Subject Code – MPHD1-101 **L T P C** **Duration – 75 Hrs**
3 1 0 4

Scope and Objectives: This course is designed to impart a fundamental knowledge on the structure and functions of the human body. It also helps in understanding both homeostasis mechanisms and homeostatic imbalances of various body systems. Since a medicament, which is produced by pharmacist, is used to correct the deviations in human body, it enhances the understanding of how the drugs act on the various body systems in correcting the disease state of the organs.

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

1. Describe the structure (gross and histology) and functions of various organs of the human body;
2. Describe the various homeostatic mechanisms and their imbalances of various systems;
3. Identify the various tissues and organs of the different systems of the human body;
4. Perform the hematological tests and also record blood pressure, heart rate, pulse and respiratory volumes;
5. Appreciate coordinated working pattern of different organs of each system; and
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body

Syllabus

1. **Scope of Anatomy and Physiology (07 Hrs):** Scope, basic medical terminology used in these subjects. Structure of cell, its components and their functions. Elementary Tissues of the Human Body: Epithelial, connective, muscular and nervous tissues, their sub-types and their characteristics.
2. **Osseous System (07 Hrs):** Structure, composition and functions of skeleton, Classification of joints, types of movements of joints, Disorders of joints.
3. **Skeletal Muscles (09 Hrs):** Gross anatomy; physiology of muscle contraction, physiological properties of skeletal muscles and their disorders.
4. **Smooth Muscles (07 Hrs):** Morphology, Electrical and Mechanical Activity, molecular basis of contraction, relation of length to tension and plasticity.
5. **Haemopoietic System (15 Hrs):** Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation. Lymph and Lymphatic System: Composition, formulation and circulation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen.
6. **Cardiovascular System (15 Hrs):** Morphology, Electrical Properties, Pacemaker tissue Basic anatomy of the heart, Physiology of heart, blood vessels and circulation. Cardiovascular System Basic understanding of Cardiac cycle, heart sounds and understanding of Cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation.
7. **Communicable Diseases** (**15 Hrs):** Brief outline, their causative agents, modes of transmission and prevention (Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelitis, helminthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy, syphilis, gonorrhoea, and AIDS).

Recommended Books

1. J. Tortora Gerard and Bryan Derrickson, 'Principles of Anatomy and Physiology', HarperCollins College, New York.
2. Anne Waught & Allison Grant, 'Ross and Wilson's Foundations of Anatomy and Physiology in Health and Illness', Churchill Livingstone, Edinburg.
3. C. Guyton Arthur, 'Physiology of Human Body', Holtsaunders Publishers.
4. C.C. Chatterjee, 'Human Physiology Vol. I & II', Medical Allied Agency, Calcutta.
5. Peter L. Williams, Roger Warwick, Mary Dyson and Lawrence, H. Gray, 'Anatomy' Churchill Livingstone, London.
6. K. Sembulingam & Prema Sembulingam, 'Medical Physiology', 4th Edn., Jay Pee Brothers.

PHARMACEUTICS

Subject Code – MPHD1-102 **L T P C** **Duration – 50 Hrs**
2 1 0 3

Scope and objectives: This course is designed to impart a fundamental knowledge on the art and science of formulating different dosage forms. It prepares the students for most basics of the applied field of pharmacy.

Upon the completion of the course the student should be able to:

a. Know the formulation aspects of different dosage forms
b. Do different pharmaceutical calculation involved in formulation
c. Formulate different types of dosage forms
d. Appreciate the importance of good formulation for effectiveness

Topics

1. a. Introduction to dosage forms - classification and definitions **(06 Hrs)**
   b. Prescription: definition, parts and handling
   c. Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses.
2. History of profession of Pharmacy in India in relation to pharmacy education, industry and organization in brief. **(03 Hrs)**
3. Development of Indian Pharmacopoeia. Salient features of latest edition of IP (IP 2008) and introduction to other Pharmacopoeias such as BP, USP, European Pharmacopoeia, Extra pharmacopoeia and Indian National formulary. **(03 Hrs)**
4. Weights and measures, Calculations involving percentage solutions, allegation, proof spirit, isotonic solutions. **(06 Hrs)**
5. Powders and Granules: Classification advantages and disadvantages, Preparation of simple, compound powders, Insufflations, Dusting powders, Eutectic and Explosive powders, Tooth powder and effervescent powders and granules. **(05 Hrs)**
6. Monophasic Dosage forms: Theoretical aspects of formulation including adjuvant like Vehicles, Organoleptic additives and Stabilizers, with examples. Study of Monophasic liquids (formulation aspects and examples) like gargles, mouth washes, Throat paint, Ear drops, Nasal drops, Liniments and lotions, Enemas and collodion. **(06 Hrs)**
7. Biphasic dosage forms: Suspensions and emulsions, Definition, advantages and disadvantages, classification and formulation of Suspensions and Emulsions. Test for the type of emulsion and stability problems in emulsions. **(06 Hrs)**
8. Suppositories: Definition, advantages and disadvantages, types of base, method of

preparation, Displacement value and evaluation. **(03 Hrs)**

9. Galenicals: Definition, of different extraction processes like infusion, Decoction, Maceration and Percolation. Study of Maceration and Percolation processes. **(06 Hrs)**
10. Surgical aids: Surgical dressings, sutures, ligatures and preparation of surgical catgut **(04 Hrs)**
11. Incompatibilities: Introduction, classification, Examples and methods to overcome Physical and therapeutic incompatibilities. **(02 Hrs)**

Recommended Books

1. Cooper and Gunn, 'Dispensing for Pharmacy Students'.
2. N.K. Jain and S.N. Sharma, 'A text book Professional Pharmacy'.
3. Howard C. Ansel, 'Introduction to Pharmaceutical Dosage'.
4. Remington, 'Pharmaceutical Sciences'.
5. Cooper and Gunn, 'Register of General Pharmacy'.
6. M.L. Schroff, 'General Pharmacy'.

MEDICINAL BIOCHEMISTRY

Subject Code – MPHD1-103 **L T P C** **Duration – 75 Hrs**
3 1 0 4

Scope and Objectives: Biochemistry deals with complete understanding of the molecular level of the chemical process associated with living cells in normal and abnormal state. Clinical chemistry deals with the study of chemical aspects of human life in health and illness and the application of chemical laboratory methods to diagnosis, control of treatment and prevention of diseases. The objective of the present course is providing biochemical facts and the principles to the students of pharmacy.

Upon completion of the course student shall be able to –

a) Understand the catalytic activity of enzymes and importance of enzymes in diagnosis of diseases and therapeutic agents;
b) Know the metabolic pathways of biomolecules in health and illness (metabolic disorders);
c) Understand the genetic organization of mammalian genome, protein synthesis, replication, mutation and repair mechanism.
d) Know the biochemical principles of organ function tests of kidney, liver and endocrine gland; and
e) Do the qualitative analysis and determination of biomolecules in the body fluids and their clinical significance.

