

SYLLABUS OF MASTER OF PHARMACY

First Semester

Category - Departmental / Specialization Basket

Paper- I

PG / PHAR / T/ 111A **Pharmaceutics I**

Polymers in drug delivery, Gastro retentive drug delivery system, Osmotic drug delivery system, Buccal drug delivery system, Transmucosal drug delivery system, Occular drug delivery system, Intra-nasal drug delivery system, Vaginal drug delivery system.

PG / PHAR / T/ 111B **Pharmacognosy I**

Quality control of herbal drugs. General consideration of drug constituents from natural origin. Antitumor and antidiabetic drugs of natural origin. Natural drugs of steroid group. Preservation and storage of crude drugs. Natural drug of protein group. Pharmacological activity of crude drugs. Hallucinogenic, allergenic, teratogenic drugs. Chemotaxonomy of natural drugs. Modern methods of extraction, application of latest techniques like chromatography and electrophoresis in the isolation, purification and identification of phytochemical of crude drugs.

PG / PHAR / T/ 111C **Microbiology I**

Classification and taxonomy; structure and cytology, Nutritional requirements; Enzymes and metabolism by micro –organisms Methods of cultivation of bacteria fungi and viruses. Isolation and identification of contaminants in spoiled pharmaceutical products. Fermentative products of carbohydrates and their uses for identification of some genera of true bacteria.

Methods of sterilization used in pharmaceutical products. Methods of sterility testing for pharmaceutical products. Industrial production of malts, Beverages, antibiotics, and other common products. Methods of preservation against microbial attacks. Different germicidal tests. Mode of action of chemotherapeutic agents in relation to their inhibition of cell wall, protein, cell membrane, RNA, DNA, etc.

Studies of microbial agents of disease by bacteria, and fungi, clinical features, laboratory diagnosis and epidemiology of bacterial diseases. Antibiotics and chemotherapeutic agents. Drug parasite relationships and drug dependence.

Host-parasite relationships, structure and formation of antigens and antibodies; Antigen antibody reaction. Immunofluorescence and electrophoresis, Complement system, etc.

PG / PHAR / T/ 111D **Pharmaceutical Engineering I**

Flow of fluids

Newtonian fluid flow: Revision of undergraduate curriculum; boundary layer concept and applications; Displacement thickness; Problems.

Nonnewtonian fluid flow: Classification; streamline and turbulent flows, modified Reynolds number; applications and problems

Motion of particles in a fluid: Drag force on spherical and nonspherical particles; Motion of particles in different fields; application and problems; Fluidization – theory and particle.

Separation techniques

Filtration and Centrifugation: Theory; Different equipment's and applications; Filter aids; Super centrifuge; Problems.

Gravitational separation: Total and frictional drags; sedimentation; Thickeners and clarifiers; Pharmaceutical applications.

Chromatographic separation: Different types; Theories and equipments; selective adsorption of biological macromolecules.

Membrane separation: Classification; different membranes and types of operation; Reverse osmosis; Electrodialysis; pervaporation; different applications.

Separation of drugs by adsorptive bubble separation method.

Packaging of solids and liquids: Solid packaging; liquid packaging, fillers; marking and labeling, handling and storage.

Conveying of solids.

Paper- II

PG / PHAR / T/ 112A Pharmaceutical Chemistry I

Theory and application of modern analytical instruments. Kinetics in homogeneous system. Physicochemical factors regulating bioavailability, bioequivalence and ADMET parameters.

Drugs from their natural origin with therapeutic importance, their toxicity and regulation: Secondary metabolites with therapeutic importance; Safety, toxicity, pharmacokinetic pharmacodynamic issues; Regulatory perspectives on drug development from Natural sources.

Systematic study of some newer synthetic drugs. Stereochemical studies and conformation analysis -- Cyclic and acyclic systems. Physicochemical incompatibilities. Combinatorial chemistry, HTS, and deconvolution analysis. Introduction to topological structure representation. Protein and peptide drugs.

PG / PHAR / T/ 112B Biochemistry I

Metabolic pathways (e.g. cholesterol synthesis, tryptophan metabolism etc) and their relation to general drug development. Modern elementary concepts of protein and nucleic acid structures. Elementary cytochemistry of mammalian, bacterial and viral cells. Importance of cytochemistry drug development. Study of enzymes emphasizing their general properties, active sites, Kinetics of enzyme reaction, activation and inhibition of enzyme. Basis of metabolic antagonism. Medical enzymes, their production, uses and assay methods. Vitamins as cofactors, their preparation, assay methods and role as drugs.

