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AUROSRI INSTITUTE OF PHARMACEUTICAL EDUCATION AND RESEARCH

A SYLLABUS for

DIPLOMA IN PHARMACY

(As per Education and regulation Act-1991)

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ODISHA

FIRST YEAR

1.1	Pharmaceutics-I	(Theory & Practical)
1.2	Pharmaceutical Chemistry-I	(Theory & Practical)
1.3	Pharmacognosy	(Theory & Practical)
1.4	Biochemistry & Clinical Pathology	(Theory & Practical)
1.5	Human Anatomy & Physiology	(Theory & Practical)
1.6	Health Education & Community Pharmacy	(Theory)

SECOND YEAR

2.1	Pharmaceutics-II	(Theory & Practical)
2.2	Pharmaceutical Chemistry-II	(Theory & Practical)
2.3	Pharmacology & Toxicology	(Theory & Practical)
2.4	Pharmaceutical Jurisprudence	(Theory)
2.5	Drug Store & Business Management	(Theory)
2.6	Hospital & Clinical Pharmacy	(Theory & Practical)

DIPLOMA IN PHARMACY (FIRST YEAR)

1.1 PHARMACEUTICS-I

Theory (75 hours)

1. Introduction to different dosage forms. Their classification with examples – their relative applications. Familiarization with new drug delivery systems.

2. Introduction to pharmacopoeias with special reference to the Indian pharmacopoeia.

3. **Metrology –** Systems of weights and measures. Calculations including conversion from one to another system. Percentage calculation and adjustment of products. Use of allegation method in calculations. Isotonic solutions.

4. Packaging of pharmaceuticals – Desirable features of a container – types of containers. Study of glass and plastics as materials for containers and rubber as material for closures, their merits and demerits. Introduction to aerosol packaging.

5. Size reduction – Objectives and factors affecting size reduction, methods of size reduction – study of hammer mill, ball mill, fluid energy mill and disintegrator.

6. Size separation – Size separation by shifting official standard for powders. Sedimentation methods of size separation. Construction and working of cyclone separator.

7. Mixing and Homogenisation – Liquid mixing and powder mixing, mixing of semisolids. Study of Silverson mixer, Homogeniser, Planetary mixer, Agitated powder mixer. Triple roller mill, Propeller mixer, Colloid mill and Hand homogenizer, Double cone mixer.

8. **Clarification and filtration –** Theory of filtration, filter media, filter aids and selections of filters, study of the following filtration equipments – Filter press, Sintered Filters, Filter candles, Metafilter.

9. Extraction and Galenicals – (a) Study of percolation and maceration and their modifications. Continuous hot extraction applications in the preparation of tinctures and extracts.

(b) Introduction of Ayurvedic dosage forms.

10. **Heat processes –** Evaporation – Definition, Factors affecting evaporation, Study of evaporating still and Evaporating pan.

11. **Distillation –** Simple distillation and fractional distillation, Steam distillation and Vacuum distillation. Study of vacuum still, preparation of Purified Water I.P. and Water for injection I.P. Construction and working of the still used for the same.

12. **Introduction to drying process - Study of Tray Driers: Fluidized Bed Dryer, Vacuum Dryer and Freeze Dryer.**

13. **Sterilization –**Concept of sterilization and its differences from disinfection - Thermal resistance of micro-organisms. Detailed study of the following sterilization processes.

a) Sterilization with moist heat.

b) Dry heat sterilization.

c) Sterilization by radiation.

d) Sterilization filtration, and

e) Gaseous sterilization.

Aseptic techniques – Application of sterilization, processes in hospitals, particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.

14. Processing of Tablets – Definition: Different types of compressed tablets and their properties, Processes involved in the production of tablets, tablet excipients, defect in tablets, evaluation of tablets, Physical standards including disintegration and dissolution.

Tablet coating – Sugar coating, film coating, enteric coating and microencapsulation (Tablet coating may be dealth in an elementary manner).

15. **Processing of capsules:** Hard and soft gelatin capsules, different size of capsules, filling of capsules, handling and storage of capsules, Special applications of capsules.

16. **Study of immunological products:** Like Sera, Vaccines, Toxoids and their preparations.

PRACTICAL (100 hours)

Preparation (minimum numbers stated against each) of the following categories illustrating different techniques involved.

