PHARMACEUTICS

History of the profession of Pharmacy in India in relation to Pharmacy education, industry, pharmacy practice and various professional associations .Pharmacy as a career. Pharmacopoeia. Introduction to IP, BP, USP, NF and Extra Pharmacopoeia. Salient features of Indian Pharmacopoeia. **Packaging materials**-Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials. **Pharmaceutical aids-** Organoleptic (Colouring, flavouring, and sweetening) agents. **Preservatives**-Definition, types with examples and uses. **Unit operations** -Definition, objectives/applications, principles, construction and working. **Size reduction-** hammer mill and ball mill. **Size separation-** Classification of powders according to IP, Cyclone separator, Sieves and standards of sieves. **Mixing-** Double cone blender, Turbine mixer, Triple roller mill and Silverson mixer homogenizer. **Filtration-** Theory of filtration, membrane filter and sintered glass filter. **Drying-** working of fluidized bed dryer and process of freeze drying. **Extraction**-Definition, Classification, methods and applications. **Tablets**-coated and uncoated, various modified tablets (sustained release, extended-release, fast dissolving, multi- layered, etc.). **Capsules** - hard and soft gelatin capsules. **Liquid oral preparations** - solution, syrup, elixir, emulsion, suspension, dry powder for reconstitution. **Topical preparations** - ointments, creams, pastes, gels, liniments and lotions, suppositories and pessaries. Nasal preparations, Ear preparations. **Powders and granules** - Insufflations, dusting powders, effervescent powders and effervescent granules. **Sterile formulations**– Injectables, eye drops and eye ointments**. Immunological products**: Sera, vaccines, toxoids and their manufacturing methods. **Basic structure, layout, sections, and activities of pharmaceutical manufacturing plants**. **Quality control and quality assurance**: Definition and concepts of quality control and quality assurance, current good manufacturing practice (cGMP). Introduction to the concept of calibration and validation. **Novel drug delivery systems-** Introduction, Classification with examples, advantages and challenges.

PHARMACEUTICAL CHEMISTRY

Introduction to Pharmaceutical chemistry - Scope and objectives.

Sources and types of errors- Accuracy, precision, significant figures.

Impurities in Pharmaceuticals- Source and effect of impurities in Pharmacopoeial substances, importance of limit test, Principle and procedures of Limit tests for chlorides, sulphates, iron, heavy metals and arsenic.

Volumetric analysis- Fundamentals of volumetric analysis, Acid-base titration, non-aqueous titration, precipitation titration, complexometric titration and redox titration. **Gravimetric analysis-** Principle and method. **Inorganic Pharmaceuticals** - Pharmaceutical formulations, market preparations, storage conditions and uses of: **Haematinics-** Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyl iron. **Gastro-intestinal Agents:** Antacids- Aluminium hydroxide gel, Magnesium hydroxide, Magaldrate, Sodium bicarbonate, Calcium Carbonate, Acidifying agents, Adsorbents, Protectives and Cathartics. **Topical agents:** Silver Nitrate, Ionic Silver, Chlorhexidine Gluconate, Hydrogen peroxide, Boric acid, Bleaching powder, Potassium permanganate. **Dental products:** Calcium carbonate, Sodium fluoride, Denture cleaners, Denture adhesives, Mouth washes. **Medicinal Gases:** Carbon dioxide, nitrous oxide and oxygen. Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to three rings. **Study of the following category of medicinal compounds with respect to classification, chemical name, chemical structure (compounds marked with*) uses, stability and storage conditions, different types of formulations and their popular brand names.**

Drugs Acting on Central Nervous System- Anaesthetics: Thiopental Sodium*, Ketamine Hydrochloride*, Propofol. **Sedatives and Hypnotics:** Diazepam*, Alprazolam*, Nitrazepam, Phenobarbital*. **Antipsychotics:** Chlorpromazine Hydrochloride*, Haloperidol*, Risperidone*, Sulpiride*, Olanzapine, Quetiapine, Lurasidone. **Anticonvulsants:** Phenytoin*, Carbamazepine*, Clonazepam, Valproic Acid*, Gabapentin*, Topiramate, Vigabatrin, Lamotrigine. **Anti-Depressants:**

