M.Pharm Syllabus

DEPARTMENT OF PHARMACEUTICAL SCIENCES

SYLLABUS FOR MASTER OF PHARMACY

MPL 501: Advanced Pharmaceutical Drug Analysis
8 Credits (4-0-8)
The various topics stated below shall be dealt with in sufficient details giving specific examples of typical pharmaceutical substances from the official compendia wherever possible:


- Nuclear Magnetic Resonance Spectroscopy: The NMR-phenomenon viz. spinning nucleus, effect of an external field, precessional motion, precessional frequency, energy transition, chemical shift. $^3$H-NMR (Tritium NMR-spectroscopy), $^{13}$C-NMR-spectroscopy. 2D-NMR, interpretations of NMR-spectrum. Instrumentation, applications in pharmaceutical analysis.


- Electrophoresis: Moving boundary electrophoresis, zone electrophoresis, continuous electrophoresis (preparative), isotadiphoresis, isoelectric focussing.


Practical: UV-Visible analysis of certain pure medicinal compounds: Their absorption bands and identification of structures e.g. Analgin, Paracetamol, Sulphamethoxazole, Ibuprofen, Ampicillin, Chloramphenicol, etc. Simultaneous estimation of two individual drug substances in some marketed combination formulations e.g. Trimethoprim & Sulphamethoxazole, Paracetamol and Ibuprofen, etc. Two-dimensional thin layer chromatography of mixture of amino acids, alkaloids, etc. Separation by electrophoresis of protein hydrolysates or mixture of amino acids. Comparison of two/three different analytical methods for certain pure drugs e.g. Salbutamol, Ephedrine, etc. Experiments based on HPLC. Structure elucidation of some known/unknown compounds. FT-IR/NMR/Mass spectroscopy of compounds. Case studies on Q.C. Laboratory & Analytical Reporting of Raw Materials, In-process and finished products. Any other relevant exercises based on theoretical aspects.

MPL 551: Pharmaceutical Chemistry-II (Advanced Organic Chemistry)

8 Credits (4-0-8)


**MPL 552: Pharmaceutical Chemistry-II (Advanced Medicinal Chemistry)**

8 Credits (4-0-8)

Practical: Note: All the syntheses should be monitored by TLC and products confirmed by spectroscopy. Identification of compounds on the basis of spectroscopy- UV, IR, NMR and Mass. Quantitative estimation of functional groups. Quantitative estimation of Nitrogen in organic compounds. Synthesis of organic compounds of medicinal value such as- paracetamol, phenytoin, DEET, cinnamate esters, 8-hydroxy quinoline, quinoxaline etc. Resolution of racemic drugs by different methods such as preferential crystallization and column chromatography of diastereomeric salts.

MPH 553 : Pharmaceutical Chemistry-III (Chemistry of Natural Products)
8 Credits (4-0-8)

Practical: Isolation and characterization of medicinally active constituents e.g. Eugenol from clove, Curcumin from Turmeric, Hesperidin from Orange Peel, Glycyrrhizin from Glycyrrhiza, Piperine from Black Pepper, Trimyristin and Myristicin from Nutmeg, Pectin from Orange Peel, Ascorbic acid from Lemon, Sennoside from Senna, Menthol from Peppermint oil. sitosterol from edible oils, Glycosides, Alkaloids, Terpenoids from natural sources, Degradation reactions of natural products and their identification by micro-TLC, qualitative tests and spectroscopic methods viz. Atropine, caffeine, ephedrine and nicotine. Paper chromatography, electrophoresis of amino acids derived from plant sources.

MPL 601 Pharmaceutics–I (Product Development)
8 Credits (4-0-8)
Preformulation :Objectives, methodology, physico-chemical parameters viz. pKa and solubility, partition coefficient, vapour pressure, polymorphism, surface characteristics, compatibility tests, applications of solubility parameters in the development of solid, oral liquid and parenteral dosage forms. Pilot plant scale up techniques : Significance, scale-up techniques for tablets, capsules and liquid orals (involving specific considerations e.g. formula, equipment, product uniformity, stability, processing, physical layouts, personnel required etc.).


