DEPARTMENT OF PHARMACEUTICAL SCIENCES
UNIVERSITY OF KASHMIR
SRINAGAR

Course No: BPH-I

PHARMACEUTICS- I

Teaching hours-60

1. Pharmacy Profession

Pharmacy as a career, Evaluation of Pharmacy profession, Earlier period, Middle to Modern Ages.

Introduction to Pharmacopoeias with special reference to Indian Pharmacopoeia, B.P, U.S.P and International Pharmacopoeia.

2. Metrology

Imperial, Metric and S.I Weights and measures, Interconversion.

3. Classification of dosage forms:

Solids, Semisolids & Liquid dosage form.

Principles involved in the preparation of following Pharmaceutical products official in I.P and their uses.

a) Purified water, Deionized water, Distilled water and water for injection,
b) Aromatic water
c) Solutions
d) Spirits
e) Glycerines
f) Syrups
g) Elixirs
h) Lotions
i) Mucilages
j) Liniments

4. Pharmaceutical Additives:

Diluents, Vehiciles, Solvents. Organoleptic additives, Surfactants and their applications, Binaers, Disintegrating agents , Preservatives , Anti-oxidants.

5. Size Reduction and Size Separation

Definitions, factors affecting size reduction ; Principles, Laws and factors affecting energy requirements , different methods of size reduction , study of Hammer mill, Fluid energy mill and disintegrator. Various methods & equipments employed for size separation e.g. sieving, sedimentation, centrifugal, elutriation, microscopic methods etc

6. Mixing and Homogenisation

Liquid mixing and powder mixing, mixing of semisolids, study of different types of mixers used in Pharmaceuticals.

7. Clarification and Filtration

Definition, theory and factors affecting Filtration, Types of filter media, Filter Aids and selection of filters. Equipments like gravity filter, pressure filter, vacuum filters, filter press, leaf filters, continuous rotary drum filter, edge filter, sand filter, Membrane filters. Centrifugal type filters; batch, Semicontinuous and continuous type.

8. Heat processes

a) Evaporation: Factors affecting evaporation, study of evaporating stills and evaporating pans. Heat transferring evaporators. Vapour compression evaporators, evaporation under reduced pressure.

b) **Distillation:** Importance of distillation in Pharmacy, methods of distillation. Brief introduction to freeze drying, Sublimation, desiccation and exsiccation, efflorescence and its importance.

9. Extraction and Galenicals.

Extraction processes, study of percolation and maceration and their modifications.

Applications in the preparation of tinctures & Extracts.

PRACTICALS

Total hours :100

1. Preparation of following classes of products, involving the use of calculations in

   Metrology (at least two products from each category wherever applicable)

   a. Aromatic waters
   b. Injections
   c. Solutions
   d. Spirits
   e. Glycerine
   f. Syrups
   g. Elixirs
   h. Lotions
   i. Mucilage
   j. Liniments
   k. Suppositories
   l. Tablets
   m. Powders
   n. Capsules

2. Study of one monograph from the latest edition of Indian Pharmacopoeia.
3. Demonstration of equipments(working procedure) for;
   a. Size Reduction and size separation
   b. Mixing and Homogenization
   c. Clarification and filtration
   d. Evaporation
   e. Distillation
   f. Percolation

BOOKS RECOMMENDED:

1. N.K.Jain and S.N.Sharma , The theory and Practice of professional Pharmacy
2. E.A.Rawlins, Bentley's Text book of Pharmaceutics
3. Gilbert S.Banker and Christopher T. Rhodes, Modern Pharmaceutics
4. Indian Pharmacopoeia
5. Remington's Pharmaceutical Sciences, Mack Publishing Company.