1. Aromatic waters 3

2. Solutions 4

3. Spirits 2

4. Tinctures 4

5. Extracts 2

6. Creams 2

7. Cosmetic preparations 3

8. Capsules 2

9. Tablets

10. Preparations involving sterilization

11. Ophthalmic preparations

12. Preparations involving aseptic techniques.

Book Recommended (Latest Editions)

1. Remington's Pharmaceutical Sciences.

2. The Extra Pharmacopoeia – Martindale.

1.2 PHARMACEUTICAL CHEMISTRY

Theory (75 hours)

1. General discussion on the following inorganic compounds including important physical and chemical properties, medicinal and pharmaceutical uses, storage conditions and chemical incompatibility.

(A) Acids, bases and buffers:– Boric acid, Hydrochloric acid, Strong ammonium hydroxide, Calcium hydroxide, Sodium hydroxide and Official buffers.

(B) Antioxidants:- Hypophosphorous acid, Sulphur dioxide, Sodium bisulphate, Sodium metabisulphites, Sodium thiosulphate, Nitrogen and Sodium nitrite.

(C) Gastrointestinal agents:-

(i) Acidifying agents – Dilute hydrochloric acid.

(ii) Antacids – Sodium bicarbonate, Aluminium hydroxide gel, Aluminium phosphate, Calcium carbonate, Magnesium carbonate, Magnesium trisilicate, Magnesium oxide, Combinations of antacid preparations.

(iii) Protectives and Adsorbents – Bismuth subcarbonate & Kaolin.

(iv) Saline cathartics – Sodium potassium tartrate and Magnesium sulphate.

(D) Topical Agents:-

i) Protectives– Talc, Zinc Oxide, Calamine, Zinc Stearate, Titanium dioxide, Silicone polymers.

ii) Antimicrobials and Astringents – Hydrogen peroxide, Potassium permanganate, Chlorinated lime, Iodine, Solutions of Iodine, Povidone Iodine, Boric acid, Borax, Silver nitrate, Mild silver protein, Mercury, Yellow mercuric oxide, Ammoniated mercury.

iii) Sulphur and its compounds – Sublimed sulphurs, precipitated sulphur, Selenium sulphide.

iv) Astringents – Alum and Zinc sulphate.

(E) Dental Products – Sodium chloride, stannous fluoride, calcium carbonate, sodium metaphosphate, Dicalcium phosphate, Strontium chloride, Zinc chloride.

(F) Inhalants – Oxygen, Carbon dioxide, Nitrous oxide.

(G) Respiratory stimulants – Ammonium carbonate.

(H) Expectorants and Emetics: Ammonium chloride, Potassium iodide, Antimony potassium tartrate.

(I) Antidotes – Sodium nitrite.

2. **Major Intra and Extracellular electrolytes.**

(A) Electrolytes used for replacement therapy– Sodium chloride and its preparations, Potassium chloride and its preparations.

(B) Physiological acid base balance and electrolytes used– Sodium acetate, Potassium acetate, Sodium bicarbonate injection, Sodium citrate, Potassium citrate, Sodium lactate injection. Ammonium chloride and its injection.

(C) Combination of oral electrolyte powders and solutions.

3. **Inorganic official compounds of**- Iron, Iodine, Calcium, Ferrous Sulphate and Calcium gluconate.

4. **Radio pharmaceuticals and contrast media** – Radio activity, Alpha, Beta and Gamma Radiations, Biological effects of radiations, Measurement of radio activity. G.M. counters. Radio isotopes– Their uses, storage and precautions with special reference to the official preparations. Radio opaque contrast media, Barium sulphate.

5. **Quality control of Drugs and Pharmaceuticals** – Importance of quality control, significant errors, Methods used for quality control, sources of impurities in pharmaceuticals. Limits tests of arsenic, chloride, sulphate, iron and heavy metals.

6. Identification tests for cations and anions as per Indian Pharmacopoeia.

PRACTICAL (75 hours)

1. Identification tests for inorganic compounds particularly drugs and pharmaceuticals.

2. Limit test for chloride, sulphate, arsenic, iron and heavy metals.

3. Assay of inorganic pharmaceuticals involving each of the following methods of compounds marked with (*) under theory.

a) Acid – Base titrations (at least 3)

b) Redox titration (One each of permanganatometry and iodimetry).

c) Complexometric (Calcium and magnesium)

Books recommended (latest Editions)

1. Indian Pharmacopoeia.

PHARMACOGNOSY

Theory (75 hours)

1. Definition, history and scope of Pharmacognosy including indigenous system of medicine.

2. Various systems of classification of drugs of natural origin.

3. Adulteration and drug evaluation: Significance of Pharmacopoeial standards.

4. Brief outline of occurrence, distribution, outline of isolation, identification tests, therapeutic effects and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.