Syllabus

1. **Introduction to biochemistry:** Cell and its biochemical organization, transport process across the cell membranes. Energy rich compounds; ATP, Cyclic AMP and their biological significance. **(05 Hrs)**
2. **Enzymes**: Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases. **(10 Hrs)**
3. **Carbohydrate metabolism**: Glycolysis, citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, glycogenesis gluconeogenesis. Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases); Glucose tolerance test and its significance; hormonal regulation of carbohydrate metabolism. **(11 Hrs)**

4. **Lipid metabolism:** Beta-Oxidation of saturated fatty acid; Ketogenesis and ketolysis; biosynthesis of fatty acids and lipids; metabolism of cholesterol; Hormonal regulation of lipid metabolism. Defective metabolism of lipids (Atherosclerosis, fatty liver, hypercholesterolemia).
5. **Biological oxidation** (**09 Hrs):** Enzymes and Coenzyme system involved in Biological oxidation. Electron transport chain (its mechanism in energy capture, regulation and inhibition); Oxidative phosphorylation and uncouplers of ETC.
6. **Protein and amino acid metabolism** (**08 Hrs):** protein turn over; nitrogen balance; general reactions of catabolism of amino acids (Transamination, deamination & decarboxylation). Urea cycle and its metabolic disorders; production of bile pigments; hyperbilirubinemia, porphorias, jaundice. Metabolic disorder of Amino acids.
7. **Nucleic acid metabolism** (**12 Hrs):** Metabolism of purine and pyrimidine nucleotides; Protein synthesis; Genetic code; inhibition of protein synthesis; DNA damage and repair mechanism; DNA replication (semi conservative).
8. **The kidney function tests (03 Hrs):** Role of kidney; Laboratory tests for normal function includes
   a) Urine analysis (macroscopic and physical examination, quantitative and semi quantitative tests.)
   b) Test for NPN constituents. (Creatinine /urea clearance, determination of blood/
   c) urine creatinine, urea and uric acid)
   d) Urine concentration test
   e) Urinary tract calculi (stones)
9. **Liver function tests (04 Hrs):** Physiological role of liver, metabolic, storage, excretory, protective, circulatory functions and function in blood coagulation.
   a) Test for hepatic Dysfunction-Bile pigments metabolism.
   b) Test for hepatic function test- Serum bilirubin, urine bilirubin, and urine urobilinogen.
   c) Dye tests of excretory function.
   d) Tests based upon abnormalities of serum proteins.
   e) Selected enzyme activity determination tests.
10. **Lipid profile tests (03 Hrs):** Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.
11. **Immunochemical techniques (04 Hrs):** for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases. Radio immuno assay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA).
12. **Electrolytes (06 Hrs):** Body water, compartments, water balance, and electrolyte distribution. Determination of sodium, calcium potassium, chlorides, bicarbonates in the body fluids

Recommended Books

1. Martin, ‘Harpers review of Biochemistry’.
2. D. Satyanarayana, ‘Text Book of Biochemistry’.
3. Alex Kaplan & Laverve L. Szabo, ‘Text Book of Clinical Chemistry’.
4. Lehninger, ‘Principles of Biochemistry’.
5. Ramarao, ‘Text Book of Biochemistry’.
6. David T. Plummer, ‘Practical Biochemistry’.
7. Pattabhiraman, ‘Practical Biochemistry’.

PHARMACEUTICAL ORGANIC CHEMISTRY

Subject Code – MPHD1-104 **L T P C** **Duration – 75 Hrs**
3 1 0 4

Scope and objectives: This course is designed to impart a very good knowledge about

a) IUPAC/Common systems of nomenclature of simple organic compounds belonging to different classes of organic compounds
b) Some important physical properties of organic compounds
c) Free radical/ nucleophylic [alkyl/ acyl/ aryl] /electrophylic- substitution, free radical/ nucleophylic / electrophylic- addition, elimination, oxidation and reduction reactions with mechanism, orientation, order of reactivity, stability of compounds
d) Some named organic reactions with mechanisms
e) Uses of organic compounds in pharmacy.

At the end of the course the student should be able to

a) name, write the structure of organic compound
b) name the type of isomerism
c) compare physical properties
d) tell the name, class of reaction
e) tell the method of conversion of compounds
f) account for reactivity, orientation of reactions
g) prepare organic compounds
h) identify, confirm the identification of organic compound

SYLLABUS

Topic

1. Classification and Nomenclature **(10 Hrs)**

Different types of classification of organic compounds

a. Common- IUPAC systems of nomenclature of following classes of open chain compounds. Hydrocarbons, halohydrocarbons, alcohols, aldehydes, ketones, carboxylic acids, carboxylic acid halides, carboxylic acid amides, carboxylic acid esters, acid anhydrides, amines, ethers
b. Nomenclature of alicyclic compounds and aromatic compounds (non-heterocyclic)

2. Isomerism **(04 Hrs)**

a. Structural isomerism, chain isomerism, positional isomerism, functional isomerism, metamerism, tautomerism
b. Stereo isomerism, optical isomerism, geometrical isomerism
c. specification of configuration, conformational isomerism

3. Structure and Properties **(05 Hrs)**

a. Polar molecules, nonpolar molecules, protic molecules, aprotic molecules
b. Inter molecular forces
c. Melting point, boiling point of organic compounds, solubility of organic compounds

4. Alkanes **(03 Hrs)**

Free radical substitution reactions of alkanes- reactivity, inhibition. Reaction between methane, ethane, propane and halogens

5. Alkenes **(08 Hrs)**

a) Dehydrohalogenation reactions of alkyl halides- kinetics, rearrangement of carbo cations, reactivity, orientation

b) Dehydration of alcohols reactions- kinetics, rearrangement of carbo cations, reactivity, orientation
c) E1 versus E2 reactions
   i) Electrophilic addition reactions of alkenes- orientation, rearrangement of carbo cations, reactivity
   ii) Free radical addition reactions of alkenes- orientation, reactivity

6. Alkyl halides (**03 Hrs)**

Preparation of alkyl halides from alcohols by Nucleophilic substitution reactions Nucleophilic substitution reactions of alkyl halides- kinetics, reactivity, rearrangement of carbocations, solvent effect, stereochemistry, SN^1 versus SN^2 reactions.

7. Alicyclic compounds (**03 Hrs)**

a. Baeyer's strain theory, Sachse Mohr theory
b. General methods of preparation

8. Dienes (**03 Hrs)**

Classification, stability, eases of formation of conjugated dienes, electrophylic and free radical addition reactions of conjugated dienes

9. Aromatic compounds (**08 Hrs)**

a) Evidences in the derivation of structure of Benzene, aromatic characters
b) i. Electrophylic substitution reactions of Benzene- nitration, sulfonation, halogenations, reactivity of halogens, Friedel craft's alkylation, reactivity of alkyl halides and limitation of Friedel crafts alkylation reactions, Friedel crafts acylationbreactions.
   ii. Classification of substituents
   iii. Orientation of mono substituted Benzene compounds towards electrophylic substitution reactions.
c) Nucleophilic aromatic substitution reactions- reactivity, comparison with aliphatic nucleophylic substitution reactions

10. Carbonyl compounds (**06 Hrs)**

a) Nucleophylic addition reactions, reactions between carbonyl compounds and hydrogen cyanide, Sodium bisulphite, hydroxyl amine, hydrazine, phenyl hydrazine, 2,4- dinitro phenyl hydrazine, alcohol
b) Aldol, crossed aldol, Cannizaro, crossed Cannizaro, Benzoin, Perkin reactions

11. Carboxylic acids and derivatives (**05 Hrs)**

a) Acidity of carboxylic acids and effect of substituents on it.
b) Nucleophylic acyl substitution reactions, esterification.
c) Comparison of alkyl nucleophilic substitution with nucleophilic acyl substitution reactions

12. Amines (**03 Hrs)**

a) Basicity of amines
b) Hoffmanns degradation of amides, diazotization reactions, coupling reactions, replacement reactions of aromatic diazonium salts

13. Phenols (**03 Hrs)**

a) Acidity of phenols
b) Kolbe's synthesis, Riemer tiemann reactions, pthalein reaction, Schotten Bauman reaction, Libermann's nitrosation reaction

14. Heterocyclic compounds (**04 Hrs)**

Classification, nomenclature of mono and bicyclic compounds, medicinal uses of some

important heterocyclic compounds

15. Carbohydrates **(03 Hrs)**

Classification, qualitative tests

16. Amino acids and proteins **(04 Hrs)**

a) Classification of amino acids, qualitative tests for amino acids

b) Classification, structure, colour reactions of proteins. Qualitative tests for proteins

Recommended Books

1. T.R. Morrison and R. Boyd, 'Organic Chemistry'.
2. Bentley and Driver, 'Text Book of Pharmaceutical Chemistry'.
3. I.L. Finar, 'Organic Chemistry - The Fundamentals of Chemistry'.
4. P.L. Soni, 'Organic Chemistry'.
5. B.S. Bahl and Arun Bahl, 'Text Book of Organic Chemistry'.
6. J.M. Cram and D.J. Cram, 'Organic Chemistry'.
7. Brown, 'Organic Chemistry'.
8. Jerry March, 'Advanced Organic Chemistry', Wiley Publications.
9. Cram and Hammered, 'Organic Chemistry', Pine Hendrickson

PHARMACEUTICAL INORGANIC CHEMISTRY

Subject Code – MPHD1-105 **L T P C** **2 1 0 3** **Duration – 50 Hrs**

Scope and objectives: This course mainly deals with fundamentals of analytical chemistry and also the study the Inorganic pharmaceuticals regarding their monographs and also the course deals with basic knowledge of analysis of various pharmaceuticals.