DEPARTMENT OF PHARMACEUTICAL SCIENCES
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COURSE NO: BPH-II

MATHEMATICS & BIO-STATISTICS

A. Statistics and Calculus:

1. Condensation of the data collected; various forms of distribution tables.
2. Pictorial representation of frequency distribution in histograms and frequency polygons.
3. Measures of central tendency
4. Measures of dispersion-range .mean deviation and standard deviation, coefficient of variation
5. Significance tests- test of significance and Chi-square test of significance.
6. Correlation between two variables.
7. Interpolation
8. Probability
9. Use of log-log graph.
10. Limits of Algebraic function
11. Lim Sin 0/0 ; axioms on limits ; of trig . Functions
12. Differential coefficient of a function; derivatives of x", N_0R.
13. Derivative formula of sum and difference of two functions generalizing it for more than two; derivative of product of two functions generalizing it for the product of 3 functions; derivative of quotient of two functions.
14. Derivative of trignometrical functions and inverse functions.
15. Derivative by method of substitution.
16. Derivative of function of a function.
17. Derivative by method of substitution.
18. Parametric functions; implicit function; log. Differentiation.
19. Higher order derivatives.
20. Partial derivatives.
21. Total differentials and total derivatives, higher order, partial derivatives.
22. Tangent and normal, velocity and acceleration.
23. Approximate values, maxima and minima
24. Derivation of formulae of integration from derivative formula.
25. Integration of sum and difference of two functions.
26. Integration by substitution, Integration by parts.
27. The relationship of integration and summation.
28. Definite integration, interpretation of definite Integration as an area of circle.
29. R and B (beta functions)
30. Double integrals S.S(x.y) dydx over a particular region and its interpretation.
31. Ordinary differential equations of the first order.
32. Linear differential equations with constant coefficient.
33. Simultaneous differential equations.

BOOKS RECOMMENDED

1 . Differentia! Calculus
2. Integral Calculus
3. Statistics , Yule and Kendell
4. Statistics , Croxton and Fedrick
5. Mathematics and Stats for students of Pharmacy, Ayers.

DEPARTMENT OF PHARMACEUTICAL SCIENCES
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Course No: BPH-III

COMPUTER APPLICATIONS

Teaching hours: 1 hour/week

1. **Fundamentals of Computers:**
   Computers, its types and uses, computer generations, Hardware, Software, Elements of a computer system.
   Number bases- Decimal, Binary, Octal, Hexadecimal, Data representation.
   Storage devices- Primary memory, Hard disk, Floppy disk, CD- ROM Input and output devices.
2. ***2.*** **Operating system- DOS, Windows & Unix:**
   Operating system- Definition, Organization unctions, Operations and types.
   History of DOS, Windows and Unix operating systems, Handling of commands- Internal, External.
   Program Groups, items, Icons, Clipboard, Folders, Task Swapping etc.
   Major differences between DOS and UNIX operating system.
3. **Data transmission and Networks:**
   Hardware and software components, (Seven Layer model, Bus, Star and Ring topologies.
4. **Programming:**
   High level languages, Machine language, Syntax, Semantics, programme design aims, stages in programming, Flow charts.
5. **Programming language 'C'**
   Data types, Constants, Variables, Arithmetic and Relational expressions, Symbolic constants.
   Input and output, Increment and Decrement operators, Assignment statement, if-else,
   switch statements.
   Loops- While, do-while, for
   Transfer statements, Functions , Header Files, Recursion, Pointers and Arrays, Structures.
6. **Application Software:**
   Word processing techniques, File manipulations and formatting, printing setups, Mail- Merge, Table handling, Mathematical equations, Graphs, Picture handling and Drawings. About spredsheet programmes, workbooks/ worksheets, formatting of sheets, Formulae and Functions, Graphs, Import and Export of files/data. Presentation packages, Slide designing, Graphs, Import and Export facilities.