Amitriptyline Hydrochloride*, Imipramine Hydrochloride*, Fluoxetine*, Venlafaxine, Duloxetine, Sertraline, Citalopram, Escitalopram, Fluvoxamine, Paroxetine. **Drugs Acting on Autonomic Nervous System - Sympathomimetic Agents: Direct Acting -** Nor-Epinephrine*, Epinephrine, Phenylephrine Dopamine*, Terbutaline, Salbutamol (Albuterol), Naphazoline*, Tetrahydrozoline. **Indirect Acting Agents*:*** Hydroxy Amphetamine, Pseudoephedrine. Agents with Mixed Mechanism**:** Ephedrine, Metaraminol. **Adrenergic Antagonists:** Alpha Adrenergic Blockers: Tolazoline, Phentolamine, Phenoxybenzamine, Prazosin. Beta Adrenergic Blockers: Propranolol*, Atenolol*, Carvedilol. **Cholinergic Drugs and Related Agents:** Direct Acting Agents: Acetylcholine*, Carbachol and Pilocarpine. Cholinesterase Inhibitors: Neostigmine*, Edrophonium Chloride, Tacrine Hydrochloride, Pralidoxime Chloride, Echothiopate Iodide. **Cholinergic Blocking Agents:** Atropine Sulphate*, Ipratropium Bromide. **Synthetic Cholinergic Blocking Agents**: Tropicamide, Cyclopentolate Hydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride*. **Drugs Acting on Cardiovascular System**: **Anti-Arrhythmic Drugs**: Quinidine Sulphate, Procainamide Hydrochloride, Verapamil, Phenytoin Sodium*, Lidocaine Hydrochloride, Lorcainide Hydrochloride, Amiodarone and Sotalol. **Anti-Hypertensive Agents**: Propranolol*, Captopril*, Ramipril, Methyldopate Hydrochloride, Clonidine Hydrochloride, Hydralazine Hydrochloride, Nifedipine.**Antianginal Agents**: Isosorbide Dinitrate. **Diuretics:** Acetazolamide, Frusemide*, Bumetanide, Chlorthalidone, Benzthiazide, Metolazone, Xipamide, Spironolactone. **Hypoglycemic Agents:** Insulin and Its Preparations, Metformin*, Glibenclamide*,Glimepiride, Pioglitazone, Repaglinide, Gliflozins, Gliptins. **Analgesic And Anti-Inflammatory Agents:** Morphine Analogues, Narcotic Antagonists; **Nonsteroidal Anti- Inflammatory Agents (NSAIDs)** - Aspirin*, Diclofenac, Ibuprofen*, Piroxicam, Celecoxib, Mefenamic Acid, Paracetamol*, Aceclofenac. **Anti-Infective Agents Antifungal Agents:**Amphotericin-B, Griseofulvin, Miconazole, Ketoconazole*, Itraconazole, Fluconazole*, Naftifine Hydrochloride. **Urinary Tract Anti-Infective Agents:** Norfloxacin, Ciprofloxacin, Ofloxacin*, Moxifloxacin. **Anti-Tubercular Agents:**

INH*, Ethambutol, Para Amino Salicylic Acid, Pyrazinamide, Rifampicin, Bedaquiline, Delamanid, Pretomanid*. **Antiviral Agents:** Amantadine Hydrochloride, Idoxuridine, Acyclovir*, Foscarnet, Zidovudine, Ribavirin, Remdesivir, Favipiravir. **Antimalarials:** Quinine Sulphate, Chloroquine Phosphate*, Primaquine Phosphate, Mefloquine*, Cycloguanil, Pyrimethamine and Artemisinin. **Sulfonamides:** Sulfanilamide, Sulfadiazine, Sulfamethoxazole, Sulfacetamide*, Mafenide Acetate, Cotrimoxazole, Dapsone*. **Antibiotics:** Penicillin G, Amoxicillin*, Cloxacillin, Streptomycin. **Tetracyclines*:*** Doxycycline, Minocycline. **Macrolides:** Erythromycin, Azithromycin. **Miscellaneous:** Chloramphenicol*, Clindamycin. **Anti-Neoplastic Agents:** Cyclophosphamide*, Busulfan, Mercaptopurine, Fluorouracil*, Methotrexate, Dactinomycin, Doxorubicin Hydrochloride, Vinblastine Sulphate, Cisplatin* and Dromostanolone Propionate.