5. Occurrence, distribution, organoleptic evaluations. Chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.

a) **Laxatives:** Aloes, Rhubarb, Castor oil, Ispaghula, Senna.

b) **Cardiotonics –** Digitalis, Arjuna.

c) **Carminatives and GI regulators –** Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper, Asafoetida, Nutmeg, Cinnamon, Clove.

d) **Astringents –** Catechu.

e) **Drugs acting on nervous system –** Hyoscyamus, Belladonna, Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nuxvomica.

f) **Antihypertensives–** Rauwolfia.

g) **Antitussives–** Vasaka, Tolu balsam, Tulsi.

h) **Antirheumatics** – Guggul, Colchicum

i) **Antitumour-** Vinca.

j) **Antileprotics-** Chaulmoogra Oil

k) **Antidiabetics–** Pterocarpus, Gymnema sylvestre.

l) **Diuretics –** Gokhru, Punarnava.

m) **Antidysenteric –** Ipecacuanha.

n) **Antiseptics and disinfectants –** Benzoin, Myrrh, Neem, Curcuma.

o) **Antimalarials –** Cinchona.

p) **Oxytocics–** Ergot.

q) **Vitamins –** Shark liver oil and Amla.

r) **Enzymes –** Papaya, Diastase, Yeast.

s) **Perfumes and flavouring agents –** Peppermint oil, Lemon oil, Orange oil, Lemon grass oil, Sandal wood oil.

t) **Pharmaceutical aids –** Honey, Arachis oil, Starch, Kaolin, Pectin, Olive oil, Lanolin, Bees wax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatin.

u) **Miscellaneous –** Liquorice, Garlic, Picrorhiza, Dioscorea, Linseed, Shatavari, Shankhpushpi, Pyrethrum, Tobacco.

6. Collection and preparation of crude drugs for the market as exemplified by Ergot, Opium, Rauwolfia, Digitalis, Senna.

7. Study of source, preparation and identification of fibres used in sutures and surgical dressing – Cotton, Silk, Wool and Regenerated fibres.

8. Gross anatomical studies of: Senna Datura, Cinnamon, Cinchona, Fennel, Clove, Ginger, Nux Vomica and Ipecacuanha.

PRACTICAL (75 hours)

1. Identification of drugs by morphological characters.

2. Physical and chemical tests for evaluation of drugs wherever applicable.

3. Gross anatomical studies (T.S) of the following drugs; Senna, Datura, Cinnamon, Cinchona, Coriander Fennel. Clove Ginger, Nux Vomica, Ipecacuanha.

4. Identification of fibres and surgical dressings.

BIOCHEMISTRY AND CLINICAL PATHOLOGY

Theory (50 hours)

1. Introduction to Biochemistry.

2. Brief chemistry and role of proteins, polypeptides and amino acids. Classifications, Qualitative tests, Biological value. Deficiency diseases.

3. Brief chemistry and role of Carbohydrate, Classification Qualitative tests. Diseases related to carbohydrate metabolism.

4. Brief chemistry and role of lipids, Classification, Qualitative tests. Diseases related to metabolism.

5. Brief chemistry and role of vitamins and coenzymes.

6. Role of minerals and water in life processes.

7. Enzymes: Brief concept of enzymatic action, factors affecting it, therapeutic and pharmaceutical importance.

8. Brief concept of normal and abnormal metabolism of proteins, carbohydrates and lipids.

9. Introduction to pathology of blood and urine.

10. Lymphocytes and platelets, their role in health and disease.

11. Erythrocytes – Abnormal cells and their significance.

12. Abnormal constituents of Urine and their significance in diseases.

PRACTICALS (75 hours)

1. Detection and identification of Proteins, Amino acids, Carbohydrates and Lipids.

2. Analysis of normal and abnormal constituents of Blood and Urine (Glucose, Urea, Creatine, Creatinine, Cholesterol, Alkaline phosphatase, Acid phosphatase, Bilirubin, SGPT, SGOT Calcium, Diastase, Lipase).

3. Examination of sputum and faeces (Microscopic and staining).

4. Practice in injection drugs by intramuscular, subcutaneous and intravenous routes, Withdrawal of blood samples.

HUMAN ANATOMY AND PHYSIOLOGY

Theory (50 hours)

1. Scope of Anatomy and Physiology. Definition of various terms used in Anatomy.

2. Structure of cell, function of its components with special reference to mitochondria and microsomes.

3. Elementary tissues of the body i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

4. Structure and function of skeleton. Classification of joints and their functions. Joint disorders.

5. Composition of blood, function of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood.

6. Name and functions of lymph glands.

7. Structure and functions of various parts of the heart. Arterial and venous system with special reference to the names and position of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.