PRACTICALS: Total hours-25

MS Office- MS word, MS excel, Power point. DOS commands

BOOKS RECOMMENDED:

1. Bryon S.Gottfried McGraw Hill Bookm Co. (Schaum's Sevier) programming with C
2. E.Balaguruswamy Tata McGraw Hill Publishing Co., programming in 'C"
3. Sheeley, Jhon&Hunt, Roger,Computer studies,First course,Delhi:A.K.Wheeler &Co,1986.
4. Scidal, R.J and Rubin, M.L(Ed),Computer and communications:Implication for Education, academic press, 1977
5. V.Rajaraman, Fundamental of Computers, Second Edition. Eastern Economy Edition.

DEPARTMENT OF PHARMACEUTICAL SCIENCES
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Course No: BPH-IV

Pharmaceutical Engineering
(Unit Operation) Total hours: 80

UNIT-I

1. Elements of Industrial Stoichiometry, Material and Energy Balance.
2. Flow of fluids: Manometers, Bernaulli theorm frictional losses, Measurement of fluid flow, Transportation of fluids; Pipe joints and fittings, pumps and compressors.

UNIT-II

1. Heat transfer; Mechanisms of heat transfer, Resistances in series (flat and cylindrical). Overall heat transfer co-efficient in conductive and convective heat transfer; Radiation, heat transfer.
2. Evaporation; Different types of evaporators, their advantages and disadvantages. Single effect and Multiple effect evaporators; Capacity and heat economy of MEE.

UNIT-III

1. Distillation; Types of distillation methods: Single stage and multistage distillation; Batch distillation, rectification, calculations of stages by McCabe and Theile method. Vacuum and steam distillation.
2. Crystallization; Classification of crystallizers, crystal nucleation and growth, Caking of crystals.
3. Centrifuges; Classification, Simple Bowl centrifuge.Tubular centrifuge, disk centrifuge, super centrifuge.

UNIT-IV

1. Drying; Objectives and important considerations in drying, Tunnel, rotary, vacuum and spray dryers. Theory of drying, drying rate curves and simple calculations for determination of drying time; Principles of freeze drying.
2. Humidity; Relative humidity, percentage humidity, saturation humidity etc. Wet bulb theory, humidity chart, refrigeration process, equipment for humidification and dehumidification.

UNIT-V

1. Size reduction; Mechanism involved and factors effecting size reduction, Pharmaceutical applications, Energy consumption, equipment classification and various types. Primary, secondary and fine crushers, Fluid energy mill, Colloid mill. Critical velocity, open and closed circuit grinding.
2. Size separation; Screen analysis, standard screens, Oscilating screens, gyratory screens, Cyclone separator, free setting and hindered setting (sedimentation), elutriation, handling of powders.

UNIT-VI

1. Filtration; Mechanism and types of filtration. Constant pressure, constant rate and continuous filtration. Filter media selection and filter aid used. Plate and frame filter press, continuous vacuum drum filter, leaf filter, modern filters (membrane filter etc.).
2. Conveying; Types of conveyers - Belt conveyor, Chain conveyor, bucket elevators, pneumatic conveying.

UNIT-VII

1. Materials of construction; Types of materials, their nature, properties and utility in plant manufacture.
2. Corrosion of materials ; Types of corrosion; Corrosion resistant materials, methods of reducing corrosion. protective coatings.
3. Safety and Hazard prevention; Different safety methods for labs, Industrial sites, Chemical storages. Hazard and hazard prevention, Check list etc.

UNIT-VIII

Elementary drawing; Drawing instruments; drawing identification, letter writing, drawing of various types of lines; Boundary lines, hidden lines, section lines etc. Simple drawings of heat exchanger. Evaporator, distillation column.

PRACTICALS-100 hours

1. Effect of number of balls/volume of grinding medium on grinding rate in a ball mill.
2. Fluid flow characterization by by Reynold's apparatus.
3. Determination of flow rate using venturimeter
4. Determination of flow rate using orifice meter.
5. Determine the effect of solid concentration and container/vessel diameter on rate of sedimentation.
6. Calculation of volume surface mean diameter. Specific surface and surface area of a given mass of solid.
7. To perform sieve analysis and calculate vanius average diameter of a given mass of solid.
8. To find screen effectiveness of a given screen.
9. Study of Cyclone separator.
10. Study of grinder/crusher
11. Study of Belt conveyor.
12. Determination of fanning friction factor and head loss due to friction.
13. Study of various types of Manometers.
14. Determination of filter resistance constants in a filter press.