PHARMACOGNOSY

Definition, history, present status and scope of Pharmacognosy.

Classification of drugs: Alphabetical, Taxonomical, Morphological, Pharmacological, Chemical, Chemo-taxonomical. **Quality control of crude drugs:** Different methods of adulteration of crude drugs**,** Evaluation of crude drugs. Brief outline of occurrence, distribution, isolation, identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.

Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs.

Laxatives: Aloe, Castor oil, Ispaghula, Senna. **Cardiotonic:** Digitalis, Arjuna. **Carminatives and G.I. regulators** : Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon. **Astringents-** Myrobalan, Black Catechu, Pale Catechu. **Drugs acting on nervous system -** Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca.

Anti-hypertensive- Rauwolfia. **Anti-tussive:** Vasaka, Tolu Balsam.

Anti-rheumatics: Colchicum seed.

Anti-tumour: Vinca, Podophyllum**. Antidiabetics:** Pterocarpus, Gymnema. **Diuretics:**Gokhru, Punarnava**. Anti-dysenteric:** Ipecacuanha**. Antiseptics and Disinfectants:** Benzoin, Myrrh, Neem, Turmeric**. Antimalarial:** Cinchona, Artemisia**. Oxytocic** – Ergot. **Vitamins: Cod** liver oil, Shark liver oil. **Enzymes:** Papaya, Diastase, Pancreatin,Yeast. **Pharmaceutical Aids:** Kaolin, Lanolin, Beeswax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatin**. Miscellaneous:** squill, Galls, Ashwagandha, Tulsi, Guggul**. Plant fibres used as surgical dressings:** Cotton, silk, wool and regenerated fibres **.** Sutures – Surgical Catgut and Ligatures. **Basic principles involved in the traditional systems of medicine like:** Ayurveda, Siddha, Unani and Homeopathy. **Method of preparation of Ayurvedic formulations like:** Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma. Role of medicinal and aromatic plants in national economy and their export potential. **Herbs as health food:** Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietary fibres, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic. Introduction to herbal formulations.

Herbal cosmetics: Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of: Aloe vera gel, Almond oil, Lavender oil, Olive oil, Rosemary oil and Sandal Wood oil. **Phytochemical investigation of drugs.**

HUMAN ANATOMY AND PHYSIOLOGY

Scope of Anatomy and Physiology. Definition of various terminologies.

Structure of Cell- Components and its functions. **Tissues of the human body-** Epithelial, Connective, Muscular and Nervous tissues-their sub-types and Characteristics. **Osseous system-** structure and functions of bones of axial and appendicular skeleton. Classification, types and movements of joints, disorders of joints. **Haemopoietic system-**Composition and functions of blood, Process of Hemopoiesis. Characteristics and functions of RBCs, WBCs and platelets. Mechanism of Blood Clotting, Importance of Blood groups. **Lymphatic system-**

Lymph and lymphatic system, composition, function and its formation. Structure and functions of spleen and lymph node. **Cardiovascular system-** Anatomy and Physiology of heart, Blood vessels and circulation (Pulmonary, coronary and systemic circulation), Cardiac cycle and Heart sounds, Basics of ECG, Blood pressure and its regulation. **Respiratory system** -Anatomy of respiratory organs and their functions. Regulation, and Mechanism of respiration. Respiratory volumes and capacities – definitions. **Digestive system-**Anatomy and Physiology of the GIT**,** Anatomy and functions of accessory glands**,** Physiology of digestion and absorption. **Skeletal muscles-**Histology**,** Physiology of muscle contraction**,** Disorder of skeletal muscles**. Nervous system-** Classification of nervous system**,** Anatomy and physiology of cerebrum, cerebellum, mid brain**,** Function of hypothalamus, medulla oblongata and basal ganglia**,** Spinal cord-structure and reflexes**,** Names and functions of cranial nerves. Anatomy and physiology of sympathetic and parasympathetic nervous system (ANS)**. Sense organs-**Anatomy and physiology of Eye, Ear, Skin, Tongue, Nose. **Urinary system-**Anatomy and physiology of urinary system**,** Physiology of urine formation**,** Renin - angiotensin system**,** Clearance tests and micturition. **Endocrine system (Hormones and their functions)-**Pituitary gland**,** Adrenal gland**,** Thyroid and parathyroid gland**,** Pancreas and gonads**. Reproductive system-**Anatomy of male and female reproductive system**,** Physiology of menstruation**,** Spermatogenesis and Oogenesis**,** Pregnancy and parturition.