Upon completion of course student shall be able to:

a) Understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceutical;

b) Know the analysis of the inorganic pharmaceuticals their applications

c) Appreciate the importance of inorganic pharmaceuticals in preventing and curing the disease.

Syllabus

1. Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures. **(02 Hrs)**
2. Fundamentals of volumetric analysis, theories of indicators and methods of expressing concentrations. Primary and secondary standard. Preparation and standardization of various volumetric solutions like oxalic acid, sodium hydroxide, hydrochloric acids, sodium thiosulphate, sulfuric acid, potassium permanganate, iodine and ceric ammonium sulphate solutions. **(04 Hrs)**
3. **Acid base titration**: Classification and estimation of strong, weak, and very weak acids and bases. **(02 Hrs)**
4. **Principles of redox titrations**: Concepts of oxidation and reduction. Redox reactions, strength and equivalent weights of oxidizing and reducing agents, theory of redox titrations, cerrimetry, Iodimetry, Iodometry, bromometry, titrations with potassium iodate, potassium bromate, titanous chloride, 2,6- dichlorophenol indophenol. **(03 Hrs)**
5. **Non aqueous titration**: Introduction to solvents, classification and estimation of Sodium benzoate and ephedrine HCl. **(02 Hrs)**

6. **Principles of precipitation titrations:** Different Methods-Mohr's, Modified Mohr's, Volhard's, Modified Volhard's, Fajan's with example. Estimation of sodium chloride by modified volhards method. **(03 Hrs)**
7. **Complexometric titration and its classification**: Estimation of Magnesium sulphate, and Calcium Gluconate by complexometric method. Metal ion indicators. **(03 Hrs)**
8. **Gravimetry**: Introduction to gravimetric method, steps involved in gravimetric method, precipitants and estimation of Barium sulphate by gravimetric method. **(02 Hrs)**
9. **Limit test:** Source and effect of impurities in pharmacopoeial substances, importance of limit test, general principle and procedures for limit test, limit test for chloride, sulphate, iron, arsenic and lead and heavy metals. Special procedure for limit test for chloride and sulphate. **(05 Hrs)**

General methods of preparation, assays*, storage condition and medicinal uses of inorganic compounds belonging to the following classes.

10. **Medicinal gases:** Oxygen, Nitrous oxide, Carbon dioxide **(01Hr)**
11. **Acidifies**: Dil HCl, Ammonium Chloride* **(01Hr)**
12. **Antacid**: Aluminum hydroxide gel*, sodium bicarbonate*, Magnesium trisilicate, Magnesium carbonate (Light and Heavy), Magnesium hydroxide mixture*, Preparation containing combination of antacids. **(03 Hrs)**
13. **Cathartics**: Magnesium sulphate, Sodium orthophosphate **(01 Hr)**
14. **Major extra and intracellular electrolytes**: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Sodium chloride Injection, Sodium chloride compound injection, Potassium chloride, Potassium chloride injection, Calcium Gluconate* and Electrolyte combination therapy and ORS, Physiological acid base balance. **(04 Hrs)**
15. **Essential trace elements:** Copper, Iron, Iodine and Zinc **(01 Hr)**
16. **Antimicrobials:** Potassium permanganate*, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations, Boric acid*. **(03 Hrs)**
17. **Pharmaceutical aids:** Bentonite, sodium metabisulphite, Barium sulphate*. **(01 Hr)**
18. **Dental products:** Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, Stannous fluoride, Zinc Eugenol cement. **(02 Hrs)**
19. **Miscellaneous compounds:**
    i) Expectorants: Potassium iodide*
    ii) Haematinics: Ferrous sulphate*, Ferrous gluconate, Ferrous fumarate,
    iii) Emetics: Copper sulphate*, Sodium potassium tartarate
    iv) Poison and Antidote: Sodium thiosulphate, Activated charcoal, **(04 Hrs)**
20. **Radiopharmaceuticals:** Radio activity, natural radio activity and artificial radio activity. Measurement of radioactivity, Properties of α, β, γ radiations, Hal-life, radio isotopes and study of radio isotopes sodium iodide I-121, Ferric citrate Fe-59. Storage conditions, precautions & pharmaceutical application of radioactive substances. **(02 Hrs)**

*** Assay of these compounds should be study.**

Recommended Books

1. A.H. Beckett and J.B. Stenlake, 'Practical Pharmaceutical Chemistry Vol I and II', 4th Edn., Stahl one Press of University of London.
2. Vogel, 'Text Book of Quantitative Inorganic Analysis'.
3. P. Gundu Rao, 'Inorganic Pharmaceutical Chemistry', 3rd Edn.

4. Surendra N. Pandey, 'A Text Book of Inorganic Medicinal Chemistry'.
5. M.L Schroff, 'Inorganic Pharmaceutical Chemistry'.
6. Bentely and Driver, 'Textbook of Pharmaceutical Chemistry'.
7. Dr. A.V. Kasture et al, 'Pharmaceutical Analysis Vol - I', 13th Edn., Nirali Prakashan,
8. Anand and Chetwal, 'Inorganic Pharmaceutical Chemistry'.
9. John H. Kennedy, 'Analytical Chemistry Principles'.

REMEDIAL MATHEMATICS

Subject Code – MMAT0-105 **L T P C** **Duration – 75 Hrs**
3 1 0 4

1. **Scope and objectives**: This is an introductory course in mathematics. This subjects deal with the introduction to matrices, determinants, trigonometry, analytical geometry, differential calculus, integral calculus, differential equations, Laplace transform.
   Upon completion of the course the student shall be able to: –
   a) Know Trigonometry, Analytical geometry, Matrices, Determinant, Integration,
   b) Differential equation, Laplace transform and their applications;
   c) Solve the problems of different types by applying theory; and
   d) Appreciate the important applications of mathematics in pharmacy.