MPL 602 Pharmaceutics–II (Biopharmaceutics & Pharmacokinetics)
8 Credits (4-0-8)
compartmental approaches, inter species scaling, integrated PKPD models. *In Vitro–InVivo Correlations*: Drug dissolution, principles and methodology, different methods of *in vitro-in vivo* correlation, their applications and limitations. Controlled release dosage forms: Bioavailability and pharmacokinetics of oral, parenteral, ocular, transdermal CRDF and IUDs. Computer Applications and Pharmacokinetics: Introduction, strategy for model building, selection and application of suitable pharmacokinetic, statistical and variance models, function minimisation, iterative and noniterative techniques and weighting schemes for nonlinear regression. Critical evaluation of computer fits and computer use in ADME. Literature review on computer software for pharmacokinetics, study of some computer software like- PC-NONLIN, NONMEM/NM-WIN, MicroPharm-K, TOPFIT etc.

**Practical**: Effect of polymorphism on solubility and dissolution rate. Comparison of dissolution rates of different marketed products. Determination of bioavailability from blood level and urinary excretion data. Protein binding of drugs. Study of drug absorption through everted rat-gut method: influence of different variables like pH, and drug concentration. *In situ* absorption of drugs in laboratory animals. Calculation of AUC, Ka, Ke, t_{1/2}, Cmax, Tmax and Bioequivalence from the data obtained/provided. *In vitro- in vivo* correlations.

**MPL 603 Pharmaceutics–III (Novel Drug Delivery Systems)**

8 Credits (4-0-8)

applications. Biochemical and Molecular Biology Approaches to CDDS: Microparticulate Drug Carriers- structural aspects, preparation, characterisation, evaluation and applications of Liposomes, Nanoparticles, microspheres etc. Other vascular systems- general aspects and applications of niosomes, crythrosomes, pharmacosomes, aquasomes and supramolecules. Monoclonal antibodies- preparation and applications. Absorption of proteins and peptide drugs: Consideration in the delivery of proteins and peptides, stability, membrane barriers, delivery systems for proteins and peptides, toxicity aspects; Enzymes and enzyme immobilization. Recent trends in vaccine and vaccine delivery systems.

**Practical:** Preparation of various polymer films containing different drugs and studies of the film characteristics and release pattern. Study of the diffusion of drugs through various polymer membranes. Preparation and evaluation of microcapsules by different microencapsulation techniques. Preparation of released erythrocytes from blood, loading of various drugs and study of the released pattern. Preparation and evaluation of wax embedded microspheres of diclofenac sodium and theophylline. Preparation of albumin microspheres and their evaluation viz: Particle-size characterization, flow properties and release study. Studies on *in vitro* dissolution of various sustained release products — preparation and comparison with marketed products.

**MPL 701 Pharmacology-I (Advanced Pharmacology)**

*8 Credits (4-0-8)*


**MPL 702 Pharmacology-II (Recent Trends in Pharmacology)**

*8 Credits (4-0-8)*

Essential Drugs


MPL 703 Pharmacology-III (Pharmacological Screening of drugs)
8 Credits (4-0-8)
Study of animal models for screening of following categories of drugs: Analgesics, Anti inflammatory, Local Anesthetics, Antianxiety, Antidepressant, Antipsychotics, Anticonvulsant, Anti Parkinsonism, Antihypertensives, Antidiabetics, Anti-fertility, Anti- Alzheimer’s disease


MPL 801 Pharmacognosy-I (Advanced Pharmacognosy)
8 Credits (4-0-8)

Practical: Preparation and Sterilization of Nutrient media, plant cell culture, callus culture. Preparation of Herbarium Identification of Plant constituents with chromatographic techniques viz. Thin Layer, Preparative TLC, Paper, HPLC.

