D PHARM SYLLABUS

APPENDIX-A	
1.1	Pharmaceutics I
1.2	Pharmaceutical Chemistry I
1.3	Pharmacognosy
1.4	Biochemistry and Clinical Pathology
1.5	Human Anatomy & Physiology
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2.5	Drug Store & Business management
2.6	Hospital and Clinical Pharmacy

APPENDIX –A SYLLABUS
DIPLOMA IN PHARMACY (PART –I)
PHARMACEUTICS –I
Theory (75 hours)

1. Introduction of different dosage forms. Their classification with examples-their relative applications. Familiarisation 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 calculations and adjustments of products. Use of alligation method in calculations, Isotonic solutions.

4. Packing 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 Enegy Mill and Disintegrator.

6. Size separation–Size separation by sifting. 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 Homogeniser. Double cone mixer.

8. Clarification and Filtration –Theory of filtration, Filter media; Filter aids and selection 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 modification, continuous hot extraction–Applications in the preparation of tinctures and extracts.
(b) Introduction to 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 processes–Study of Tray Dryers: 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 process.
(i) Sterilization with moist heat,
(ii) Dry heat sterilization,
(iii) Sterilization by radiation,
(iv) Sterilization by filtration and
(v) 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; Tablets excipients; Defects 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 dealt in an elementary manner.)

15. Processing of Capsules–Hard and soft gelatin capsules; different sizes capsules; filling of capsules; handling and storage of capsules, Special applications of capsules.

16. Study of immunological products like sera vaccines, toxoids & their preparations.

PRACTICAL (100 hours)		
Preparation (minimum number 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	2
10.	Preparations involving sterilization	2
11.	Ophthalmic preparations	2
12.	Preparations involving aseptic techniques	2

Books Recommended : (Latest editions)

1.Remington's Pharmaceutical Sciences.
2.The Extra Pharmacopoeia –Martindale.

1.2 PHARMACEUTICAL CHEMISTRY -I

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 bisulphite, Sodium metabisulphite, 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 and 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 sulphur precipitated sulphur, selenium sulphide.

(iv) Astringents:-Alum and Zinc Sulphate.

(E) Dental Products–Sodium Floride, Stannous Flouride, 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 tartarate.

(I) Antidotes-Sodium nitrate.

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, and, Calcium Ferrous Sulfate 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. Counter Radio isotopes their uses, storage and precautions with special reference to the official preparations.Radio opaque Contrast media–Barium sulfate.

5.Quality control of Drugs and Pharmaceuticals-Importance of quality control, significant errors, methods used for quality control, sources of impurities in Pharmaceuticals, Limit tests for 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, sulfate, 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 (atleast 3)
b. Redox titrations (One each of Permanganometry and iodimetry)
c. Precipitation titrations (atleast 2)

d. Complexometric titrations (Calcium and Magnesium)

Book recommended (Latest editions)

Indian Pharmacopoeia.

1.3 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 evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.

(a) Laxatives: Aloes, Rhuburb, Castor oil, Ispaghula, Senna.
(b) Cardiotonics-Digitalis, Arjuna.
(c) Carminatives & G.I. 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, Nux vomica.
(f) Antihypertensives-Rauwolfia.
(g) Antitussives-Vasaka, Tolu balsam, Tulsi.
(h) Antirheumatics-Guggul, Colchicum.
(i) Antitumour-Vinca.
(j) Antileprotics-Chaulmoogra Oil.
(k) Antidiabetics -Pterocarpus, Gymnema, Sylvestro.
(l) Diuretics–Gokhru, Punarrnava.
(m) Antidysentrics-Ipecacuanha.
(n) Antiseptics and disinfectants Benzoin, Myrrh. Nim, curcuma.
(o) Antimalarials–Cinchona.

(p) Oxytocics-Ergot.
(q) Vitamines-Shark liver Oil and Amla.
(r) Enzymes-Papaya, Diastase, Yeast.
(s) Perfumes and flavouring agents –Peppermint Oil, Lemon Oil, Orange Oil, Lemon grass Oil, Sandalwood.
(t) Pharmaceutical aids-Honey, Arachis Oil, Starch, Kaolin, Pectin, Olive oil, Lanolin, Beeswax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatin.
(u) Miscellaneous –Liquorice, Garlic, Picrorhiza, Dioscorea, Linseed, Shatavari, Shankhapusphi, Pyrethrum, Tobacco.