Syllabus

1. **Algebra:** Matrices: Definition, Addition, Subtraction and Multiplication of matrices, Determinants: Determinants of order two and three, Properties of determinants (without Proof). Inverse of square Matrices, Adjoint of square matrix, Solution of linear equation by Matrix method, Cramer's rule, Characteristic equation, Statement of Cayley-Hamilton Theorem (Without Proof) – Pharmaceutical examples **(18 Hrs)**
2. **Trigonometry:** Relation between Sides and angles of a triangle, solution of triangles – Simple problems **(05 Hrs)**
3. **Analytical Geometry:** Points, Straight line, Types of straight lines – Y= mx + c, (y-y1) = m*(x-x1), (y-y1) = ((y2-y1)/(x2-x1))*(x-x1) Parallel and Perpendicular straight lines, Angle between two lines, Perpendicular distance from a point to the line, distance between parallel lines, Circle: General equation of circle, finding centre and radius of the circle, Parabola: Equation of the parabola y2= 4ax , Simple problems **(15Hrs)**
4. **Differential Calculus:** Function, Limit, Differentiation, Differentiation of sum, Product, Quotient, Composite, Parametric, exponential, trigonometric and Logarithmic function. Successive differentiation, simple problems. **(16 Hrs)**
5. **Integral Calculus:** Partial fractions, Definition of integration, integration by substitution and integration by parts, Properties of definite integrals, Simple problems. **(07 Hrs)**
6. **Differential equations:** Definition, order, degree, variable separable, homogeneous differential equation, linear differential equation, exact differential equation, Simple problems. **(10 Hrs)**
7. **Laplace Transform:** Definition, Laplace transform of elementary functions, linearity and shifting property, simple problems. **(04 Hrs)**

Recommended Books

1. Shantinarayan, 'Differential Calculus'.
2. Prof. B.M. Sreenivas, 'Text book of Mathematics for second year pre-university'.
3. Shanthinarayan, 'Integral Calculus'.

4. B.S. Grewal, 'Engineering Mathematics'.
5. S.L. Loncy, 'Trigonometry Part-I'.

REMEDIAL BIOLOGY

Subject Code – MPHD1-106 **L T P C** **Duration – 75 Hrs**
3 1 0 4

Scope and Objectives: This is an introductory course in Biology, which gives detailed study of natural sources such as plant and animal origin. This subject has been introduced to the pharmacy course in order to make the student aware of various naturally occurring drugs and its history, sources, classification, distribution and the characters of the plants and animals. This subject gives basic foundation to Pharmacognosy.

Syllabus

PART – A

1. Introduction **(02 Hrs)**
2. General organization of plants and its inclusions **(04 Hrs)**
3. Plant tissues **(04 Hrs)**
4. Plant kingdom and its classification **(04 Hrs)**
5. Morphology of plants **(04 Hrs)**
6. Root, Stem, Leaf and Its modifications **(05 Hrs)**
7. Inflorescence and Pollination of flowers **(04 Hrs)**
8. Morphology of fruits and seeds **(04 Hrs)**
9. Plant physiology **(04 Hrs)**
10. Taxonomy of Leguminosae, umbelliferae, Solanaceae, Lilliaceae, Zinziberaceae, Rubiaceae **(06 Hrs)**
11. Study of Fungi, Yeast, Penicillin and Bacteria **(04 Hrs)**

PART-B

1. Study of Animal cell **(04 Hrs)**
2. Study animal tissues **(04 Hrs)**
3. Detailed study of frog **(08 Hrs)**
4. Study of Pisces, Reptiles, Aves **(05 Hrs)**
5. General organization of mammals **(05 Hrs)**
6. Study of poisonous animals **(04 Hrs)**

Recommended Books

a. S.B. Gokhale, 'Text Book of Biology'.
b. Dr. Thulajappa and Dr. Seetaram, 'A Text Book of Biology'.
c. B.V. Sreenivasa Naidu, 'A Text Book of Biology'.
d. Naidu and Murthy, 'A Text book of Biology'.
e. A.C. Dutta, 'Botany for Degree Students'.
f. M. Ekambaranatha Ayyer and T.N. Ananthakrishnan, 'Outlines of Zoology'.
g. S.B. Gokhale and C.K. Kokate, 'A Manual for Pharmaceutical Biology Practical'.

HUMAN ANATOMY AND PHYSIOLOGY

Subject Code – MPHD1-107 **L T P C**
0 0 4 2

General Requirements: Laboratory napkin, muslin cloth, record, observation book (100pages), stationary items, and blood lancet.

List of Experiments:

1. Study of compound microscope.
2. Study of tissues of human body
   a) Epithelial tissue.
   b) Muscular tissue.
3. Study of tissues of human body
   (a) Connective tissue.
   (b) Nervous tissue.
4. Study of appliances used in haematological experiments.
5. Determination of total WBC count of blood.
6. Determination of total RBC count of blood.
7. Determination of differential leukocyte count of blood.
8. Determination of
   (a) Erythrocyte Sedimentation Rate. (ESR)
   (b) Haemoglobin content of blood.
   (c) Bleeding time & clotting time.
9. Determination of
   (a) Blood pressure.
   (b) Blood group.
10. Study of various systems with the help of charts, models & specimens
    (a) Skeleton system part I-axial skeleton.
    (b) Skeleton system part II- appendicular skeleton.
    (c) Cardiovascular system.
    (d) Respiratory system.
    (e) Digestive system.
    (f) Urinary system.
    (g) Nervous system.
    (h) Special senses.
    (i) Reproductive system.
11. Study of different family planning appliances.
12. Study of pregnancy diagnosis test.
13. Study of appliances used in experimental physiology.
14. Study of record of simple muscle curve using gastrocnemius sciatic nerve preparation.
15. Study of simple summation curve using gastrocnemius sciatic nerve preparation.
16. Study of simple effect of temperature using gastrocnemius sciatic nerve preparation.
17. Study of simple effect of load & after load using gastrocnemius sciatic nerve preparation.
18. Study of fatigue curve using gastrocnemius sciatic nerve preparation.

Recommended Books

1. R.K. Goyal, M.P. Natvar and S.A. Shah, 'Practical Anatomy, Physiology and Biochemistry', B.S. Shah Prakashan, Ahmedabad.

2. V.G. Ranade, 'Text book of Practical Physiology', PVG Publishers, Pune.
3. 'Anderson Experimental Physiology'.

PHARMACEUTICS

Subject Code – MPHD1-108 **L T P C**
0 0 4 2

List of Experiments:

1. Syrups
a) Simple Syrup I.P
b) Syrup of Ephedrine Hydrochloride NF
c) Orange Syrup

2. Elixir
a) Piperizine citrate elixir BP
b) Paracetamol elixir BPC

3. Linctus
a) Simple linctus BPC
b) Pediatric simple linctus BPC

4. Solutions
a) Solution of cresol with soap IP
b) Aqueous Iodine Solution IP
c) Strong solution of Iodine IP
d) Strong solution of ammonium acetate IP

5. Liniments
a) Liniment of turpentine IP*
b) Liniment of camphor IP

6. Suspensions*
a) Calamine lotion
b) Magnesium Hydroxide mixture BP

7. Emulsions*
a) Cod liver oil emulsion
b) Liquid paraffin emulsion

8. Powders*
a) Eutectic powder
b) Dusting powder
c) Insufflations

9. Suppositories*
a) Boric acid suppositories
b) Chloral suppositories

10. Incompatibilities
a) Preparations having with Physical Incompatibilities (3 Nos)

* colourless bottles required for dispensing & Paper envelope (white), butter paper and white paper required for dispensing.

MEDICINAL BIOCHEMISTRY

Subject Code – MPHD1-109 **L T P C**
0 0 4 2

Title of the Experiment:

1. Qualitative analysis of normal constituents of urine.
2. Qualitative analysis of abnormal constituents of urine.
3. Quantitative estimation of urine chlorides by Volhard's method.
4. Quantitative estimation of urine creatinine by Jaffe's method.
5. Quantitative estimation of urine calcium by precipitation method.
6. Quantitative estimation of serum cholesterol.
7. Preparation of Folin Wu filtrate from blood.
8. Quantitative estimation of blood creatinine.
9. Quantitative estimation of blood sugar Folin-Wu tube method.
10. Estimation of SGOT in serum.
11. Estimation of SGPT in serum.
12. Estimation of Urea in Serum.
13. Estimation of Proteins in Serum.
14. Determination of serum bilirubin
15. Determination of Glucose by means of Glucose oxidase.
16. Enzymatic hydrolysis of Glycogen/Starch by Amylases.
17. Study of factors affecting Enzyme activity. (pH & Temp.)
18. Preparation of standard buffer solutions and its pH measurements (any two)
19. Experiment on lipid profile tests
20. Determination of sodium/calcium / potassium in serum.