8. Various parts of respiratory system and their functions, physiology of respiration.

9. Various parts of urinary systems and their function. Structure and functions of kidney, Physiology of Urine formation. Pathophysiology of renal diseases and oedema.

10. Structure of skeleton muscle. Physiology of muscle contraction, Names positions attachments and functions of various skeletal muscles, Physiology of neuromuscular junction.

11. Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of autonomic nervous system.

12. Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin, Physiology of pain.

13. Digestive system: Names of the various parts of digestive system and their functions structure and functions of liver. Physiology of digestion and absorption.

14. Endocrine glands and Hormones. Location of the glands, their hormones and functions. Pituitary, Thyroid, Adrenal and pancreas.

15. Reproductive system – Physiology and anatomy of Reproductive system.

PRACTICALS (50 hours)

1. Study of the human skeleton.

2. Study with the help of charts and models of the following systems and organs.

a) Digestive system.

b) Respiratory system.

c) Cardiovascular system.

d) Urinary system.

e) Reproductive system.

f) Nervous system.

g) Eye.

h) Ear.

3. Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle, connective tissue and nervous tissue.

4. Examination of blood films for TLC, DLC and malarial parasite.

5. Determination of clotting times of blood, erythrocyte sedimentation rate and Hemoglobin value.

6. Recording of body temperature, pulse, heart rate, blood pressure & ECG.

HEALTH EDUCATION AND COMMUNITY PHARMACY

Theory (50 hours)

1. **Concept of health –** Definition of physical health, mental health, social health, spiritual health, determinants of health, indicators of health, concept of disease, natural history of diseases. The disease agents, concept of prevention of diseases.

2. **Nutrition and health –** Classification of foods, requirements, Diseases induced due to deficiency of proteins, vitamins and minerals; treatments and prevention.

3. **Demography and family planning –** Demography cycle, fertility, family planning, contraceptive methods behavioural methods, natural family planning methods, chemical methods, natural family planning methods chemical methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.

4. **First Aid –** Emergency treatment in shock, snake bite, burns, poisoning, heart – disease, fractures and resuscitation methods. Element of minor surgery and dressings.

5. **Environment and health –** Sources of water supply, water pollution, purification of water, health and air, noise, light; Solid waste disposal and control – Medical entomology, arthropod borne diseases and their control, rodents, animals and diseases.

6. **Fundamental principles of microbiology –** Classification of microbes, isolation, staining techniques of organisms of common diseases.

7. **Communicable diseases –** Causative agents, mode of transmission and preventions.

a) **Respiratory infection –** Chicken pox, measles. Influenza, diphtheria, whooping cough and tuberculosis.

b) **Intestinal infections –** Poliomyelitis, Hepatitis, Cholera, Typhoid, Food poisoning, Hookworm injection.

c) **Arthropod borne infection –** Plague, Malaria, Filariasis.

d) **Surface infections –** Rabies, Trachoma, Tetanus, Leprosy.

e) **Sexually transmitted diseases –** Syphilis, Gonorrhea, AIDS

8. **Non communicable diseases**- Causative agents, prevention, care and control. Cancer, Diabetes, Blindness, Cardiovascular diseases.

9. **Epidemiology –** Its scope, method, uses, dynamics of diseases transmission. Immunity and Immunisation: Immunological products and their dose schedule. Principles of diseases control and prevention Hospital acquired infection, Prevention and control. Disinfection, types of disinfection, disinfection procedures for faeces, urine, sputum, room, linen, dead bodies, instruments.

SYLLABUS

DIPLOMA IN PHARMACY (SECOND YEAR)

2.1 PHARMACEUTICS-II

Theory (75 hours)

1. Dispensing Pharmacy

i) **Prescription –** Reading and understanding of prescriptions, Latin terms commonly used (Detailed study is not necessary). Modern methods of prescribing, Adoption of merit system, Calculations involved in dispensing.

ii) **Incompatibilities in prescription –** Study of various types of incompatibilities physical, chemical and therapeutic.

iii) **Posology –** Dosage and dosage of drug. Factors influencing dose, Calculations of doses on the basis of age, sex and surface area. Veterinary doses.

2. Dispensed Medications:

(Note: A detailed study of the following dispensed medication is necessary: Methods of preparation with theoretical and practical aspects), Use of appropriate containers and closures. Special labeling requirements and storage conditions should be high – lighted.

i) **Powders–** Type of powders, advantages and disadvantages of powders, Granules, Cachets and Tablet triturates. Preparation of different types of powders encountered in prescriptions, weighing methods, possible errors in weighing, minimum weighable amounts and weighing of a material below the minimum weighable of a material below the minimum weighable amount, geometric dilution and proper usage and care of dispensing balance.

ii) Liquid Oral Dosage forms:

a. **Monophasic–** Theoretical aspects including commonly used vehicles essential adjuvant like stabilizers, colourants and flavours with examines.