SOCIAL PHARMACY

Introduction to Social Pharmacy: Definition and Scope. Social Pharmacy as a discipline and its scope in improving the public health. Role of Pharmacists in Public Health. Concept of Health -WHO Definition, various dimensions, determinants, and health indicators. National Health Policy – Indian perspective. Public and Private Health System in India, National Health Mission. Introduction to Millennium Development Goals, Sustainable Development Goals, FIP Development Goals. **Preventive healthcare – Role of Pharmacists in the following:** Demography and

Family Planning, Mother and child health, importance of breastfeeding, ill effects of infant milk substitutes and bottle feeding. Overview of Vaccines, types of immunity and immunization. Effect of Environment on Health — Water pollution, importance of safe drinking water, waterborne diseases, air pollution, noise pollution, sewage and solid waste disposal, occupational illnesses, Environmental pollution due to pharmaceuticals. Psychosocial Pharmacy: Drugs of misuse and abuse — psychotropics, narcotics, alcohol and tobacco products. Social Impact of these habits on social health and productivity and suicidal behaviors. **Nutrition and Health:** Basics of nutrition – Macronutrients and Micronutrients. Importance of water and fibers in diet. Balanced diet, Malnutrition, nutrition deficiency diseases, ill effects of junk foods, calorific and nutritive values of various foods, fortification of food. Introduction to food safety, adulteration of foods, effects of artificial ripening, use of pesticides, genetically modified foods. Dietary supplements, nutraceuticals, food supplements– indications, benefits, Drug-Food Interactions. Introduction to Microbiology and common microorganisms**. Epidemiology:** Introduction to epidemiology, and its applications. Understanding of terms such as epidemic, pandemic, endemic, mode of transmission, outbreak, quarantine, isolation, incubation period, contact tracing, morbidity, mortality, Causative agents, epidemiology and clinical presentations and Role of Pharmacists in educating the public in prevention of the following communicable diseases: Respiratory infections – chickenpox, measles, rubella, mumps, influenza (including Avian-Flu, H1N1, SARS, MERS, COVID-19), diphtheria, whooping cough, meningococcal meningitis, acute respiratory infections, tuberculosis, Ebola. Intestinal infections — poliomyelitis, viral hepatitis, cholera, acute diarrheal diseases, typhoid, amebiasis, worm infestations, food poisoning. Arthropod-borne infections - dengue, malaria, filariasis and, chikungunya. Surface infections – trachoma, tetanus, leprosy. STDs, HIV/AIDS. Introduction to health systems and all ongoing National Health programs in India, their objectives, functioning, outcome, and the role of pharmacists. **Pharmacoeconomics** – Introduction, basic terminologies, importance of Pharmacoeconomics.

PHARMACOLOGY

General Pharmacology - Introduction and scope of Pharmacology**.** Various routes of drug administration - advantages and disadvantages**.** Drug absorption - definition, types, factors affecting drug absorption**.** Bioavailability and the factors affecting bioavailability. Drug distribution - definition, factors affecting drug distribution. Biotransformation of drugs - Definition, types of biotransformation reactions, factors influencing drug metabolisms **.**Excretion of drugs - Definition, routes of drug excretion**.** General mechanisms of drug action and factors modifying drug action.

Drugs Acting on the Peripheral Nervous System-Steps involved in neuro humoral transmission- Definition, classification, pharmacological actions, dose, indications, and contraindications of Cholinergic drugs **,** Anti-Cholinergic drugs**,** Adrenergic drugs**,** Anti-adrenergic drugs **,** Neuromuscular blocking agents**,** Drugs used in Myasthenia gravis, Local anaesthetic agents , Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)**.**

Drugs Acting on the Eye- Definition, classification, pharmacological actions, dose, indications and contraindications of Miotics**,** Mydriatics**,** Drugs used in Glaucoma**.**