PHARMACEUTICAL ORGANIC CHEMISTRY

Subject Code – MPHD1-110 **L T P C**
0 0 4 2

Title of the experiment

1. Recrystallization of organic compounds
2. Preparation of simple non hetero cyclic organic compounds and recrystallization of compounds prepared.
   (Minimum of 08 compounds)
   Aspirin/Benzanilide/Phenyl benzoate/Acetanilide by acylation
   2,4,6-Tribromo aniline/Para bromo acetanilide by halogenations
   5-Nitro salicylic acid/Meta di nitro benzene by nitration
   Dibenzal acetone from benzaldehyde by Claisen Schmidt
   Benzoic acid from benzyl chloride by oxidation
   Benzoic acid/Salicylic acid by hydrolysis
   1- Phenyl azo -2- napthol from aniline by diazotization and coupling
   Benzophenone oxime from benzophenone
3. Systematic qualitative analysis of unknown organic compounds for preliminary and Lassaigns tests.

4. Systematic qualitative analysis of unknown organic compounds for functional groups (for preliminary / Lassaigns / solubility / functional group tests)
   Following classes of compounds may be analyzed
   Phenols, amide/ urea, carbohydrate, amine, carboxylic acid, aldehyde, ketone, alcohol, carboxylic acid ester, hydrocarbon, halohydrocarbon, nitrocompound, anilide
5. Determination of melting and boiling points of organic compounds
6. Preparation of suitable solid derivatives from organic compounds
7. Introduction to the use of stereomodels – Methane,Ethane, Ethene,
   Acetylene, Cyclo hexane, Benzene (Students to prepare the ball and stick stereo models using china clay, plastic sticks individually and to explain the formation of bonds& bond angles, bond lengths).

Recommended Books

a) Mann and Saunders, 'Practical Organic Chemistry'
b) Pavia, Lampman, Kriz, 'Introduction to Organic Laboratory Techniques'
c) Vogel, 'Text book of Practical Organic Chemistry'

PHARMACEUTICAL INORGANIC CHEMISTRY (P)

Subject Code – MPHD1-111 **L T P C**
0 0 4 2

Following Experiments to be Covered in 25 Different Practical Classes)

1. Limit Tests (7 exercises) *
   a) Limit Test for Chlorides
   b) Limit Test for Sulphate
   c) Limit Test for Iron
   d) Limit Test for Heavy Metals
   e) Limit Test for Arsenic
   f) Modifications in Limit Tests for Chloride and Sulphates in Potassium Permanganate,
   g) Sodium Bicarbonate, Sodium Benzoate and Sodium Salicylate.
2. Preparation and Standardization of the Following (3 exercises) *.
   a) 0.IN NaOH
   b) 0.IN $KMnO_4$
   c) 0.IN Ceric ammonium sulphate
   d) 0.IN $HClO_4$
   e) 0.05M Disodium EDTA
   f) 0.IN Sodium thiosulphate
3. Assay of the Following Compounds*
   a) Ammonium Chloride-Acid Base Titration (Formal titration)
   b) Ferrous Sulphate- (Redox) Ceric Ammonium Sulphate Titration
   c) Copper Sulphate- (redox) Iodometry
   d) Calcium Gluconate-Complexometry
   e) Hydrogen Peroxide- (redox -Permanganometry)
   f) Sodium Benzoate-Nonaqueous Titration
   g) Sodium Chloride-Modified Volhard's Method
   h) Assay of KI-KIO_3 titration
   i) Assay of Zinc Oxide (Acid Base Back Titration)

4. Test for Identify for the Following (2 exercises) *
   a) Sodium Bicarbonate
   b) Ferrous Sulphate
   c) Potassium Iodide.
   d) Calcium Chloride
5. Test for purity for the following (2 exercises) *
   a) Swelling Power in Bentonite
   b) Ammonium Salts in Potash alum.
   c) Presence of Iodates in KI
6. Preparation of inorganic pharmaceuticals (2 exercises) *
   a) Boric Acid
   b) Potash Alum
   c) Magnesium Hydroxide.
   d) Magnesium Sulphate

BIOLOGY

Subject Code – MPHD1-112 **L T P C**
0 0 4 2

1. Introduction of Biology Experiments (Section Cutting Techniques,
2. Mounting and Staini9ng, Permanence Slide Preparation and Microscope)
3. Study of Cell Wall Constituents and Cell Inclusions
4. Study of Stem Modifications
5. Study of Root Modifications
6. Study of Leaf Modifications
7. Identification of Fruits and Seeds
8. Preparation of Permanent Slides
9. Simple Plant Physiological Experiments
10. Identification of Animals
11. Detailed Study of Frog by Using Computer Models
12. Computer Based Tutorials

PATHOPHYSIOLOGY

Subject Code – MPHD1-213 **L T P C**
3 1 0 4

1. **Scope of the Subject:** This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic Pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge of its application in other subject of pharmacy.
2. **Objectives of the Subject:** Upon completion of the subject student shall be able to
   a. Describe the etiology and pathogenesis of the selected disease states;
   b. Name the signs and symptoms of the diseases; and
   c. Mention the complications of the diseases.

Recommended Text Books

1. Cotran, Kumar, Robbins, 'Pathologic basis of Disease'.
2. Harsh Mohan, 'Text book of Pathology'.
3. Y.M. Bhinde, 'Text book of Pathology'.

Reference Books

1. Roger Walker, 'Clinical Pharmacy and Therapeutics' 2nd Edn., Churchill Livingstone.

Detailed syllabus and lecture wise schedule: Chapter

1 **Basic principles of cell injury and Adaptation**

a. Causes, Pathogenesis and morphology of cell injury
b. Abnormalities in lipoproteinaemia, glycogen infiltration and glycogen infiltration and glycogen infiltration and glycogen storage diseases

2 **Inflammation**

a. Pathogenesis of acute inflammation, Chemical mediators in inflammation, Types of chronic inflammation
b. Repairs of wounds in the skin, factors influencing healing of wounds

3 Diseases of Immunity

a. Introduction to T and B cells
b. MHC proteins or transplantation antigens c)
Immune tolerance, Hypersensitivity
c. d)Hypersensitivity type I, II, III, IV, Biological significance, Allergy due to food, chemicals and drugs
d. Autoimmunity

Criteria for autoimmunity, Classifications of autoimmune diseases in man, mechanism of autoimmunity, Transplantation and immunologic tolerance, allograft rejections, transplantation antigens, mechanism of rejection of allograft.

- Acquired immune deficiency syndrome (AIDS)
- Amyloidosis

4 Cancer: Differences between benign and malignant tumors, Histological diagnosis of malignancy, invasions and metastasis, patterns of spread, disturbances of growth of cells, classification of tumors, general biology of tumors, spread of malignant tumors, etiology and pathogenesis of cancer.

5 Types of shock, mechanisms, stages and management

6 Biological effects of radiation

7 Environmental and nutritional diseases

a. Air pollution and smoking- SO2, NO, NO2, and CO
b. Protein calorie malnutrition, vitamins, obesity, pathogenesis of starvation.

8 Pathophysiology of common diseases

a. Parkinsonism
b. Schizophrenia
c. Depression and mania
d. Hypertension,
e. Stroke (ischaemic and haemorrhage)
f. Angina, CCF, Atherosclerosis, Myocardial infarction
g. Diabetes Mellitus
h. Peptic ulcer and inflammatory bowel diseases
i. Cirrhosis and Alcoholic liver diseases

j. Acute and chronic renal failure
k. Asthma and chronic obstructive airway diseases

9 Infectious diseases:

Sexually transmitted diseases (HIV, Syphilis, Gonorrhea), Urinary tract infections, Pneumonia, Typhoid, Tuberculosis, Leprosy, Malaria Dysentery (bacterial and amoebic), Hepatitis- infective hepatitis.