6. Collection and preparation of crude drug 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 dressings—cotton, silk, wool and regenerated fibre.

8. Gross anatomical studies of Senna, Datura, Cinnamon, Cinchona, Fennel, Clove, Ginger, Nux vomica & Ipecacuanha.

PRACTICAL (75 hours)

1. Identification of drug 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, Nuxvomica, Ipecacuanha.
4. Identification of fibres and surgical dressings.

1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY

Theory (50 hours)

1. Introduction to biochemistry.
2. Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.
3. Brief chemistry and role of Carbohydrates, Classification, qualitative tests, Diseases related to carbohydrate metabolism.
4. Brief chemistry and role of Lipids, Classification, qualitative tests. Diseases related to lipids metabolism.
5. Brief chemistry and role of Vitamins and Coenzymes.
6. Role of minerals and water in life processes.
7. Enzymes : Brief concept of enzymic 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.

(a) Lymphocytes and Platelets, their role in health and disease.
(b) Erythrocytes Abnormal cells and their significance.
(c) Abnormal constituents of urine and their significance in diseases.

PRACTICAL (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 injecting drugs by intramuscular, subcutaneous and intravenous routes. Withdrawal of blood samples.

1.5 HUMAN ANATOMY AND PHYSIOLOGY
THEORY (75 hours)

1. **Scope of Anatomy and Physiology.**
2. **Definition of various terms used in Anatomy**
3. **Structure of cell, function of its components with special reference to mitochondria and microsomes.**
4. **Elementary tissues of the body. i.e epithelial tissue, muscular tissue, connective tissue and nervous tissue.**
5. **Structure and function of skeleton. Classification of joints and their function, Joint disorder.**
6. **Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood.**
7. **Name and functions of lymph glands.**
8. **Structure and functions of various parts of the heart. Arterial and venous systems with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.**
9. **Various parts of respiratory system and their functions. Physiology of respiration.**
10. **Various parts of urinary system and their functions, structure and functions of kidney. Physiology of Urine formation. Pathophysiology of renal diseases and oedema.**
11. **Structure of skeletal muscle. Physiology of muscle contraction, Names, position, attachments and functions of various skeletal muscles. Physiology of neuromuscular junction.**
12. **Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and Physiology of autonomic nervous system.**
13. **Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.**

14. **Digestive system; names of the various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.**
15. **Endocrine glands and Hormones. Locations of the glands, their hormones and functions. Pituitary, thyroid, Adrenal and Pancreas.**
16. **Reproductive system -Physiology and Anatomy of Reproductive system.**

PRACTICAL (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 tissues.
4. Examination of blood films for TLC, DLC and malarial parasite.
5. Determination of clotting time of blood, erythrocyte sedimentation rate and Hemoglobin value.
6. Recording of body temperature, pulse, heart rate, blood pressure and ECG.

1.6 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, disease induced due to deficiency of proteins, Vitamins and minerals –treatment and prevention.

3. Demography and family planning—Demography cycle, fertility, family planning, contraceptive methods, behavioural methods, natural family planning method, chemical method, 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. Elements 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, modes of transmission and prevention.

(a) Respiratory infections—Chicken pox, measles. Influenza, diphtheria, whooping cough and tuberculosis.
(b) Intestinal infections: Poliomyelitis. Hepatitis. Cholera. Typhoid, Food poisoning, Hookworm infection.
(c) Arthropod borne infections –plague, Malaria, Filariasis.
(d) Surface infections –Rabies, Trachoma, Tetanus, Leprosy.
(e) Sexually transmitted diseases ---Syphilis. Gonorrhoea. AIDS.

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

9. Epidemiology– Its scope, methods, uses, dynamics of disease transmission, immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection, disinfection procedures, for faeces, urine, sputum, room linen, dead –bodies, instruments.

2.1 PHARMACEUTICS II Theory (75 hours)

1. Dispensing Pharmacy:

(i) Prescriptions –Reading and understanding of prescription; Latin terms commonly used (Detailed study is not necessary), Modern methods of prescribing, adoption of metric system. Calculations involved in dispensing.
(ii) Incompatibilities in Prescriptions –Study of various types of incompatibilities – physical, chemical and therapeutic.
(iii) Posology—Dose and Dosage of drugs, 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 labelling requirements and storage conditions should be high –lighted).

(i) Powders –Types 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 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 examples. Review of the following monophasic liquids with details of formulation and practical methods..