PG / PHAR / T/ 112C Pharmacology I

Anti-microbials: General principles of chemotherapy. Sulphonamides-trimethoprim-nitrofurantoin. Antibiotics. Chemotherapy of tuberculosis-leprosy-malaria-amoebiasis-helminthiasis-viral disease- fungal diseases –neoplastic diseases.

Heavy metal poisoning, and chelating agents. Adverse drug reaction, iatrogenic diseases and their importance in clinical pharmacy

Paper- III

PG / PHAR / T/ 113A **Pharmaceutics II**

Principles and application of sustained / controlled drug delivery system, Development of various novel drug delivery system, Drug regulatory affairs.

PG / PHAR / T/ 113B **Pharmacognosy II**

Quality control of herbal drugs. General consideration of drug constituents from natural origin. Antitumor and antidiabetic drugs of natural origin. Natural drugs of steroid group. Preservation and storage of crude drugs. Natural drug of protein group. Pharmacological activity of crude drugs. Hallucinogenic, allergenic, teratogenic drugs. Chemotaxonomy of natural drugs. Modern methods of extraction, application of latest techniques like chromatography and electrophoresis in the isolation, purification and identification of phytochemical of crude drugs.

PG / PHAR / T/ 113C **Microbiology II**

Classification and taxonomy; structure and cytology, Nutritional requirements; Enzymes and metabolism by micro –organisms Methods of cultivation of bacteria fungi and viruses. Isolation and identification of contaminants in spoiled pharmaceutical products. Fermentative products of carbohydrates and their uses for identification of some genera of true bacteria.

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PG / PHAR / T/ 113D **Pharmaceutical Engineering II**

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PG / PHAR / T/ 113E Pharmaceutical Chemistry II

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PG / PHAR / T/ 113F Biochemistry II

Metabolic pathways (e.g. cholesterol synthesis, tryptophan metabolism etc) and their relation to general drug development. Modern elementary concepts of protein and nucleic acid structures. Elementary cytochemistry of mammalian, bacterial and viral cells. Importance of cytochemistry drug development. Study of enzymes emphasizing their general properties, active sites, Kinetics of enzyme reaction, activation and inhibition of enzyme. Basis of metabolic antagonism. Medical enzymes, their production, uses and assay methods. Vitamins as cofactors, their preparation, assay methods and role as drugs.

PG / PHAR / T/ 113G Pharmacology II

Biostatistics: Mean, median, Mode, SD, coefficient of variation (CV), student t test, one way ANOVA, Chi-square test, probability, frequency distribution, regression analysis, bioavailability, cross-over design, Wilcoxon signed rank test, introduction to control charts. Pharmacokinetics and Pharmacodynamics. Drugs and poison information, pharmacy administration. Drug allergies- drug dependence- drug tolerance- drug interaction

Category – Inter - Disciplinary Basket

Paper - IV

PG / PHAR / T/ 114A Pharmaceutical Pre formulation Product Development

Pre-formulation studies for candidate drug selection, Biopharmaceutical studies for drug selection, Pre-formulation for product design and development, Bio-pharmaceutics for product design and development, product optimization.

Paper - V

PG / PHAR / T/ 115A Pharmaceutical Quality Assurance

Analytical method development and monitoring of drug release from formulation, instrumental methods and techniques involved in drug and formulation testing, in process quality assurance method , selection and testing of major raw material input, methods of drug sampling, statistical quality control of major categories of dosage forms. High throughput screening of drug development, evaluation and assessment of drugs with the modern techniques like HTS , HRS,Bioassay guided fractionation etc.Development of chromatographic techniques for drug development like HPLC,HPTLC, CPC, LC-MS etc.

Paper - VI

Subject to be offered by other departments.

Category – Sessional Courses

Sessional 1

PG / PHAR / S / 111 Laboratory

Sessional 2

PG / PHAR / S / 112 Seminar

Second Semester

Category - Departmental / Specialization Basket

Paper – VII

PG / PHAR / T/ 127A Pharmaceutics A

Pharmaceutical Biotechnology - DNA Structure, Replication, Transcriptional (Gene Expression) and Translocation Processes, protein folding and design, protein design tests and their significances to create new molecules, DNA recombination and cloning, basics of Immuno-pharmacology and its relevance to drug and pharmaceutical research.

Various drugs and vaccines (whole organism vaccines, recombinant vector vaccines, synthetic peptide vaccines, multivalent sub-unit vaccines and anti-idiotypic vaccines) of biotechnological origin. Anti-sense therapy and technology. Gene as drug delivery system and gene therapy using polymeric carrier systems.