Assignments:

Title of the Experiment

1. Chemical Mediators of inflammation
2. Drug Hypersensitivity
3. Cigarette smoking & its ill effects
4. Biological Effects of Radiation
5. Etiology and hazards of obesity
6. Complications of diabetes
7. Diagnosis of cancer
8. Disorders of vitamins
9. Methods in Pathology-Laboratory values of clinical significance
10. Pathophysiology of Dengue Hemorrhagic Fever (DHF)

Format of the Assignment

1 Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year
4. It shall be computer draft copy.
5. Name and signature of the student
6. Time allocated for presentation may be 8+2 Min.

PHARMACEUTICAL MICROBIOLOGY

Subject Code – MPHD1-214 **L T P C**
3 1 0 4

1. **Scope of the Subject:** Microbiology has always been an essential component of pharmacy curriculum. This is because of the relevance of microbiology to pharmaceutical sciences and more specifically to pharmaceutical industry. Pharmaceutical biotechnology is the logical extension of pharmaceutical microbiology, which is expected to change the complete drug product scenario in the future.
   This course deals with the various aspects of microorganisms, its classification, morphology, laboratory cultivation identification and maintenance. It's also discusses with sterilization of pharmaceutical products, equipment, media etc. The course further discusses the immunological preparations, diseases its transmission, diagnosis, control and immunological tests.
2. **Objectives of the Subject**:
   Upon completion of the subject student shall be able to
   a) Know the anatomy, identification, growth factors and sterilization of microorganisms;
   b) Know the mode of transmission of disease causing microorganism, symptoms of disease, and treatment aspect;
   c) Do estimation of RNA and DNA and there by identifying the source;

d) Do cultivation and identification of the microorganisms in the laboratory;
e) Do identification of diseases by performing the diagnostic tests; and
f) Appreciate the behaviour of motility and behavioural characteristics of microorganisms.

Recommended Text Books

1. Vanitha Kale and Kishor Bhusari, ' Applied Microbiology', Himalaya Publishing House, Mumbai.
2. Mary Louis Turgeon, 'Immunology and Serology in Laboratory Medicines', 2nd Edn., Mosby- Year Book Inc St. Louis Missouri 63146, **1996**.
3. Harsh Mohan, 'Text Book of Pathology', 3rd Edn., B-3 Ansari Road Darya Ganj N. Delhi, **1998**.

Reference Books

1. L.M. Prescot, G.P. Jarley, D.A. Klein, Microbiology, 2nd- edition Mc Graw Hill Company Inc
2. Rawlins E.A. Bentley's Text Book of Pharmaceutics B ailliere Tindals 24-28 London 1988
3. Forbisher —Fundamentals of Microbiology Philidelphia, W.B. Saunders.
4. Prescott L.M. Jarley G.P., Klein.D.A. —Microbiology, 2nd edition WMC Brown Publishers, Oxford. 1993
5. War Roitt, Jonathan Brostoff, David male, —Immunology, 3rd edition 1996, Mosby-year book Europe Ltd, London.
6. Pharmacopoeia of India, Govt of India, 1996.

Detailed syllabus and lecture wise schedule: Title of the topic

1 Introduction to the science of microbiology. Major divisions of microbial world and Relationship among them.

2 Different methods of classification of microbes and study of Bacteria, Fungi, virus, Rickettsiae, Spirochetes.

3 Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures.

4 Different methods used in isolation and identification of bacteria with emphasis to different staining techniques and biochemical reactions. Counting of bacteria -Total and Viable counting techniques.

5 Detailed study of different methods of sterilization including their merits and demerits. Sterilization methods for all pharmaceutical products. Detailed study of sterility testing of different pharmaceutical preparations. Brief information on Validation.

6 Disinfectants- Study of disinfectants, antiseptics, fungicidal and virucidal agent's factors affecting their activation and mechanism of action. Evaluation of bactericidal, bacteristatic, virucidal activities, evaluation of preservatives in pharmaceutical preparations.

7 Immunology- Immunity, Definition, Classification, General principles of natural immunity, Phagocytosis, acquired immunity (active and passive). Antigens, chemical nature of antigens structure and formation of Antibodies, Antigen-Antibody reactions. Bacterial exotoxins and endotoxins. Significance of toxoids in active immunity, Immunization programme, and importance of booster dose.

8 **Diagnostic Tests:** Schick's Test, Elisa test, Western Blot test, Southern Blot PCR Widal, QBC, Mantaux Peripheral smear. Study of malarial parasite.

9 **Microbial Culture Sensitivity Testing:** Interpretation of results Principles and methods of different microbiological assays, microbiological assay of Penicillin, Streptomycin and vitamin B_2 and B_{12}. Standardisation of vaccines and sera.

10 **Study of Infectious D iseases:** Typhoid, Tuberculosis, Malaria, Cholera, Hepatitis, Meningitis, Syphilis & Gonorrhea and HIV.

PHARMACOGNOSY & PHYTOPHARMACEUTICALS

Subject Code – MPHD1-215 **L T P C**
3 1 0 4

1. **Scope and objectives:** This subject has been introduced for the pharmacy course in order to make the student aware of medicinal uses of various naturally occurring drugs its history, sources, distribution, method of cultivation, active constituents, medicinal uses, identification tests, preservation methods, substitutes and adulterants.
2. **Upon Completion of the Course student shall be able to:**
   a. Unders tand the basic principles of cultivation, collection and storage of crude drugs;
   b. Know the source, active constituents and uses of crude drugs; and
   c. Appreciate the applications of primary and secondary metabolites of the plant.
3. **Course Materials:**

Recommended Text Books

1. G.E. Trease & W.C. Evans, 'Pharmacognosy'.
2. C.K. Kokate, Gokhale & A.C. Purohit, 'Pharmacognosy'.

Reference Books

1. Brady & E. Tyler, 'Pharmacognosy'.
2. T.E. Wallis, 'Pharmacognosy'.
3. C.S. Shah & Qadery, 'Pharmacognosy'.
4. M.A. Iyengar, 'Pharmacognosy'.

4. **Lecture wise Programme: Topics**
   1 Introduction.
   2 Definition, history and scope of Pharmacognosy.
   3 Classification of crude drugs.
   4 Cultivation, collection, processing and storage of crude drugs.
   5 Detailed method of cultivation of crude drugs.
   6 Study of cell wall constituents and cell inclusions.
   7 Microscopical and powder Microscopical study of crude drugs.
   8 Study of natural pesticides.
   9 Detailed study of various cell constituents.
   10 Carbohydrates and related products.
   11 Detailed study carbohydrates containing drugs. (11 drugs)
   12 Definition sources, method extraction, chemistry and method of analysis of lipids.
   13 Detailed study of oils.
   14 Definition, classification, chemistry and method of analysis of protein.
   15 Study of plants fibers used in surgical dressings and related products.

16 Different methods of adulteration of crude drugs.

PHARMACOLOGY–I

Subject Code – MPHD1-216 **L T P C**
3 1 0 4

1. **Scope of the Subject:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses,dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, apart from general pharmacology, drugs acting on autonomic nervous system, cardiovascular system, central nervous system, blood and blood forming agents and renal system will be taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.
2. **Objectives of the Subject**: Upon completion of the subject student shall be able to (Know, do, appreciate) –
   a. Understand the pharmacological aspects of drugs falling under the above-mentioned chapters;
   b. Handle and carry out the animal experiments;
   c. Appreciate the importance of pharmacology subject as a basis of therapeutics; and
   d. Correlate and apply the knowledge therapeutically.