Drugs Acting on the Central Nervous System- Definition, classification, pharmacological actions, dose, indications, and contraindications of General anaesthetics **,** Hypnotics and sedatives**,** Anti- Convulsant drugs **,** Anti-anxiety drugs**,** Anti-depressant drugs **,** Anti-psychotics**,** Nootropic agents**,** Centrally acting muscle relaxants**,** Opioid analgesics**. Drugs Acting on the Cardiovascular System** Definition, classification, pharmacological actions, dose, indications, and contraindications of Anti-hypertensive drugs**,** Anti-anginal drugs**,** Anti-arrhythmic drugs, Drugs used in atherosclerosis, Congestive heart failure and Drug therapy for shock**. Drugs Acting on Blood and Blood Forming Organs-** Definition, classification, pharmacological actions, dose, indications and contraindications of Hematinic agents**,** Anti-coagulants**,** Anti-platelet agents**,** Thrombolytic drugs. Definition, classification, pharmacological actions, dose, indications, and contraindications of Bronchodilators**,** Expectorants**,** Anti-tussive agents**,** Mucolytic

agents . **Drugs Acting on the Gastro Intestinal Tract-**Definition, classification, pharmacological actions, dose, indications and contraindications of Anti-ulcer drugs**,** Anti-emetics **,** Laxatives and purgatives**,** Anti-diarrhoeal drugs**. Drugs Acting on the Kidney-**Definition, classification, pharmacological actions, dose, indications and contraindications of Diuretics and Anti-Diuretics**. Hormones and Hormone Antagonists-**Physiological and pathological role and clinical uses of Thyroid hormones**,** Anti-thyroid drugs**,** Parathormone**,** Calcitonin**,** Vitamin D**,** Insulin**,** Oral hypoglycemic agents **,** Estrogen**,** Progesterone **,**Oxytocin**,** Corticosteroids. **Autocoids-**Physiological role of Histamine, 5-HT and Prostaglandins**.** Classification, clinical uses and adverse effects of antihistamines and 5 HT antagonists .

Chemotherapeutic Agents- Introduction, basic principles of chemotherapy of infections, infestations and neoplastic diseases, Classification, dose, indication and contraindications of drugs belonging to following classes: Penicillins, Cephalosporins, Aminoglycosides, Fluoroquinolones, Macrolides, Tetracyclines, Sulphonamides, Anti-tubercular drugs, Anti-fungal drugs, Anti-viral drugs, Anti-amoebic agents, Anthelmintics, Anti-malarial agents, Anti-neoplastic agents. **Biologicals-** Definition, types and indications of biological agents with examples.

COMMUNITY PHARMACY AND MANAGEMENT

Community Pharmacy Practice — Definition, history and development of community pharmacy - International and Indian Scenarios. Professional responsibilities of community pharmacists. Introduction to the concept of Good Pharmacy Practice and SOPs. **Prescription and prescription handling**-Definition, parts of prescriptions, legality of prescriptions, prescription handling, labelling of dispensed medications (Main label, ancillary label, pictograms), brief instructions on medication usage. Dispensing process, Good Dispensing Practices, dispensing errors and strategies to minimize them.

Communication skills – Definition, types of communication skills**,** Interactions with professionals and patients**.** Verbal-communication skills (one-to-one, over the

telephone). Written communication skills. Body language. Patient interview techniques. **Patient counselling:** Definition and benefits of patient counselling. **Stages of patient counselling** - Introduction, counselling content, counselling process, and closing the counselling session. **Barriers to effective counseling** - Types and strategies to overcome the barriers. **Patient counselling points for chronic diseases/disorders** - Hypertension, Diabetes, Asthma, Tuberculosis, Chronic obstructive pulmonary disease and AIDS. **Patient Package Inserts** - Definition, importance and benefits, Scenarios of PPI use in India and other countries. **Patient Information leaflets** - Definition and uses. **Medication Adherence** - Definition, factors influencing non- adherence, strategies to overcome non-adherence.

Health Screening Services in Community Pharmacy — Introduction, scope and importance of various health screening services - for routine monitoring of patients, early detection, and referral of undiagnosed cases. **Over The Counter (OTC) Medications** — Definition, need and role of Pharmacists in OTC medication dispensing. OTC medications in India, counseling for OTC products. Self-medication and role of pharmacists in promoting the safe practices during self-medication. Responding to symptoms, minor ailments and advice for self-care in conditions such as - Pain management, Cough, Cold, Diarrhea, Constipation, Vomiting, Fever, Sore throat, Skin disorders, Oral health (mouth ulcers, dental pain, gum swelling). **Community Pharmacy Management** - Legal requirements to set up a community pharmacy. Site selection requirements. Pharmacy designs and interiors. Vendor selection and ordering. Procurement, inventory control methods and inventory management. Financial planning and management. Accountancy in community pharmacy – Day book, Cash book. Introduction to pharmacy operation softwares – usefulness and availability. Customer Relation Management (CRM). Audits in Pharmacies. SOP of Pharmacy Management. Introduction to Digital Health, mHealth and Online pharmacies.