Recommended Text and reference books

1. Unit operations of Chemical engineering by McCabe and Smith-McCraw Hill, IBC. London
2. Tutorial Pharmacy by Cooper & Gunns - CBS Publisher, Delhi
3. Introduction to Chemical Engineering by Badger & Banchero- McCraw Hill, IBC. London
4. Introduction to Pharmaceutics-l by A.K.Gupta-CBS Publishers.Delhi
5. Bentley's text book of Pharmaceutics 2ed. by-E.A Rawlins-AITBS, Delhi
6. Chemical engineering hand book by Perry and Chilton-Mc Graw Hill IBC.London.

DEPARTMENT OF PHARMACEUTICAL SCIENCES
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COURSE NO:-BPH- V

PHARMACEUTICAL CHEMISTRY-I
(Inorganic Pharmaceutical Chemistry)
Total hours: 50

The following topics will be treated covering an outline of methods of preparation, limits, chemical properties, assay and uses of:

1. Major Intra and Extra Cellular Electrolytes:

Electrolytes used in replacement therapy(Sodium chloride and Potassium chloride), electrolytes used in acid base therapy(Sodium acetate, Potassium acetate, Sodium bicarbonate, Sodium citrate, Potassium citrate, Sodium lactate, Ammonium chloride), electrolyte combination therapy.

2. Essential and Trace ions:

Copper, Zinc, Chromium, Manganese, Iodine, Iron.

3. Gastrointestinal agents:

a. Acidifying agents: dilute HCL
b. Antacids: Sodium bicarbonate, Aluminum hydroxide, Magnesium carbonate and Magnesium oxide.
c. Protectives and adsorbants: Kaolin,
d. Sodium potassium tartarate and Magnesium sulphate.

4. Topical agents:

a. Protective: Talc, Zinc oxide, Calamine, Zinc stearate.
b. Antimicrobials: Hydrogen peroxide, Potassium permagnate, Chlorinated lime, Iodine, Boric acid, Silver nitrate, Mercury, Zinc peroxide.
c. Astringents: Alum, Zinc sulphate.

5. Dental products:

a. Anticaries agents: Sodium fluoride.
b. Dentrifices: Calcium carbonate, Sodium metaphosphate, Zinc chloride, Strontium chloride.

6. Pharmaceutical aids and necessities:

a. Official acids and bases.
b. Buffers: Study of various Pharmacoepoeial buffers.
c. Water: Official waters.
d. Antioxidants: Sodium bisulphate, Sodium thiosulphate.

7. Miscellaneous Inorganic Pharmaceutical agents:

a. Inhalants: Oxygen
b. Respiratory Stimulants: Ammonium carbonate, Ammonium hydroxide.
c. Expectorants and emetics: Ammonium chloride
d. Antidotes: Sodium nitrate, Activated charcoal.
e. Sclerosing agents: Morrhuate Sodium Injection, Sodium tetradecyl sulphate
8. Sources of impurities in Pharmaceutical substances and their control.

PRACTICALSs

1. Limit tests for impurities (Chloride, Sulphate, Iron,)
2. Assay of selected compounds of Pharmaceutical importance :
   Solution of ammonia, Boric acid, Sodium bicarbonate, Sodium carbonate, Ferrous sulphate, Copper sulphate, Chlorinated lime, Sodium chloride, Ammonium chloride, Sodium sulphate, Calcium gluconate, Magnesium sulphate, Sodium thiosulphate, Strong and week iodine solutions.