Recommended Text Books

1. K.D. Tripathi, ‘ Essentials of Medical Pharmacology’, 4th Edn., JayPee, Delhi, **1999**.
2. R.S. Satoskar and S.D. Bhadarkar, ‘Pharmacology and Pharmacotherapeutics’, 16th Edn., (single volume), Popular, Dubai, **1999**.
3. H.P. Rang & M.M. Dale, ‘Pharmacology’, 4th Edn.,. Churchill Living Stone, **1999**.

Reference Books

1. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman’s the Pharmacological Basis of Therapeutics. 9th Edn., McGraw Hill, Pergamon Press, **1996**.
2. C.R. Craig & R.E. Stitzel, ‘Modern Pharmacology’, Little Brown Co.
3. B.G. Katzung, ‘ Basic and Clinical Pharmacology’, Prentice Hall, Int.
4. Shargel and Leon, ‘ Applied Biopharmaceutics and Pharmacokinetics’, Prentice Hall, London.

Recommended Text Books (Practical)

1. S.K. Kulkarni and P.C. Dandia, ‘Hand Book of Experimental Pharmacology’, Vallab, Delhi.

Reference Books (Practical)

1. L.J. Macleod, ‘Pharmacological Experiments on Intact Preparations’, Churchill Livingstone.
2. L.J. Macleod, ‘ Pharmacological Experiments on Isolated Preparations’, Churchill Livingstone.

Detailed Syllabus and Lecture wise Schedule: **Title of the topic**

1. General Pharmacology

a. Introduction, definitions and scope of pharmacology
b. Routes of administration of drugs
c. Pharmacokinetics (absorption, distribution, metabolism and excretion)
d. Pharmacodynamics
e. Factors modifying drug effects
f. Drug toxicity - Acute, sub- acute and chronic toxicity.
g. Pre-clinical evaluations
h. Drug interactions

Note: The term Pharmacology used here refers to the classification, mechanism of action, pharmacokinetics, pharmacodynamics, adverse effects, contraindications, Therapeutic uses, interactions and dose and route of administration.

2. **Pharmacology of Drugs acting on ANS**

a. Adrenergic and antiadrenergic drugs
b. Cholinergic and anticholinergic drugs
c. Neuromuscular blockers
d. Mydriactics and miotics
e. Drugs used in myasthenia gravis
f. Drugs used in Parkinsonism

3. Pharmacology of drugs acting on cardiovascular system

a. Antihypertensive
b. Anti-anginal drugs
c. Anti-arrhythmic drugs
d. Drugs used for therapy of Congestive Heart Failure
e. Drugs used for hyperlipidaemias

4. Pharmacology of drugs acting on Central Nervous System

a. General anaesthetics
b. Sedatives and hypnotics
c. Anticonvulsants
d. Analgesic and anti-inflammatory agents
e. Psychotropic drugs
f. Alcohol and methyl alcohol
g. CNS stimulants and cognition enhancers
h. Pharmacology of local anaesthetics

5. **Pharmacology of Drugs acting on Respiratory Tract**

a . Bronchodilators
b . Mucolytic
c. Expectorants
d. Antitussives
e. Nasal Decongestants

6. **Pharmacology of Hormones and Hormone antagonists**

a. Thyroid and Antithyroid drugs
b. Insulin, Insulin analogues and oral hypoglycaemic agents
c. Sex hormones and oral contraceptives
d. Oxytocin and other stimulants and relaxants

7. **Pharmacology of autocoids and their antagonists**
   a. Histamines and Antihistaminic
   b. 5-Hydroxytryptamine and its antagonists
   c. Lipid derived autacoids and platelet activating factor

COMMUNITY PHARMACY

Subject Code – MPHD1-217 **L T P C**
2 1 0 3

1. **Scope**: In the changing scenario of pharmacy practice in India, Community Pharmacists are expected to offer various pharmaceutical care services. In order to meet this demand, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling, health screening services for improved patient care in the community set up.
2. **Objectives:** Upon completion of the course, the student shall be able to –
   a. Know pharmaceutical care services;
   b. Know the business and professional practice management skills in community pharmacies;
   c. Do patient counselling & provide health screening services to public in community pharmacy
   d. Respond to minor ailments and provide appropriate medication;
   e. Show empathy and sympathy to patients; and
   f. Appreciate the concept of Rational drug therapy.

Recommended Text Books

1. N.S. Parmar, 'Health Education and Community Pharmacy'.
2. 'WHO Consultative Group Report'.
3. Mohammed Ali & Jyoti, 'Drug Store & Business Management'.

Reference Books

1. 'Handbook of Pharmacy – Health Care', Edt. Robin J. Harman, The Pharmaceutical Press.
2. 'Comprehensive Pharmacy Review', Edt. Leon Shargel. Lippincott Williams & Wilkins.

Special Requirements:

1. Either the college is having model community pharmacy (meeting the schedule N requirement) or sign MoU with at least 4-5 community pharmacies nearby to the college for training the students on dispensing and counselling activities.
2. Special equipment's like B.P. apparatus, Glucometer, Peak flow meter, and apparatus for cholesterol estimation.

3. Scheme of Evaluation (80 Marks)

   a. Synopsis-10
   b. Major Experiment- 30
   c. Minor Experiment (Ability to measure B.P/ CBG / Lung function)- 30
   d. Prescription Analysis (Analyzing the prescriptions for probable drug interaction and ability to tell the management)- 15
   e. Viva – Voce- 15

4. Lecture wise P**rogramme**: **Topics**

1 **Definition, scope, of community pharmacy**
Roles and responsibilities of Community pharmacist

2 **Community Pharmacy Management**
a) Selection of site, Space layout, and design
b) Staff, Materials- coding, stocking
c) Legal requirements
d) Maintenance of various registers
e) Use of Computers: Business and health care soft wares

3 **Prescriptions** – parts of prescription, legality & identification of medication related problems like drug interactions.

4 **Inventory Control in Community Pharmacy** Definition, various methods of Inventory Control **ABC, VED, EOQ, Lead time, safety stock.**

5 **Pharmaceutical Care**
Definition and Principles of Pharmaceutical care.

6 **Patient Counselling**
Definition, outcomes, various stages, barriers, Strategies to overcome barriers Patient information leaflets- content, design, & layouts, advisory labels

7 **Patient Medication Adherence**
Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.

8. **Health Screening Services**
Definition, importance, methods for screening Blood pressure/ blood sugar/ lung function and Cholesterol testing

9 **OTC Medication- Definition, OTC medication list & Counselling**

10 **Health Education**
WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.
Commonly occurring Communicable Diseases, causative agents, Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhoea and AIDS, Balance diet, and treatment & prevention of deficiency disorders Family planning – role of pharmacist

11 **Responding to symptoms of minor ailments** Relevant pathophysiology, common drug therapy to, Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhoea, constipation), Pyrexia, Ophthalmic symptoms, worm's infestations.

12 **Essential Drugs concept and Rational Drug Therapy**, **Role of community pharmacist**

13 **Code of ethics for community pharmacists**

PHARMACOTHERAPEUTICS - I

Subject Code – MPHD1-218 **L T P C**
3 1 0 4

1. **Scope of the Subject:** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.
2. **Objectives:** At completion of this subject it is expected that students will be able to understand –
   a. The pathophysiology of selected disease states and the rationale for drug therapy;
   b. The therapeutic approach to management of these diseases;
   c. The controversies in drug therapy;
   d. The importance of preparation of individualised therapeutic plans based on diagnosis;
   e. Needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects);
   f. Describe the pathophysiology of selected disease states and explain the rationale for drug therapy;
   g. Summarize the therapeutic approach to management of these diseases including reference to the latest available evidence;
   h. Discuss the controversies in drug therapy;
   i. Discuss the preparation of individualised therapeutic plans based on diagnosis; and
   j. Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects).