Review on the following monophasic liquids with details of formulation and practical methods.

Liquids for Internal Administration	Liquids for external administration or used on Mucous Membranes
Mixtures and concentrates syrups Elixirs	Gargles Mouth washes Throat – paints Douches Ear Drops Nasal drops & Sprays Liniments Lotions

b. **Biphasic Liquid Dosage Forms**i.

Suspensions (Elementary study) Suspension Containing diffusible solids and liquids and their preparation. Study of the adjuvants used like thickening agents, wetting agents their necessity and quantity to be incorporated./ suspensions of Precipitate forming liquid like tinctures their preparation and stability. Suspensions produced by chemical reaction. An introduction to flocculated/non-flocculated suspension system.

ii. **Emulsion:** Identification of emulsion systems, formulation of emulsion, selection of emulsifying agents. Instabilities in emulsions. Prevention of emulsions.

iii) **Semi-Solid Dosage Forms:**

a) **Ointments –** Types of Ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following process

(i) Trituration, (ii) Fusion, (iii) Chemical reaction, (iv) Emulsification.

b) **Pastes –** Difference between ointments and pastes. Bases of pastes. Preparation of pastes and their preservation.

c) **Jellies –** An introduction to the different types of jellies and their preparation.

d) **An elementary study of poultice.**

e) **Suppositories and pessaries–** Their relative merits and demerits, types of suppositories, suppository bases, classification, properties, preparation and packing of suppositories. Use of suppositories for drug absorption.

iv) **Dental and cosmetic Preparations:**

Introduction to Dentifrices Facial cosmetics, Deodorants, Antiperspirants, shampoos, Hair dressing and Hair removers.

v) **Sterile Dosage forms:**

a) **Parenteral dosage forms:** Definition, General requirements for parenteral dosage forms, types of parenteral formulations, vehicles, adjuvants processing, personnel, facilities and quality control. Preparation of Intravenous fluid and admixtures, total parenteral nutrition, Dialysis fluids.

b) Sterility testing, Particulate matter monitoring, Faulty seals, packaging.

c) **Ophthalmic products –** Study of essential characteristics of different ophthalmic preparations. Formulation additives, special precaution in handling and storage of ophthalmic products.

PRACTICAL (100 hours)

Dispensing of at last 100 products covering a wide range of preparation such as mixtures, emulsions, lotions, liniments, E.N.T. preparation, ointment, suppositories, powder. Incompatible prescription etc.

Books Recommended Latest Edition

1) Indian Pharmacopoeia.

2) British Pharmacopoeia.

3) National formularies (N.F.I., B.N.F.)

4) Remington's Pharmaceutical Sciences.

5) Martindale's Extra Pharmacopoeia.

2.2 PHARMACEUTICAL CHEMISTRY-II

Theory (100 hours)

1. Introduction to the nomenclature of organic chemical systems with particular reference to heterocyclic system containing up to 3 rings.

2. The chemistry of following pharmaceutical organic compounds covering their nomenclature, chemical structure, uses and the important physical and chemical properties (Chemical structure of only those compounds marked with asterisk(*). The stability and storage conditions of different type of Pharmaceutical formulations of these drugs and their popular brand names.

Antiseptics and Disinfectants– Proflavine*, Benzalkonium chloride, Cetrimide, Chlorocresol*, Chloroxylene, Foramldehyde solution, Hemachlorophene, Liquified phenol, Nitrofurantoin.

Sulfonamides– Sulfadiazine*, Sulfaguanidine*, Phthalylsulfathiazole, Succinyl sulfathiazole, Sulfadimethoxine, Sulfamethoxpyridazine, Sulfamethoxazole, Cotrimoxazole, Sulfacetamide*.

Antileprotics Drugs – Clofazimine, Thiambutosine, Dapsone*, Solapsone.

Anti-tubercular Drugs– Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, Cycloserine, Pyrazinamide*.

Antiamoebic and Anthelmintic Drugs– Emetine, Metronidazole*, Halogenated hydroxyquinolines, Diloxanide furoate, Paromomycin, Piperazine*, Mebendazole, D.F.C.*.

Antibiotics – Benzyl penicillin*, Phenoxymethyl penicillin*, Benzathine pencillin, Ampicillin*, Cloxacillin, Carbenicillin, Gentamycin, Neomycin, Erythromycin, Tetracycline, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol.

Antifungal agents – Undecylenic acids, Tolnaftate, Nystatin, Amphotericin, Hamycin.