BOOKS RECOMMENDED:

1. Remington's Pharmaceutical sciences
2. Inorganic Pharmaceutical Chemistry by Chatwal
3. Pharmacopoeia of India, Govt, Ministry of Health, Delhi.
4. Inorganic Pharmaceutical Chemistry by Qadri
5. Modern Inorganic Pharmaceutical chemistry by Jhon Wiley
6. Rogers Inorganic Pharmaceutical Chemistry.

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COURSE NO: BPH-VI

PHARMACEUTICAL CHEMISTRY-I

(Organic Chemistry)

Total teaching hours-50

1. Basic principles and concepts of Organic Chemistry:

Atomic and molecular orbitals, dipole moment, resonance, inductive and electrometric effects, intermolecular and intermolecular hydrogen bonding, acids and bases.

2. Stereochemistry:

Introduction, optical activity, stereoisomerism, specification of configuration, reactions involving stereoisomerism, Bayer Strain theory and conformational analysis.

Structure, nomenclature, preparation and reactions/ properties of following groups of Compounds (including mechanism of reactions wherever necessary)

3. Aliphatic & Alicyclic Hydrocarbons;

Alkanes, alkenes, alkynes, cycloalkanes.

4. Aliphatic Halohydrocarbons:

SN1 and SN2 reactions, chloroform, carbon tetrachloride, trichloroethylene and halothane.

Aliphatic Alcohols:

Primary, secondary and tertiary alcohols, methanol, ethanol, proof spirit, denatured alcohol, methylated spirit, determination of alcohol in Pharmaceutical preparations, di and trihydric alcohols: glycols, glycerol, ethylene glycol, propylene glycols, glyceryl trinitrate, allylalcohol, polyethylene glycols.

5. Ethers:

Thioethers, divinyl ether, solvent ether, anaesthetic ether

6. Aldehydes and Ketones:

Formaldehyde, paraformaldehyde, acetaldehyde and its polymers, chloral hydrate.

7. Saturated Monocarboxylic acids and Esters:

Preparation and properties of formic acid, acetic acid and derivatives, propionic acid, butyric acid, valeric acid, palmitic acid and stearic acid, ethyl acetate, ethyl acetoacetate, dioctyl sodium sulphosuccinate, ethyl oleate, sodium lauryl sulphate, lactic acid, lactones, glucuronic acid and gluconic acid.

8. Di & Tricarboxylic acids:

Oxalic acid, malonic acid, succinic acid and their amide and imide derivatives, maleic acid fumaric acid, glutaric acid, tartaric acid and citric acid.

Aliphatic Amines and Related compounds:
Alkylamines, b-hydroxy and b-haloalkyl diamines, urea and ureides, dextropropoxyphene hydrochloride, dicyclamine hydrochloride, mustine hydrochloride, ethylene diamine hydrate, sodium calcium edetate, cyclamic acid, calcium cyclamate, thiambutosine.

9. Carbanions:

Reactions involving carbonions: Malonic ester, synthesis of carboxylic acid, acetoacetic ester, synthesis of ketones, direct and indirect alkylation of esters and ketones, alkylation of carbonyl compounds via enamines, a, b- unsaturated carbonyl compounds (conjugate addition) including Michael and Diels-Alder reaction.

PRACTICALS

Total hours-100

1. Lassaigne's test for N,S and halogens.
2. Identification of organic compounds based on solubility and functional group test.
3. Performance of qualitative test for alkaloids, steroids, carbohydrates, glycosides, proteins and amino acids.
4. Test for identity of selected drugs: atropine, caffeine, quinine, glucose, sucrose, barbiturates, ascorbic acid and sulphanilamide.