BIOCHEMISTRY & CLINICAL PATHOLOGY

Introduction to biochemistry - Scope of biochemistry in pharmacy; Cell and its biochemical organization. **Carbohydrates -** Definition, classification with examples, chemical properties. Monosaccharides –Structure of glucose, fructose, and galactose, Disaccharides-structure of maltose, lactose, and sucrose**.** Polysaccharides - chemical nature of starch and glycogen**.** Qualitative tests and biological role of carbohydrates**. Proteins -** Definition, classification of proteins based on composition and solubility with examples**.** Definition, classification of amino acids based on chemical nature and nutritional requirements with examples**.** Structure of proteins (four levels of organization of protein structure)**.** Qualitative tests and biological role of proteins and amino acids**.** Diseases related to malnutrition of proteins. **Lipids -** Definition, classification with examples**.** Structure and properties of triglycerides (oils and fats)**.** Fatty acid classification - Based on chemical and nutritional requirements with examples**.** Structure and functions of cholesterol in the body**.** Lipoproteins - types, composition and functions in the body**.** Qualitative tests and functions of lipids**. Nucleic acids-** Definition, purine and pyrimidine bases. Components of nucleosides and nucleotides with examples**.** Structure of DNA (Watson and Crick model), RNA and their functions**. Enzymes -** Definition, properties and IUB and MB classification**.** Factors affecting enzyme activity**.** Mechanism of action of enzymes, Enzyme inhibitors**.** Therapeutic and pharmaceutical importance of enzymes. **Vitamins -** Definition and classification with examples**.** Sources, chemical nature, functions, coenzyme form, recommended dietary requirements, deficiency diseases of fat and water soluble vitamins**. Metabolism -** (Study of cycle/pathways without chemical structures) - Metabolism of Carbohydrates: Glycolysis, TCA cycle and glycogen metabolism, regulation of blood glucose level. Diseases related to abnormal metabolism of Carbohydrates. Metabolism of lipids - Lipolysis, β-oxidation of Fatty acid (Palmitic acid) ketogenesis and ketolysis. Diseases related to abnormal metabolism of lipids such as Ketoacidosis, Fatty liver, Hypercholesterolemia.

Metabolism of Amino acids (Proteins): General reactions of amino acids and its significance– Transamination, deamination, Urea cycle and decarboxylation. Diseases related to abnormal metabolism of amino acids, Disorders of ammonia metabolism, phenylketonuria, alkaptonuria and Jaundice. Biological oxidation: Electron transport chain and oxidative phosphorylation. **Minerals -** Types, Functions, Deficiency diseases, recommended dietary requirements. **Water and Electrolytes -** Distribution, functions of water in the body, Water turnover and balance. Electrolyte composition of the body fluids, Dietary intake of electrolyte and Electrolyte balance. Dehydration, causes of dehydration and oral rehydration therapy. **Introduction to Biotechnology**. **Organ function tests -** Functions of kidney and routinely performed tests to assess the functions of kidney and their clinical significances**.** Functions of liver and routinely performed tests to assess the functions of liver and their clinical significances**.** Lipid profile tests and its clinical significances. **Introduction to Pathology of Blood and Urine -** Lymphocytes and Platelets, their role in health and disease**.** Erythrocytes - Abnormal cells and their significance**.** Normal and abnormal constituents of urine and their significance.