Liquids for internal administration	Liquids for external administration or used on mucus membranes.
Mixtures and concentrates	Gargles
Syrups	Mouth washes Throat –paints Douches
Elixirs	Ear Drops Nasal drops & Sprays Liniments Lotions.

(b) Biphasic Liquid Dosage Forms:

(i) Suspension (elementary study)----Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvants used like thickening agents, wetting agents, their necessity and quantity to be incorporated. Suspensions of precipitate forming liquids like, tinctures, their preparations and stability. Suspensions produced by chemical reaction. An introduction to flocculated, non-flocculated suspension system.

(ii) Emulsions –Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agents. Instabilities in emulsions. Preservation 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 processes:

(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 Dentrifices, Facial cosmetics, Deodorants, Antiperspirants, Shampoos, Hair dressing and Hair removers.

1. **(v) Sterile Dosage Forms:**
2. **(a) Parenteral dosage forms—Definitions, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvants, processing, personnel, facilities and Quality control. Preparation of Intravenous fluids and admixtures –Total parenteral nutrition, Dialysis fluids.**
3. **(b) Sterility testing, Particulate matter monitoring –Faulty seal packaging.**
4. **(c) Ophthalmic Products –Study of essential characteristics of different ophthalmic preparations. Formulation additives, special precautions in handling and storage of ophthalmic products.**

PRACTICAL (100 hours)Dispensing of at least 100 products covering a wide range of preparations such as mixtures, emulsions, lotions, liniments, E.N.T, preparations, ointments, suppositories, powders, incompatible prescriptions etc.
Books recommended :(Latest editions)

1. Indian Pharmacopoeia.
2. British Pharmacopoeia.
3. National Formularies (N.F.I, B.N.F)
4. Remington's Pharmaceutical Sciences.
5. Martindale Extra Pharmacopoeia.

2.2 PHARMACEUTICAL CHEMISTY 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 and the different type of Pharmaceutical

formulations of these drugs and their popular brand names.Antiseptics and Disinfectants –Proflavine, * Benzalkoniumchloride, Cetrimide, Chlorocresol*, Chloroxylene, Formaldehyde solution, Hexachlorophene, Liquified phenol, Nitrofurantoin.Sulfonamides-Sulfadiazine, Sulfaguanidine*, Phthalysulfathiazole, Succinylsulfathiazole, Sulfadimethoxine, Sulfamethoxypridazine, Sulfamethoxazole, co-trimoxazole, Sulfacetamide*.Antileprotic 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, diloxanidefuroate, Paramomycin Piperazine*, Mebendazole, D.E.C*,.Antibiotics –Benzyl Penicillin*, Phenoxy methyl Penicillin*, Benzathine Penicillin Ampicillin*, Cloxacillin, Carbenicillin, Gentamicin, Neomycin , Erythromycin , Tetracycline, Cephalexin, Cephaloridine , Cephalothin, Griseofulvin , Chloramphenicol.Antifungal agents – Undecylenic acid, Tolnaftate, Nystatin, Amphotericin, Hamycin.Antimalarial Drugs –Chloroquine*, Amodiaquine, Primaquine, Proguanil, Pyrimethamine*, Quinine, Trimethoprim.Tranquilizers –Chlorpromazine*, Prochlorperazine, TrifluoPerazine, Thiothixene, Haloperidol*, Triperidol, Oxypertine, Chlordiazepoxide, Diazepam*, Lorazepam, Meprobamate.Hypnotics— Phenobarbitone*, Butobarbitone, Cyclobarbitone, Nitrazepam, Glutethimide*, Methyprylone, Paraldehyde, Triclofos sodium.General Anaesthetics –Halothane*, Cyclopropane*, Diethyl ether*, Methohexital sodium, Thiopental sodium, Trichloroethyelene.Antidepressant Drugs—Amitriptyline, Nortryptyline, Imipramine *, Phenelzine, Tranylcypromine.Analeptics –Theophylline, Caffeine*, Coramine*, Dextroamphetamine.Adrenergic Drugs –Adrenaline*, Noradrenaline, Isoprenaline*, Phenylephrine Salbutamol, Terbutaline, Ephedrine *, Pseudoephedrine.Adrenergic Antagoinst –Tolazoline, Propranolol*, Practolol.Cholinergic Drugs –Neostigmine*, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine*.Cholinergic Antagonists –Atropine*, Hysocine, Homatropine, Propantheline*, Benztrophine, Tropicamide, Biperiden.*Diuretic Drugs –Furosemide*, Chlorothiazide, Hydrochlorothaizide*, Benzthiazide, Urea*, Mannitol *, Ethacrynic Acid.Cardiovascular Drugs –Ethyl nitrite*, Glyceryl trinitrate, Alpha methyl dopa, Guanethidine, Clofibrate, Quinidine.Hypoglycemic Agents –Insulin, Chlorpropamide*, Tolbutamide, Glibenclamide, Phenformin *, Metformin.Coagulants and Anti –Coagulants –Heparin, Thrombin, Menadione*, Bishydroxycoumarin, Warfarin Sodium.Local Anaesthetics –Lignocaine*, Procaine*, Benzocaine.Histamine and Anti–histaminic Agents-Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine, Pheniramine, Chlorpheniramine*.Analgesics and Anti-pyretics–Morphin, Pethidine*, Codeine, Methadone, Aspirin*, Paracetamol*, Analgin, Dextropropoxyphene, Pentazocine.Non-steroidal anti-inflammatory Agents –Indomethacin*, phenylbutazone*, Oxyphenbutazone, Ibuprofen, Thyroxine and Antithyroids – Thyroxine*, Methimazole, Methylthiouracil, Propylthiouracil.Diagnostic Agents-Iopanoic Acid, Propyliodone, Sulfobromophthalein. Sodium indigotindisulfonate, Indigo Carmine, Evans blue, Congo Red, Fluorescein Sodium .*Anticonvulsants, cardiac glycosides, Antiarrhythmic antihypertensives & vitamins.Steroidal Drugs