MPL 802 Pharmacognosy-II (Herbal Drugs Development)
8 Credits (4-0-8)

**Practical:** Standardization of Herbal Drugs by: Morphology, Histology, Quantitative microscopy, Physical constants – Sp. Gravity, ash value, moisture content, extractive values, optical rotation. Preparation of simple herbal cosmetics like, hair oil, shampoos, creams.

**MPL 803 Pharmacognosy-III (Characterization of Plant Constituents)**

8 Credits (4-0-8)
Methods of investigation of biogenetic pathways. Basic principles involved in the phytochemical and biological screening of plant drugs in : Analgesics, anti-inflammatory, cardiotonic, hypoglycemic drugs and plant immodulators
Extraction, Isolation and characterization by chemical and spectral means of various active principles having edicinal, industrial and clinical importance from the following categories: Alkaloids, glycosides, steroids, antibiotics, vitamins, terpenoids, lipids, volatile oils, coumarins and photosensitizing agents

**Practical:** Extraction, isolation and purification of following phytopharmaceuticals, Caffeine, quinine, piperine, Sennoside, Hesperidine, rutin, vasicine, curcumin, atropine. Data interpretation of compounds isolated above, Solubility, melting point, optical rotation, U.V. and I.R. Chromatography by TLC of compound isolated, where standard available.

**MPL 511 THERAPEUTIC DRUG MONITORING**

4 Credits (4-0-0)
Assay (ELISA), RPIA, Apoenzyme Reactivation Immunoassay system (ARIS), Nephalometric Inhibition Immunoassay (NIIA), Substrate Labeled Fluorescence Immunoassay (SLFIA), Prosthetic Group Labeled Immunoassay (PGLI). Criteria for selection of method for Therapeutic Drug Monitoring: Properties of drug molecule such as chemical structure, molecular weight, pKa values, melting and boiling point, drug solubility, concentration range of compound. Characteristics of method like level of precision and accuracy required, complexity of the sample, number of samples to be analysed, time required for analysis, specificity and sensitivity of the method, cost of the method. Importance of Therapeutic Drug Monitoring with reference to Adverse Drug Reactions and Drug interaction. Variation of Clinical Laboratory Tests due to drugs: Tests: Serum creatinine, Blood Urea Nitrogen, Plasma Glucose, Creatine Kinase, Phosphatases, Amylase, Bilirubin, Serum Proteins, Globulin, Complete Blood Count and Differential Blood Count. Therapeutic Drug Monitoring of specific drugs: Clinical pharmacokinetics, general guidelines, sample collection, time of sample collection, clinical comments, clinical monitoring parameters, usual dosing parameters, common toxicities, adverse drug reaction and drug interactions, clinical interpretation, technique used for estimation and importance of: Digoxin, Valproic Acid, Gentamicin, Procainamide, Lidocaine, Phenytoin, Lithium, Phenobarbitone, Theophylline, Quinidine. Cytotoxic and Hepatotoxic Drugs: Classification of cytotoxic drugs, mechanism of action, pharmacokinetics, adverse drug reaction, potential drug interactions, importance and necessity of therapeutic drug monitoring of cytotoxic and various hepatotoxic drugs. Bioequivalence and Therapeutic Equivalence: Definition and concept, terminology involved in vivo bioequivalence criteria and issues, study design for assessment of the bioavailability and bioequivalence, statistical criteria, regulatory requirements, type of bioequivalence studies, Pharmacodynamic models for bioequivalence, fundamentals of integrated PK/PD in models and importances of bioequivalence. Clinical case reports and Discussion

MPL512 DRUG DESIGN
4 Credits (4-0-0)
and allosteric inhibition, medicinal importance of enzyme inhibitors. Drugs through microbial transformation. Combinatorial chemistry, solid phase synthesis, Solution phase synthesis, deconvolution techniques and applications of combinatorial chemistry.

**MPL 513 STERILE PRODUCTS TECHNOLOGY**

*4 Credits (4-0-0)*


**MPL 514 QUALITY ASSURANCE**

*4 Credits (4-0-0)*