PHARMACOTHERAPEUTICS

Pharmacotherapeutics – Introduction, scope, and objectives. Rational use of Medicines, Evidence Based Medicine, Essential Medicines List, Standard Treatment Guidelines (STGs). **Definition, etiopathogenesis, clinical manifestations, non-Pharmacological and Pharmacological management of the diseases associated with:** (a).**Cardiovascular System-** Hypertension, Angina and Myocardial infarction, Hyperlipidemia and Congestive Heart Failure. (b). **Respiratory System-**Asthma, COPD. (c). **Endocrine System-**Diabetes**,** Thyroid disorders - Hypo and Hyperthyroidism. (d). **Central Nervous System –**Epilepsy**,** Parkinson's disease, Alzheimer's disease, Stroke, Migraine. (e). **Gastro Intestinal Disorders -** Gastro oesophageal reflux disease**,** Peptic Ulcer Disease**,** Alcoholic liver disease**,** Inflammatory Bowel Diseases (Crohn's Disease and Ulcerative Colitis).

(f). **Haematological disorders-**Iron deficiency anaemia**,** Megaloblastic anaemia. (g). **Infectious diseases-** Tuberculosis**,** Pneumonia**,** Urinary tract infections**,** Hepatitis, Gonorrhoea and Syphilis**,** Malaria**,** HIV and Opportunistic infections**,** Viral Infections (SARS, CoV2). (h). **Musculoskeletal disorders-**Rheumatoid arthritis**,** Osteoarthritis. (i). **Dermatology-**Psoriasis**,** Scabies**,** Eczema. (j). **Psychiatric Disorders-** Depression**,** Anxiety**,** Psychosis.(k) **Ophthalmology-** Conjunctivitis (bacterial and viral)**,** Glaucoma. (l). **Anti-microbial Resistance.** (m).**Women's Health-**Polycystic Ovary Syndrome**,** Dysmenorrhea and Premenstrual Syndrome.

HOSPITAL AND CLINICAL PHARMACY

Hospital Pharmacy- Definition, scope, national and international scenario**.** Organisational structure**,** Professional responsibilities, Qualification and experience requirements, job specifications, work-load requirements and inter professional relationships**.** Good Pharmacy Practice (GPP) in hospital**.** Hospital Pharmacy Standards (FIP Basel Statements, AHSP)**,** Introduction to NAQS guidelines and NABH Accreditation and Role of Pharmacists. **Different Committees in the Hospital-** Pharmacy and Therapeutics Committee - Objectives, Composition and functions**.** Hospital Formulary-Definition, procedure for development and use of hospital formulary. Infection Control Committee **–** Role of Pharmacist in preventing Antimicrobial Resistance. **Supply Chain and Inventory Control-**Preparation of Drug lists - High Risk drugs, Emergency drugs, Schedule H1 drugs, NDPS drugs and reserved antibiotics**.** Procedures of Drug Purchases — Drug selection, short term, long term, and tender / e-tender process, quotations etc. Inventory control techniques: Economic Order Quantity, Reorder Quantity Level, Inventory Turnover etc. Inventory Management of Central Drug Store — Storage conditions, Methods of storage, Distribution, Maintaining Cold Chain, Devices used for cold storage (Refrigerator, ILR, Walk-in-Cold rooms)**.** FEFO, FIFO methods**,** Expiry drug removal and handling and disposal. Disposal of Narcotics, cytotoxic drugs**,** Documentation - purchase and inventory. **Drug distribution-**Drug distribution (in- patients and out - patients) — Definition, advantages and disadvantages of individual prescription order method,

Floor Stock Method, Unit Dose Drug Distribution Method, Drug Basket Method. Distribution of drugs to ICCU/ICU/NICU/Emergency wards. Automated drug dispensing systems and devices**.** Distribution of Narcotic and Psychotropic substances and their storage**. Compounding in Hospitals**. Bulk compounding, IV admixture services and incompatibilities, Total parenteral nutrition. **Radio Pharmaceuticals -** Storage, dispensing and disposal of Radio pharmaceuticals**. Application of computers in Hospital Pharmacy Practice**- Electronic health records, Soft wares used in hospital pharmacy . **Clinical Pharmacy -** Definition, scope, and development - in India and other countries. Technical definitions, common terminologies used in clinical settings and their significance such as Paediatrics , Geriatric, Anti-natal Care, Post-natal Care, etc. **Daily activities of clinical pharmacists-** Definition, goal, and procedure of Ward round participation, Treatment Chart Review, Adverse drug reaction monitoring, Drug information and poisons information, Medication history, Patient counselling, Inter professional collaboration. **Pharmaceutical care**- Definition, classification of drug related problems. Principles and procedure to provide pharmaceutical care. **Medication Therapy Management, Home Medication Review**. **Clinical laboratory tests used in the evaluation of disease states - significance and interpretation of test results -** Hematological, Liver function, Renal function, thyroid function tests. Tests associated with cardiac disorders**,** Fluid and electrolyte balance, Pulmonary Function Tests .**Poisoning**-Types of poisoning: Clinical manifestations and Antidotes. **Drugs and Poison Information Centre and their services** –Definition, Requirements, Information resources with examples, and their advantages and disadvantages. **Pharmacovigilance**-Definition, aim and scope**,** Overview of Pharmacovigilance. **Medication errors**- Definition, types, consequences, and strategies to minimize medication errors, LASA drugs and Tallman lettering as per ISMP**. Drug Interactions-** Definition, types, clinical significance of drug interactions.