Antimalarial Drugs – Chloroquine*, Amodiaquine, Primaquine, Proguanil, Pyrimethamine*, Quinine, Trimethoprim.

Tranquillizers– Chlopromazine*, Prochloperazine, Trifluoperazine, Thiothixene, Haloperidol*, Triperidol, Oxypertine, Chloridiazepoxide, diazepam*, Lorazepam, Meprobamate.

Hypnotics – Phenobarbitone*, Butobarbitone, Cyclobarbitone, Nitrazepam, Glutethimide*, Methyprylon, Paraldehyde, Triclofos sodium.

General Anaesthetics – Halothane*, Cyclopropane*, Diethyl ether*, Methohexital sodium, Thiopental sodium, Trichloroethylene.

Antidepressant Drugs – Amitriptyline, Nortypyline, Imipramine*, Phenelzine, Tranycypromine.

Analeptics – Theophylline, Caffeine*, Coramine*, Dextroaphetamine.

Adrenergic Drugs – Adrenaline*, Noradrenaline, Isoprenaline*, Phenylephrine, Salbutamol, Terbutaline, Ephedrine, Pseudoephedrine.

Adrenergic Antagonist – Tolazoline, Propranolol*, Practalol,

Cholinegic Drugs – Neostigmine*, Pyridostigmine, Pralidoxine, Pilocarpine, Physostigmine*.

Cholinergic Antagonists – Atropine*, Hyoscine, Homatropine, Propantheline*, Benztroprine, Tropicamide, Biperiden*.

Diuretic Drugs – Furosemide*, Chlorothiazide, Hydrochlorothiazide*, Benzthiazide, Urea*, Mannitol, Ethacrynic Acid.

Cardiovasular Drugs – Ethylnitrite*, Glyceryl trinitrate, Alpha methyldopa, Guanethidine, Clofibrate, Quinidine.

Hypoglycemic Agents– Insulin, Chlorpropamide*, Tolbutamide, Gilbenclamide, Phenformin*, Metformin.

Coagulants and Anti Coagulants– Heparin, Thrombin, Menadione*, Bishydroxycounmarin, Warfarin sodium.

Local Anaesthetics – Lignocaine*, Procaine*, Benzocaine.

Histamine and Anti-histaminic Agents- Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine, Pheniramine, Chlorpheniramine*.

Analgesics and Antipyretics – Morphine, Pethidine*, Codeine, Methadone, Aspirin*, Paracetamol*, Analgin, Dextro propoxphene, Pentazocine.

Nonsteriidal anti-inflammatory agents– Indomethacin*, Phenylbutazone*, Oxphenbutazone, Ibuprofen.

Thyroxine and Antithyroids– Thyroxine*, Methimazole, Methylthiouracil, Propylthiouracil.

Diagnostic Agents – Iopanoic acids, Propyliodone, Sulfobromophthalein sodium, Indigotindisulfonate sodium, Indigocarmine, Evans Blue, Congo Red, Fluorescein sodium. Anticonvulsants, Cardiac glycosides, Antiarrhythmic, Antihypertensives and Vitamins.

Steroidal Drugs – Betamethazone, Coritsone, Hydrocortisone, Prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.

Antineoplastic Drugs– Actinomycins, Azathioprin, Busulphan, Chlorambusil, Cisplatin, Cyclophosphamide, Daunorubicin hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

Books Recommended (Latest Edition)

1. Pharmacopoeia of India.

2. British Pharmaceutical Index.

3. Martindale's extra Pharmacopoeia.

PRACTICAL (75 hours)

1. Systematic qualitative testing of Organic drugs involving solubility determination, Melting point and/or boiling point. Detection of elements and functional groups (10 Compounds).

2. Official identification tests for certain groups of drugsincluded in the I.P. like barbitutates, sulfonamides, phenothiazines, antibiotics etc. (8 compounds).

2.3 PHARMACOLOGY AND TOXICOLOGY

Theory (75 hours)

1. Introduction to pharmacology, scope of pharmacology.

2. Routes of administration of drugs their advantages and disadvantages.

3. Various processes of absorption of drugs and the factors affecting them. Metabolism, distribution and excretion of drugs.

4. General mechanism of drug action and factors which modify drug action.

5. Pharmacological classification of drugs. The discussion of drugs should emphasize the following aspects.

1) Drugs acting on the Central Nervous System.

a) General anaesthetics, adjunct to anaesthesis, intravenous anaesthetics.

b) Analgesic, anti-pyretics and non-steroidal anti-inflammatory drugs. Narcotic analgesics. Antirheumatic and antigout remedies, Sedatives and Hypnotics, Psychopharmacological agents, Anti convulsants, Analeptics.

c) Centrally acting muscle relaxants and antiparkionsonism agents.