–Betamethazone, Cortisone, Hydrocortisone, prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.Anti- Neoplastic Drugs –Actinomycins, Azathioprine, Busulphan, Chlorambucil, Cisplatin cyclophosphamide, Daunorubicin hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

Books Recommended :(Latest editions)

1. Pharmocopoeia of India.
2. British Pharmaceutical Codex.
3. Martindale The Extra Pharmacopoeia.

PRACTICAL (75 hours)

1. Systematic qualitative testing of organic drugs involving Solubility determination, melting point and boiling point, detection of elements and functional groups (10 compounds).
2. Official identification test for certain groups of drugs included in the I.P like barbiturates, sulfonamides, phenothiazine, Antibiotic etc (8 compounds).
3. Preparation of three simple organic preparations.

2.3 PHARMACOLOGY & 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 drugs action and the factors which modify drug action.
5. Pharmacological classification of drugs. The discussion of drugs should emphasise the following aspect:

(i)Drugs acting on the Central Nervous System:(a) General anaesthetics, adjunction to anaesthesia, intravenuous anasesthetics.(b) Analgesic antipyretics 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 anti parkinsonism agents(ii) Local anaesthetics.(iii) Drug acting on autonomic nervous system.(a) Cholinergic drug, Anticholinergic drugs, anti cholinesterase drugs.(b) Adrenergic drugs and adrenergic recepter blockers.(c) Neurones blockers and ganglion blockers.(d) Neuromuscular blockers, drugs used in myasthenia gravis.(iv) Drugs acting on eye, mydriatics, drugs used in glaucoma.(v) Drugs acting on respiratory system –Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.(vi)Antacids, Physiological role of histamine and serotonin, Histamine and Antihistamines, Prostaglandins.(vii) Cardio Vascular drugs, Cardiotonics, Antiarrhythmic agents, Antianginal agents, Antihypertensive agents, Peripheral Vasodilators and drugs used in

atherosclerosis.(viii) Drugs acting on the blood and blood forming organs. Haematinics, Coagulants and anti Coagulants, Haemostatics, Blood substitutes and plasma expanders.(ix) Drugs affecting renal function-Diuretics and antidiuretics.(x) Hormones and hormone antagonists –hypoglycemic agents, Antithyroid drugs, sex hormones and oral contraceptives, corticosteroids.(xi) Drugs acting on digestive system-Carminatives, digestants Bitters, Antacids and drugs used in Peptic ulcer, purgatives, and laxatives, Antidiarrhoeals, Emetics, Antiemetics, Anti-spasmodics.Chemotherapy of microbial disease ;Urinary antiseptics, Sulphonamides, Penicillins, Streptomycin, Tetracylines and other antibiotics, Antitubercular agents, Antifungal agents, antiviral drugs, antileprotic drugs.