Recommended Text Books

1. Roger and Walker, ' Clinical Pharmacy and Therapeutics', Churchill Livingstone Publication.
2. ' Pharmacotherapy: A Pathophysiologic Approach', - Joseph T. Dipiro et al. Appleton & Lange.

Reference Books

1. S.L. Robins, 'Pathologic Basis of Disease', W.B. Saunders.
2. Green and Harris, 'Pathology and Therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice', Chapman and Hall.
3. Eric T. Herfindal, 'Clinical Pharmacy and Therapeutics', Williams and Wilkins.
4. 'Applied Therapeutics: The clinical Use of Drugs', Lloyd Young and Koda-Kimble MA.
5. 'Avery's Drug Treatment', 4th Edn, Adis International Limited, **1997**.
6. Relevant review articles from recent medical and pharmaceutical literature.

Detailed Syllabus and Lecture wise Schedule

Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases

Title of the Topic

1 **Cardiovascular System:** Hypertension, Congestive cardiac failure, Angina Pectoris, Myocardial infarction, , Hyperlipidaemias , Electrophysiology of heart and Arrhythmias

2 **Respiratory System:** Introduction to Pulmonary function test, Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases **Endocrine system :** Diabetes, Thyroid diseases, Oral contraceptives, Hormone replacement therapy, Osteoporosis

3. General prescribing Guidelines for

a. Pediatric patients
b. Geriatric patients
c. Pregnancy and breast feeding

4 **Ophthalmology:** Glaucoma, Conjunctivitis- viral & bacterial

5 **Introduction to Rational Drug Use**

Definition, Role of pharmacist Essential drug concept Rational drug formulations.

PHARMACEUTICAL MICROBIOLOGY (PRACTICAL)

Subject Code – MPHD1-219 **L T P C**
0 0 2 1

Title of the Experiment:

1. Study of apparatus used in experimental microbiology*.
2. Sterilization of glass ware's. Preparation of media and sterilization. *
3. Staining techniques – Simple staining; Gram's staining; Negative staining**
4. Study of motility characters*.
5. Enumeration of micro-organisms (Total and Viable)
   * 6 Study of the methods of isolation of pure culture.
   *
6. Bio chemical testing for the identification of micro*-organisms.
7. Cultural sensitivity testing for some micro-organisms*
8. Sterility testing for powders and liquids*
9. Determination of minimum inhibitory concentration*
10. Microbiological assay of antibiotics by cup plate method*
11. Microbiological assay of vitamins by Turbidometric method**
12. Determination of RWC**
13. Diagnostic tests for some common diseases, Widal, malarial parasite**

*** Indicate minor experiment & ** indicate major experiment**

Assignments

1. Visit to some pathological laboratories & study the activities and equipment/instruments used and reporting the same.

2. Visit to milk dairies (Pasteurization) and microbial laboratories (other sterilization methods) & study the activities and equipment/instruments used and reporting the same.

3. Library assignments

a. Report of recent microbial techniques developed in diagnosing some common diseases.

b. Latest advancement developed in identifying, cultivating & handling of microorganisms.

Format of the Assignment:

1. Minimum & Maximum number of pages.
2. It shall be computer draft copy.
3. Reference(s) shall be included at the end.
4. Name and signature of the student.
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination:

Item	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03hrs**	**04hrs**

Note: Total sessional marks are 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

PHARMACOGNOSY & PHYTOPHARMACEUTICALS (PRACTICAL)

Subject Code – MPHD1-220 **L T P C**
0 0 2 1

General Requirements: Laboratory Napkin, Observation Book 150 pages Zero brush, Needle, Blade, Match box.

List of Experiments:

1. Introduction of Pharmacognosy laboratory and experiments.
2. Study of cell wall constituents and cell inclusions.
3. Macro, powder and microscopic study of Datura.
4. Macro, powder and microscopic study of Senna.
5. Macro, powder and microscopic study of Cassia. cinnamon.
6. Macro, powder and microscopic study of Cinchona.
7. Macro, powder and microscopic study of Ephedra.
8. Macro, powder and microscopic study of Quassia.
9. Macro, powder and microscopic study of Clove
10. Macro, powder and microscopic study of Fennel.
11. Macro, powder and microscopic study of Coriander.
12. Macro, powder and microscopic study of Isapgol.
13. Macro, powder and microscopic study of Nux vomica.
14. Macro, powder and microscopic study of Rauwolfia.
15. Macro, powder and microscopic study of Liquorice.
16. Macro, powder and microscopic study of Ginger.
17. Macro, powder and microscopic study of Podophyllum.

18. Determination of Iodine value.
19. Determination of Saponification value and unsaponifiable matter.
20. Determination of ester value.
21. Determination of Acid value.
22. Chemical tests for Acacia.
23. Chemical tests for Tragacanth.
24. Chemical tests for Agar.
25. Chemical tests for Starch.
26. Chemical tests for Lipids. (castor oil, sesame oil, shark liver oil, bees wax)
27. Chemical tests for Gelatin.

Scheme of Practical Examination:

Item	Sessionals	Annual
Identification	04	10
Synopsis	04	10
Major Experiment	07	20
Minor Experiment	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03hrs**	**04hrs**

Note: Total sessional marks are 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance.

PHARMACOTHERAPEUTICS - I (PRACTICAL)

Subject Code – MPHD1-221 **L T P C**
0 0 2 1

Practical's:

Hospital postings in various departments designed to complement the lectures by providing practical clinical discussion; attending ward rounds; follow up the progress and changes made in drug therapy in allotted patients; case presentation upon discharge. Students are required to maintain a record of cases presented and the same should be submitted at the end of the course for evaluation. A minimum of 20 cases should be presented and recorded covering most common diseases.

Assignments:

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

Format of the assignment:

1. Minimum & Maximum number of pages.
2. Reference(s) shall be included at the end.
3. Assignment can be a combined presentation at the end of the academic year.
4. It shall be computer draft copy.
5. Name and signature of the student.
6. Time allocated for presentation may be 8+2 Min.

Scheme of Practical Examination:

Item	Sessionals	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03hrs**	**04hrs**

Note: Total sessional marks are 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

PHARMACOLOGY - I (PRACTICAL)

Subject Code – MPHD1-221 **L T P C**
0 0 2 1

Practical's

Title of the Experiment:

1. Study of agonistic and antagonistic effects of drugs using Guinea-pig ileum preparation**
2. To study the effects of drugs on intestinal motility using frog's oesophagus model*
3. To study the effects of drugs using rat uterus preparation**
4. To study the anticonvulsant property of drugs (any one model*
5. To study antihistaminic property of drug using histamine induced anaphylactic reaction in guinea pigs.
6. To study the apomorphine-induced compulsive behaviour (stereotypy) in mice*
7. To study the muscle relaxant property of diazepam in mice using rotarod apparatus*
8. To study the anti-inflammatory property of indomethacin against carrageenan-induced paw oedema**
9. To study the anxiolytic effect of diazepam in mice using mirrored-chamber apparatus**
10. To demonstrate the effect of various drugs on the blood pressure and respiration of anaesthetized dog.
11. To study the effect of anthelmintic on earthworms.
12. To study the taming effect of chlorpromazine*
13. To study the effects of drugs on vas deferense of the male rat**
14. To study the effect of drugs on pesticide toxicity using rats as model.
15. To study the effect of drugs on heavy metal toxicity.
16. ** indicate major experiment & * indicate minor experiment

Scheme of Practical Examination:

Item	Sessional	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
Max Marks	**20**	**70**
Duration	**03hrs**	**04hrs**

Note: Total sessional marks are 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).