2. Local anaesthetics.

3. Drug acting on autonomic nervous system.

a) Cholinergic drugs, Anticholinergic drugs, Anticholinesterase drugs.

b) Adrenergic drugs and adrenergic receptor blockers.

c) Neurone blockers ganglion blockers.

d) Neuromuscular blockers, drug used in myasthenia gravis.

4. Drugs acting on eye, mydriatics, drugs used in glaucoma.

5. Drugs acting on respiratory system-Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants, Antitussive agents.

6. Autacoids. Psysiological role of histamine and serotonin, Histaminics and Antihistaminics, Prostaglandins.

7. Cardio vascular drugs: Cardiotonics, Antiarrhythmic agents, Antiarrhythmic agents, Antianginal agents, Antihypertensive agent, Peripheral vasodilators and drugs used in atherosclerosis.

8. Drugs acting on the blood and blood forming organs Haematinics, Coagulants and Anticoagulants, Hemostatics, Blood substitutes and Plasma expanders.

9. Drugs affecting renal function – Diuretics and antidiuretics.

10. Hormones and hormone antagonists – Hypoglycemic agents, Antithyroid drugs, Sex hormones and Oral contraceptives, Corticosteroids.

11. Drugs acting on digestive system – Carminatives, Digestants, Bitters, Antacids and drugs used in peptic ulcer, Purgatives and Laxatives, Antdiarrhoeals, Emetics Antiemetics, Antispasmodics.

12. Chemotherapy of microbial disease: Urinary antiseptics, Sulphonamides Penicillins, Streptomycin, Tetracyclines and other antibiotics. Antitubercular agents, antifungal agents, antviral drugs, antileprotic drugs.

13. Chemotherapy of protozoal diseases, Anthelmintic drugs.

14. Chemotherapy of cancer.

15. Disinfectants and antiseptics. (A detailed study of the action of drugs on each organ is not necessary.)

PRACTICAL(50 hours)

The first six of the following experiments will be done by the students while the remaining will be demonstrated by the teacher.

1. Effect of K+, Ca++, Acetylcholine and Adrenaline on frog's heart.

2. Effect of acetelycholine on rectus abdominis muscle of frog and guinea pig ileum.

3. Effect of spasmogens and relaxants on rabbits intestine.

4. Effect of local anaesthetics on rabbit cornea.

5. Effect of mydriatics and miotics on rabbit eye.

6. To study the action of strychnine on frog.

7. Effects of digitalis on frog's heart.

8. Effect of hypnotics in mice.

9. Effect of convulsants and anticonvulsants in mice or rats.

10. Test for pyrogens.

11. Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.

12. Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

2.4 PHARMACEUTICAL JURISPRUDENCE

Theory (50 hours)

1. **Origin and nature of Pharmaceutical legislation in India –** Its scope and objectives. Evolution of the concept of Pharmacy as an integral part of the Health care system.

2. **Principle and significance of Professional Ethics –** Critical study of the Code of Pharmaceutical Ethics drafted by Pharmacy Council of India.

3. **Pharmacy Act 1948 –** The General study of the Pharmacy Act with special reference to Education Regulation, working of State and Central Councils, Constitution of these Councils and Functions. Registration procedures under the Act.

4. **The Drugs and Cosmetics Act.** 1940 – General study of the Drugs and Cosmetics Act and the rules there under. Definitions and salient features related to retail and whole sale distribution of Drugs. The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licenses under the rule. Facilities to be provided for running a pharmacy effectively. General study of the schedules with special reference to schedules C, C1, F, G, J, H, P and X and salient features of labeling and storage condition of drugs.

5. **The Drugs and Magic Remedies** (Objectionable Advertisement) Act 1954 – General study of the Act. Objectives special reference to be laid on Advertisements. Magic remedies and objectionable and permitted advertisements – diseases which cannot be claimed to be cured.

6. **Narcotic Drugs and Psychotropic Substance Act. 1985 –** A brief study of the act with special reference to its objectives, offences and punishment.

7. **Brief introduction to the study of the following acts.**

a) Latest Drugs (Price Control) Order in force.

b) Poisons act 1919 (as amended to date).

c) Medicinal and Toilet Preparations (Excise Duties) Act 1955 (as amended to date).

d) Medical Termination of Pregnancy Act. 1971. (As amended to date).

Books Recommended (Latest Edition).

Bare Acts of the said laws Published by the Governments.