Biotransformation: Induction, type of reaction involved, design of biotransformation process and their improvement. Technology and immobilization of enzymes and its significance in Drug Research.

PG / PHAR / T/ 127B Pharmacognosy A

Screening and evaluation (including modern methods like molecular pharmacology)

Techniques of the following:

Parasympathomimetics, Parasympathomimetic blocking agents, Sympathomimetics, Sympathetic blocking agent, Ganglion stimulant and blocker, Neuromuscular stimulant and blocker, General and local anaesthetics, Sedative and hypnotic, Psychopharmacological agents, Analgesic and Anti-inflammatory agents, Drugs used in Alzheimers disease, Drug used in migraine, Anti parkinsons drugs, CNS stimulant, Cardiotonic, Anti hypertensive drugs, Antiarrhythmic, Drugs used in ischemic heart disease, Drugs used in atherosclerosis, Diuretic, Drug used in GI disorders, Drugs used in respiratory disorders, Drugs used in diabetes, Hormones and endocrine disorders.

Concept of High throughput screening, cell lines and stem cell research.

PG / PHAR / T/ 127C Microbiology A

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PG / PHAR / T/ 127D Pharmaceutical Engineering A

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Conveying of solids.

PG / PHAR / T/ 127E Pharmaceutical Chemistry A

Receptor structure and signal transduction. Drug-target interactions. Physicochemical aspects of drugs in relation to Biological activity. Pharmacokinetic issues in drug design. Rational Drug Design - QSAR/QSPR/QSTR, computational chemistry, molecular modeling, 3D QSAR. Novel statistical techniques in Data modeling – FA, PLS, GA, NN fitting. Pharmacophore mapping, Receptor mapping, Docking, Minimum energy Conformations. Newer synthetic drugs and modern approaches in drug synthesis. Stereochemistry of fused ring and bridged systems.

Insight to drug discovery from natural sources:

Ethnobotany, Ethnopharmacology and aspects of biodiversity for development of natural products; Screening and evaluation of natural products; Standardization and Quality Control of natural products in Global and Indian Perspectives.

PG / PHAR / T/ 127F Biochemistry - A

Elementary concept of molecular biology: i) Biosynthesis of proteins and nucleic acids; ii) cellular regulation mechanisms at the genetic level and at the enzymes level iii) Mutation and adaptability. Study of mutation at the DNA level iv) Bacterial viruses, their replication biochemical basis of viral infectivity process. Modern cancer chemotherapy and its biochemical basis, Develop of drugs like fluorouracil, 8- azagenine alkylating agents etc. Biochemistry study of cell membranes and cell walls, permeability problems, Relevance of the problem in drug development. Polysaccharides and lipids of bacterial cells, their chemical and immunobiological aspects. Biochemistry of drug action and drug resistance, metabolic products, detoxification, delayed action, binding with blood constituents. *Enzymes:* Kinetics of allosteric inhibition. Potential use of allosterism in drug development.

PG / PHAR / T/ 127G Pharmacology A

Recent advances in Pharmacognosy. Tissue culture and its applications. Microscopic evaluation of crude drugs. Pharmaceutical aids of natural origin. Intrinsic and extrinsic factors involving the quality of natural drugs. Marine natural products. Pest and their control in the cultivation of medicinal plants. Pesticides of natural origin. Medicinal plants growth regulator. Commercial aspects of natural drug production.

Paper – VIII

PG / PHAR / T/ 128A Pharmaceutics B

Bio-pharmaceutics, bioequivalence studies, pharmacokinetics.

PG / PHAR / T/ 128B Pharmacognosy B

Concept of biogenesis and application of radio chemical techniques in the study of the biogenesis of the secondary metabolites. Study of biogenetic pathway for certain important phytochemicals. General consideration of the principles and application of

chromatography as applied to natural products of industrial usage. General consideration of principle of physical instrumentation as applied to natural product analysis of industrial usage. Principle involved in the preparation and standardization of herbal drugs. Commercial production of certain important natural drugs. Genetic aspects of plant drugs.

PG / PHAR / T/ 128C Microbiology B

Industrial microbiology: Microbial contamination of different pharmaceutical products. Microbial spoilage and preservation. Heat resistance parameter and their uses in designing heat-sterilizations processes for different pharmaceuticals. Screening of antagonistic organisms and their antagonistic activity. Classification of antibiotics, proportion of antibiotics isolation, purification and identification of new antibiotics from fermentation broth. Analysis of water and treatment of wastewater. Production of antibiotics enzymes, steroids, amino acid.etc by immobilization. Methods of chemical, pharmacological, neurological and immunological behavior in relation to host. Preparation of immunological products. Industrial application of modern genetics for production of pharmaceuticals.