PHARMACY LAW AND ETHICS

General Principles of Law, History and various Acts related to Drugs and Pharmacy profession. **Pharmacy Act-1948 and Rules-** Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils, Registration of Pharmacists, offences and Penalties. **Pharmacy Practice Regulations 2015**. **Drugs and Cosmetics Act 1940 and Rules 1945 and New Amendments**-Objectives, Definitions, Legal definitions of schedules to the Act and Rules. **Import of drugs** – Classes of drugs and cosmetics prohibited from import, Import under license or permit. **Manufacture of drugs** – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license. Study of schedule C and C1, G, H, H1, K, P, M, N, and X. **Sale of Drugs-** Wholesale, Retail sale and restricted license, Records to be kept in a pharmacy. Drugs Prohibited for manufacture and sale in India .**Administration of the Act and Rules** – Drugs Technical Advisory Board, Central Drugs Laboratory, Drugs Consultative Committee, Government analysts, licensing authorities, controlling authorities, Drug Inspectors .**Narcotic Drugs and Psychotropic Substances Act 1985 and Rules -** Objectives, Definitions, Authorities and officers, Prohibition, Control and Regulation, offences and Penalties . **Drugs and Magic Remedies (Objectionable Advertisements) Act 1954**-Objectives, Definitions ,Prohibition of certain advertisements, Classes of Exempted advertisements , offences and Penalties .**Prevention of Cruelty to Animals Act-1960**- Objectives, Definitions, CPCSEA - brief overview, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and Acquisition of animals for experiment, Records, Power to suspend or revoke registration, offences and Penalties. **Poisons Act-1919**-Introduction, objective, definition, possession, possession for sales and sale of any poison, import of poisons. **FSSAI (Food Safety and Standards Authority of India) Act and Rules**- brief overview and

aspects related to manufacture, storage, sale and labelling of Food Supplements. **National Pharmaceutical Pricing Authority**- Drugs Price Control Order (DPCO) - 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, Pharmaceutical Policy 2002, National List of Essential Medicines (NLEM).**Code of Pharmaceutical Ethics**- Definition, ethical principles, ethical problem solving, registration, code of ethics for Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath. **Medical Termination of Pregnancy Act and Rules** – Basic understanding, salient features and Amendments. Role of all the Government pharma regulator bodies – Central Drugs Standards Control Organization (CDSCO), Indian Pharmacopoeia Commission (IPC). Good Regulatory practices (documentation, licenses, renewals, and e-governance) in Community Pharmacy, Hospital pharmacy, Pharma Manufacturing, Wholesale business**,** inspections, import, export of drugs and medical devices. Introduction to BCS system of classification, Basic concepts of Clinical Trials, ANDA, NDA, New Drug development, New Drugs and Clinical Trials Rules, 2019. Brand v/s Generic, Trade name concept, Introduction to Patent Law and Intellectual Property Rights, Emergency use authorization. Blood bank – basic requirements and functions. Clinical Establishment Act and Rules – Aspects related to Pharmacy. Biomedical Waste Management Rules 2016 – Basic aspects and aspects related to pharma manufacture to disposal of Pharma / Medical waste at homes, pharmacies and hospitals. Bioethics - Basic concepts, history and principles. Brief overview of ICMR's National Ethical Guidelines for Biomedical and Health Research involving human Participants. Introduction to the Consumer Protection Act. Introduction to the Disaster Management Act. Medical Devices – Categorization, basic aspects related to Manufacture and sale.