BOOKS RECOMMENDED;

1. R.T. Morrison and R.N. Boyd, Organic Chemistry, Allyn and Bacon Inc, Boston, USA.
2. S.L.Finar, Organic Chemistry, Vol. 1, The English Language Book Society and Longman Group Limited, London.
3. J.B. Hendrickson , D.J. Cram and C.S. Hammond, Organic Chemistry, McGraw Hill Kogakusha Limited, Tokyo.
4. P.Sykes, A guide book to mechanism in Organic Chemistry, Orient Longman, New Delhi.
5. L.M. Atherden, Bentiey and Drivers- Textbook of Pharmaceutical chemistry, Oxford university press, Delhi.
6. Practical Pharmaceutical chemistry by A.A. Siddiqui and Mohd. Ali.

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COURSE No: BPH-VII

PHARMACOGNOSY-I

Total teaching hours: 50

1. Introduction, development, present status, future and scope of Pharmacognosy.
2. Scope and significance of biology in Pharmaceutical sciences. Modern concept of biology *viz.* molecular, Physiological and biochemical concept.
3. Introduction to different group of plant constituents and their tests, Definitions of selected botanical and Pharmacological terms.
4. Principles of classification of plants with special reference to:

i. Algae: Rhodophyceae (Agar, Aliginic acid)
ii. Fungi: Eumycetes (Ergot, Yeast, Mushrooms)
iii. Gymnosperm: Pinaceae, Gnetaceae
iv. Angiosperm: Apocynacae, Compositae, Convulvulaceae, Labiateae, Rubiaceae, Rutaceae, Solanaceae, Scrophulariaceae, Umbellifereae, Leguminoseae.

5. Study of plant tissue and ergastic cell inclusions with a view to identify and authenticate powder crude drugs with emphasis on anatomical structures of bark, stem (Monocot, Dicot).
6. Different systems of classification of crude drugs.
7. Different systems of medicine practiced in India with specific reference to Unani, Ayurvedic and Homoeopathic medicines.
8. Factors involved in the production of drugs from Wild and cultivated sources including cultivation, collection, drying, storage, commerce and quality control.
9. Biological source, chemical tests for identity and salient microscopic features of commercial fibres used as surgical dressings and filtering aids. Cotton, Silk, wool and rayon.
10. Natural pesticides and insecticides.

PRACTICAL (Total hours-75)

1. Taxonomic study of families included in theory.
2. Microscopical studies: basic tissues, anatomy of bark, stem(Dicot and Monocot), root(Dicot, Monocot), seed, leaf and fruit.Trichomes, Stomata, Calcium oxalate crystals.
3. Study of surgical fibres and dressings.
4. General chemical tests for plant constituents such as alkaloids, glycosides, tannins, Saponins, resins and proteins.

BOOKS RECOMMENDED

1. T.E Waliis, Textbook of Pharmacognosy, CBS publisher, India, 14th Edition Harcourt Brace & Compound.Singapore.
2. Treas and Evans textbook of Pharmacognosy.
3. Shah & Qadry, A textbook of Pharmacognosy.
4. Mohd Ali, textbook of Pharmacognosy.CBS publisher.India
5. A.C.Dutta, Intermediate Botany.
6. B.D Vashishtha, Taxonomy of angiosperms.
7. S.S. Handa & V.K.Kapoor, textbook of Pharmacognosy.
8. Taxonomy by Lawrence.

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COURSE NO: BPH-VIII

HUMAN ANATOMY AND PHYSIOLOGY

Teaching hours: 75

1. INTRODUCTION

Definition and scope of Anatomy, Physiology and related sciences. Anatomical terms in relation to parts of the body, system and organs. Study of human skeleton.

2. CELL

a. Structures and their functions.
b. Genetic control of Cell function

3. TISSUE OF THE BODY

a. Types of tissue and their functions.
b. Physiology of Muscle contraction
c. Neuromuscular transmission

4. MEMBRANE

a. General Principles of membrane permeability and transport.
b. Mechanisms and electrophysiology of membrane.