PG / PHAR / T/ 128D Pharmaceutical Engineering B

Unit process: Introduction to basic pharmaceutical and fine chemical industries in India; Unit processes like acylation, alkylation, amination.esterification, halogenation, hydrolysis, nitration, oxidation and reduction, sulfonation and sulfation, polymerization etc; manufacturing aspects or important pharmaceuticals.

Hazards in process units and safety practices.

Corrosion and materials of construction: Different types of corrosion; prevention of corrosion; Materials for pharmaceutical plant construction, machineries and accessories.

Basic Instrumentation in pharmaceutical Industries: Instrumentation for measuring pressure, temperature, humidity, density, flow rate etc; control devices; Transducers. Instrumentation and techniques in tablet & capsule manufacturing.

Effect of pollution in Pharmaceutical Industries: Air and water pollution; pollution monitoring and controlling equipments; wastewater treatments plant (E T P); waste management.

Pilot plant and scale up Techniques: Similarity concept, Rezime concept, concept of model and pilot plant, scale equations, problems.

PG / PHAR / T/ 128E Pharmaceutical Chemistry B

Topological modeling – MCI, E-state, Kappa shape, TAU, etc. Modern synthetic techniques. Computer aided drug synthesis design. Anticancer, Anti-HIV compounds; Immunomodulators. Diagnostic agents. Relationship of functional groups to pharmacological activity, stereochemistry and drugs action, Bioisosterism. Drug metabolism. Bioactive molecules from Nature – Plants, Microorganisms and Animals. Synthetic hormones.

Phytopharmaceuticals -- development and evaluation:

Extraction, isolation and characterization of different classes of phytoceuticals of therapeutic importance; Evaluation of assessment parameters based on WHO guidelines; Modern techniques used for evaluation of natural products: HPTLC, HPLC, GC, etc.

PG / PHAR / T/ 128F Biochemistry B

Intensive study of a few metabolic pathways (e.g. Tricarboxylic acid cycle), at the enzymatic level oxidative phosphorylation and other energy conserving mechanisms. Drugs laying their sites of action at these points.

Biochemistry and mode of action on steroid hormones; their use as drugs.

Biochemistry and mode of action of hormones which are proteins or peptides in nature; their preparation, assay methods and role as drugs.

Radio –isotopes: Their importance in biochemistry and medicine.

Synthesis of radioactive compounds of medicinal importance.

PG / PHAR / T/ 128G Pharmacology B

Introduction to diseases- path physiology, symptoms and general principles of treatment of the following:

CVS, CNS, Respiratory system, GI system, Endocrine system, Excretory system, Skin, Degenerative disorders.

Paper – IX

PG / PHAR / T/ 129A Pharmaceutics C

Novel drug delivery systems like microparticles, nonoparticles, liposome, noisome resealed erythrocytes, transdermal drug delivery, colon specific drug delivery, pro-drugs.

PG / PHAR / T/ 129B Pharmacognosy C

General principles of toxicology and various preclinical toxicity tests as per schedule Y and ICH guidelines. Clinical pharmacokinetics. Drug allergies- drug dependence- drug tolerance- drug interaction. Management in acute care medicine-role in intense care unit, emergencies, total parenteral nutrition. Radioisotope handling of cytotoxic drugs and radiopharmaceuticals. Drugs and poison information, pharmacy administration.

PG / PHAR / T/ 129C Microbiology C

The subject content will be the recent trends and latest developments in the field of Microbiology.

PG / PHAR / T/ 129D Pharmaceutical Engineering C

The subject content will be the recent trends and latest developments in the field of Pharmaceutical Engineering.

PG / PHAR / T/ 129E Pharmaceutical Chemistry C

The subject content will be the recent trends and latest developments in the field of Pharmaceutical Chemistry.

PG / PHAR / T/ 129F Biochemistry C

The subject content will be the recent trends and latest developments in the field of Biochemistry.

PG / PHAR / T/ 129G Pharmacology C

The subject content will be the recent trends and latest developments in the field of Pharmacology.

Category – Sessional Courses

Sessional 1

PG / PHAR / S / 121 Term Paper Leading to Thesis

Sessional 2

PG / PHAR / S / 122 Seminar

Third and Fourth Semester

Sessional 1

PG / PHAR / TH / 21 Thesis Work

Sessional 2

PG / PHAR / VV/ 22 Viva – Voce