6. Chemotherapy of protozoal diseases Anthelmintic drugs.
7. Chemotherapy of cancer.
8. Disinfectants and antiseptics.

A detailed study of the action of drugs on each organ is not necessary.

PHARMACOLOGY 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 acetylcholine on rectus abdominis muscle of Frog and guinea pig ileum.
3. Effect on spasmogens and relaxants on rabbits intestine.
4. Effect of local anaesthetics on rabbit cornea.
5. Effect of mydriatics and miotics on rabbits eye.
6. To study the action of strychnine on frog.
7. Effect of digitalis on frog's heart.
8. Effect of hypnotics in mice.
9. Effect of convulsants and anticonvulsant in mice or rats.
10. Test for pyrogen.
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. Principles 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 Regulations, 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 thereunder. Definitions and salient features related to retail and wholesale distribution of drugs. The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licences under the rule. Facilities to be provided for running a Pharmacy effectively. General study of the Schedules with special reference of schedules C, C1, F, G, J, H, P and X and salient features of labelling and storage condition of drugs.

5. The Drug and Magic Remedies (Objectionable Advertisement) Act, 1945-General study of the Act Objectives, special reference to be laid on Advertisements. Magic remedies and objectionable and permitted advertisements –disease which cannot be claimed to be cured.

6. Narcotic Drugs and Psychotropic Substances 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.

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

2. Poisons Act 1919 (as amended to date)

3. Medicinal and Toilet Preparations (Excise Duties) Act, 1995 (as amended to date)

4. Medical Termination of Pregnancy Act, 1971 (as amended to date)

BOOKS RECOMMENDED (Latest edition)

Bare Acts of the said laws published by Government.

2.5 DRUG STORE AND BUSINESS MANAGEMENT

Theory (75 hours)Part –I Commerce (50 hours)

1. Introduction-Trade, Industry and Commerce, Functions and subdivision of Commerce, Introduction of Elements of Economics and Management.

2. Forms of Business Organisations.

3. Channels of Distribution.

4. Drug House Management –Selection of Site, Space Lay-out and legal requirements. Importance and objectives of Purchasing, selection of suppliers, credit information, tenders, contracts and price determination and legal requirements, there to.Codification, handling of drug stores and other hospital supplies.

5. Inventory Control –objects 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 Service and functions of the bank, Finance Planning and sources of finance.

Part –II Accountancy (25 hours)

1. Introduction to the accounting concepts 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 technique of analysing financial statements.

Introduction to Budgetting.

Books Recommended (Latest edition)

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 material and men.
(d) Personnel and facilities requirements including equipments based on individual and basic needs.
(e) Requirements and abilities required for Hospital pharmacists.

3. Drug Distribution system in Hospitals:

(a) Out –patient services

(b) In-patient services –(a) types of services (b) detailed discussion of unit Dose system, Floor ward stock system, Satellite 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 uses of surgical instruments and Hospital Equipments and health accessories.

6. P.T.C (Pharmacy Therapeutic Committee), Hospital Formulary System and their organisation, functioning, composition.

7. Drug Information service and Drug Information Bulletin.

8. Surgical dressing like cotton, gauze, bandages and adhesive tapes including their pharmacopoeial tests for quality. Other hospital supply e.g I.V sets B.G sets, Ryals tubes, Catheters, Syringes etc.

9. Application of computer 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, scope.

2. Modern dispensing aspects –Pharmacists and Patient counselling and advice for the use of common drugs, medication history.

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

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

5. Physiological parameters with their significance .

6. Drug Interactions:

(a) Definition and introduction.
(b) Mechanism of Drug Interaction.
(c) Drug –drug interaction with reference to analgesics, diuretics, cardiovascular drugs, Gastro-intestinal agents, Vitamins and Hypoglycemic agents.
(d) Drug –food interaction.

7. Adverse Drug Reactions.:

(a) Definition and Significance.
(b) Drug –induced diseases and Teratogenicity.

8. Drugs in Clinical Toxicity –Introduction, general treatment of poisoning, systematic antidotes. Treatment of insecticide poisoning, heavy metal poison, Narcotic drugs, Barbiturate, Organophosphours poisons.

9. Drug dependences, Drug abuse, addictive drugs and their treatment, complications.

10. Bio–availability of drugs, including factors affecting it.

Books recommended (Latest editions)

1. Remington's Pharmaceutical Sciences.

2. Martindale The Extra Pharmacopoeia

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 instruments, glass ware and other hospital supplies.

5. Handling and use of data processing equipments.