5. NERVOUS SYSTEM

a. General Anatomy and Physiology of neurons, Synapses, neurohumoral transmission.
b. Central Nervous system , its various parts and their functions.
c. RAS, Limbic system, Physiology of sleep, CSF, Sensory and motor pathway.
d. Autonomic Nervous system.
e. Reflex arc, conditioned and unconditioned reflexes

6. CARDIOVASCULAR SYSTEM AND BLOOD

a. Structure and functions of heart and blood vessels.
b. Heart sounds, ECG, Cardiac cycle, blood pressure and its regulations.
c. Circulation
d. Lymphatic system
c. Blood composition and functions
d. Blood groups, Rh factor, blood transfusion.

7. RESPIRATORY SYSTEM

a. Gross anatomy of respiratory passages.
b. Regulations and mechanism of breathing and pulmonary function test.
c. Transportation of gases
d. Hypoxia, Anoxia, Dysponea, artificial respiration

8. DIGESTIVE SYSTEM

a. Gross anatomy of alimentary canal.
b. Physiology of digestion
c. Liver and pancreas

9. ENDOCRINE SYSTEM

Physiological consideration of thyroid .parathyroid, pancreas, pituitary, suprarenal and
gonads.

10. REPRODUCTIVE SYSTEM

a. Structure and function of male and female reproductive organs.

b. Spermatogenesis
c. Puberty, Ovulation, menstrual cycle, reproductive cycles
d. Pregnancy, lactation and menopause.

11. URINARY SYSTEM

a. General disposition of organs of excretory system.
b. Physiological consideration of urine formation and factors controlling it.
c. Micturition
d. Regulation of body fluid constituents and their volumes.

12. SPECIAL SENSES

a. Physiology of hearing, taste, smell and vision.
b. Structure and functions of skin
c. Regulation of body temperature.

PRACTICAL (Total: 75 hours)

1. HUMAN ANATOMY AND PHYSIOLOGY

i. Study of human skeleton and bones
ii. Study of models of organs of various body systems.
iii. Study of surgical instruments.

2. HISTOLOGY

i. Handling of microscope
ii. Identification of various tissues

3. HAEMATOLOGY

i. Estimation of hemoglobin
ii. Total RBC count
iii. Total WBC count (TLC)
iv. Differential leucocyte count (DLC)
v. Platelets count
vi. Determination of blood groups and Rh factors
vii. Determination of ESR(demonstration)
viii. Determination of blood clotting and bleeding time
ix. Identification of plasmodium species in the human blood

4. MUSCLE PHYSIOLOGY

i. Study of Equipments used in experimental physiology
ii. Study of simple muscle curve.
iii. Muscle fatigue, effect of load and after load
iv. Effect of temperature on muscle contraction

5. RESPIRATION

Pulmonary function test using spirometer.

6. NERVOUS SYSTEM

i. Study of reflux action
ii. Recording of body temperature by various techniques
iii. Recording and interpretation of EEG

7. CARDIOVASCULAR SYSTEM

i. Determination of blood pressure by palpatory and auscultating methods,
ii. Recording of EGG and its interpretation.

BOOKS RECOMMENDED

A. THEORY

1. Concise Medical Physiology by Sujit K.Chaudhuri
2. Human Physiology by C.C Chatterjee
3. Ross and Wilson; Anatomy and Physiology in Health and Illness by Kathleen J.W.Wilson
4. Anatomy and Physiology for Nurses by T.W.A. Glenister and Jean R.W.Ross
5. Text book of Medical Physiology by Arthur C.Guyton
6. Samson Wrights Applied Physiology by Cyril A.Keele.Eric Neil and Norman Joels
7. G.J.Tortora and S.R Grabowski-Principles of Anatomy and Physiology , Harper and Colins(Eighth edition).

B. PRACTICALS

1. Experimental physiology by Shukant R. Apte.
2. Practical anatomy, physiology and bio-chemistry by Ramesh K. Natvar M. Patel and Shailesh A. Shah.
3. Practical Haematology by Sir John V. Dacie and S.M.Lewis
4. A text book of practical physiology by C.L.Ghai.