2.5 DRUG STORE AND BUSINESS MANAGEMENT

Theory (75 hours)

Part-I Commerce (50 hours)

1. Introduction: Trade, Industry and Commerce, Function and subdivision, Introduction to Elements of Economic and Management.

2. Forms of Business Organizations.

3. Channels of distribution.

4. Drug House management – Selection of site, space layout and legal requirements. Importance and objectives of purchasing, selection of suppliers, credit information, tenders, contracts and price determination and legal requirements thereto. Codification handling of drug stores and other hospital supplies.

5. Inventory control objectives and importance, Modern techniques like ABC, VED analysis the lead time inventory, carrying cost, safety, stock, minimum and maximum stock levels, economic order, quantity, scrap and surplus disposal.

6. Sales Promotion, Market Research, Salesmanship, qualities of a salesman, Advertising and Window Display.

7. Recruitment, training, evaluation and compensation of the pharmacist.

8. Banking and finance – Services and functions of bank finance planning and sources of finance.

Part-II Accountancy (25 hours)

1. Introduction to the accounting concept and conventions Double entry, Book keeping, Different kinds of accounts.

2. Cash Book.

3. General Ledger and Trial Balance.

4. Profit and Loss Account and Balance sheet.

5. Simple techniques of analyzing financial statement, introduction to Budgetting.

Books Recommended (Latest Editions)

1. Remington's Pharmaceutical Sciences.

2.6 HOSPITAL AND CLINICAL PHARMACY

Theory (75 hours)

Part-I Hospital Pharmacy

1. **Hospitals –** Definition, Function, Classifications based on Various criteria, Organisation. Management and health delivery system in India.

2. **Hospital Pharmacy –**

a) Definition.

b) Functions and objectives of Hospital Pharmaceutical services.

c) Location layout, Flow chart of materials and men.

d) Personnel and facilities, requirements including equipments based on individual and basic needs.

e) Requirements and abilities required for Hospital Pharmacists.

3. Drugs distribution system in Hospitals:

a) Out patient service.

b) In patient service: (i) types of service (ii) detailed discussion of unit dose system, floor ward stock system Satelite pharmacy services. Central sterile services. Bed Side Pharmacy.

4. Manufacturing:

a) Economical Considerations estimation of demand.

b) Sterile manufacture – large and small volume parenterals, facilities, requirements, layout, production planning, man power requirements

(c) Non-Sterile manufacture-Liquid orals, Externals, Bulk Concentrates

(d)Procurement of stores and testing of raw materials.

5. Nomenclature and use of surgical instruments and Hospital Equipments and health accessories.

6. P.T.C. (Pharmacy Therapeutic Committee) Hospital formulary system and their organization, functioning, composition.

7. Drug information service and Drug information Bulletin.

8. Surgical dressings like cotton, gauze, bandages and adhesive taps including their pharmacopoeial tests for quality other hospital supply e.g. I.V. sets, B.G. sets, Ryal tubes, catheters, syringes etc.

9. Application of computers in maintenance of records inventory control, medication monitoring, drug information and data storage and retrieval in hospital and retail pharmacy establishments.

Part-II: Clinical Pharmacy

1. Introduction to Clinical Pharmacy Practice – Definition and scope.

2. Modern dispensing aspects – Pharmacists and patient counseling and advice for the use of common drugs medication history.

3. Common daily terminology used in the Practice of Medicine.

4. Disease, manifestations and pathophysiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardio vascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.

5. Physiological parameters with their significance.

6. Drugs Interaction: (a) Definition and Introduction.

(b) Mechanism of drugs Interaction.

(c) Drug interaction with reference to analgesics, diuretics cardiovascular drugs, gastro-intestinal agent. Vitamins and hypoglycemic agents.

(d) Drug-food interaction.

7. Adverse Drug Reaction: (a) Definition and significance.

(b) Drugs in clinically induced diseases and Teratogenicity.

8. Drugs in Clinical Toxicity – Introduction, General treatment of poisoning, systemic antidotes. Treatment of insecticide poisoning, heavy metal poisoning, Narcotic drugs, Barbiturates, Organophosphorus poisons.

9. Drug dependencies, drug abuse, additive drugs and their treatment complications.

10. Bioavailability of drugs including factors affecting it.

Books Recommended (Latest Edition).

1. Remington's Pharmaceutical Sciences.
2. Testing of raw materials used in (1)

PRACTICAL (50 hours)

1. Preparation of transfusion fluids.
2. Testing of raw materials used in (1)
3. Evaluation of surgical dressings.
4. Sterilization of surgical instrument, glass were and other hospital supplies.
5. Handling and use of data processing equipments.