2. **WEB PAGE DEVELOPMENT**: Introduction to Front-page, Creating a First Web site, Basic Formatting Techniques, Manipulating Tables within Front-page, Front-page, Picture and MultiMedia, Hyper linking, Bookmarks and Image Maps, Introducing Front-page "components", Front-page and Frames, Managing your Web, Good site design, Publishing and publicizing.
3. **DATA PRESENTATION SKILLS**: MS-Word, MS-Excel, MS-Power point.
4. **UNDERSTANDING AND APPLICATION OF STATISTICAL PACKAGES:** SPSS, Kinetica, Med Calc.

FOURTH PROFESSIONAL

FIRST SEMESTER

PHARMACY PRACTICE-IVA (HOSPITAL PHARMACY)

PHARM 610 **Cr. Hr. 03**

1. **INTRODUCTION:**
   a. Role of Pharmacist in Hospital
   b. Minimum standards for pharmacies in Institutions/Hospitals
   c. Research in Hospital Pharmacy
2. **HOSPITAL AND ITS ORGANIZATION:**
   a. Classification of Hospitals
   b. Organizational Pattern
   c. Administration
   d. Clinical Departments
   e. Nursing, Dietetic, Pathology, Blood Bank, Radiology and other supportive services
   f. Role of Pharmacy in Hospital
   g. Hospital Finances
3. **PHARMACY, ITS ORGANIZATION AND PERSONNEL:**
   a. Pharmacy specialist
   b. Drug information Centre
   c. Poison Control Centre and Antidote Bank
   d. Pharmacy Education
   e. Determining the Need of Professional and other departmental staff
   f. Professional services rendered
4. **PHARMACY AND THERAPEUTIC COMMITTEE:**
5. **THE HOSPITAL FORMULARY:**
   a. General Principles and guidelines to develop Formulary
   b. Format
   c. Preparation of the Formulary
   d. Role of Pharmacist

e. Benefits and problems
f. Keeping up to date Formulary

6. DISPENSING TO INPATIENTS:

a. Methods of Dispensing & SOP's
b. Unit dose dispensing
c. Other concepts of dispensing, Satellite Pharmacy etc.

7. DISPENSING TO AMBULATORY PATIENTS:

8. DISTRIBUTION OF CONTROL SUBSTANCES:

9. DISPENSING DURING OFF-HOURS:

10. SAFE USE OF MEDICATION IN THE HOSPITAL: Medication error; Evaluation & Precautions of Medication Error; Role of Pharmacist in Controlling Medication Error.

PHARMACY PRACTICE-VA (CLINICAL PHARMACY-I) [Theory]

PHARM 611 **Cr. Hr. 03**

1. GENERAL INTRODUCTION TO CLINICAL PHARMACY:

- Introduction to clinical pharmacy and related terms, definition, basic components, comparison with other clinical fields, scope of services.
- General guidelines for clinical pharmacy practice.
- Patient Counseling Compliance
- Laboratory Data interpretation
- Electrolytes management
- Clinical literature evaluation
- Drug interactions
- Medication errors

2. PATIENT PROFILE & PATIENT COUNSELING:

a. Patient disease profile
b. Taking case history
c. Drug Profile of atleast 25 Important Medications e.g. Adrenaline, Aminoglycosides, Anti TB Drugs, Antiepileptics, Atropine, Benzodiazepines, Cepahlosporins, Chlorpheniramine, Cimetidine, Digoxin, Dobutamine, Dopamine, Fluroquinolone, Frusemide, Lactulose, Macrolides, Metoclopramide, Morphine/Pethedine, Nifedipine, NSAIDS, ORS, Penicillins, Prednisolone, Salbutamol, Vancomycin.
d. Patient Counseling

3. CLINICAL TRIALS OF DRUG SUBSTANCES: Designing of clinical trials, Types of trials, Choice of patients, Exclusion of patients and Monitoring a clinical trial.

4. EMERGENCY TREATMENT: For example, Cardiopulmonary resuscitation (CPR), Cold Blue.

5. DRUG INTERACTIONS: Mechanism, Physiological factors affecting interaction, Types and level of drug interactions, Role of pharmacist in evaluating drug interaction & its management.

6. **PHARMACOVIGILANCE:**

a) Scope, definition and aims of Pharmacovigilance

b) Adverse Drug Reactions and Side Effects: Classification, Excessive pharmacological response, Idiosyncrasy, Secondary pharmacological effects, Allergic drug reactions, Detection, Management of ADR, reporting of ADR in light of international health monitoring system.

PHARMACY PRACTICE-VA (CLINICAL PHARMACY-I) [Practical]

PHARM 611 **Cr. Hr. 01**

- Clerkship in the Clinical Setting. A report Related to Clinical Pharmacy Practices will be completed by the students and will be evaluated by the external examiner.
- Students will also complete a report independently or in a group on a Drug Use Evaluation**.**
- Students will take the assignment tasks to enhance verbal presentation, communication, written and problem-solving skills, critical analysis of data and provision of care through a weekly conference and projects.

PHARMACEUTICS-IVA (INDUSTRIAL PHARMACY) [Theory]

PHARM 612 **Cr. Hr. 03**

1. **MASS TRANSFER:**
2. **HEAT TRANSFER:**
3. **DRYING:** Theories of drying, Drying of Solids, Classification of dryers, General Methods, Fluidized Bed systems, Pneumatic systems, Spray dryer, Freeze dying.
4. **COMMUNITION (SIZE REDUCTION):** Reasons for size reduction, Factors affecting size reduction, size analysis, Sieving, Energy Mills (Ball Mill, Endrumer, Edge Rumer, Disintegrant, Colloid Mill, Hammer Mill, Cutter Mill and Fluid Energy Mill etc).
5. **MIXING:** Fundamentals, Mechanisms, Mixing Equipment used in Liquid/Liquid, Liquid/Solid and Solid/Solid mixing.
6. **CLARIFICATION AND FILTRATION:** Theory, Filter Media, Filter aids, Filter selection and Equipment (Leaf filter, Filter press, Melta filters and Rotary filters).
7. **EVAPORATION:** General principles of Evaporation, Evaporators and Evaporation under reduced pressure.
8. **COMPRESSION AND COMPACTION:** The solid-air Interface, Angle of Repose, Flow rates, Mass volume relationship, Density, Heckel Plots, Consolidation, Granulation, Friability, Compression (dry method, wet method, slugging), Physics of Tabletting, tabletting machines and other equipment required, problems involved in tabletting, tablet coating. Capsulation: Hard and soft gelatin capsules.

PHARMACEUTICS-IVA (INDUSTRIAL PHARMACY) [Practical]

PHARM 612 **Cr. Hr. 01**

NOTE: Practical of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g. Manufacture of Tablets by Wet Granulation Method, by Slugging and by Direct Compression. Coating of Tablets (Sugar Coating, Film coatingand Enteric Coating). Clarification of liquids by various processes. Size Reduction. Homogenization. Ampoule filling, sealing and sterilization clarity and leakage tests in injectables. Capsule filling by semi automatic machines. Manufacture of sustained action drugs. Tablets Tests like Disintegration. Dissolution. Friability. Hardness and Thickness tests. Determination of weight variation in tablets. Density of powder. Particle size analysis.
(Note: A minimum of 10 practicals will be conducted).

PHARMACEUTICS-VA (Biopharmaceutics & Pharmacokinetics) [Theory]

PHARM 613 **Cr. Hr. 03**

1. **DEFINITIONS AND TERMINOLOGY:** Biopharmaceutics, Generic Equivalence, Therapeutic Equivalents, Bioavailability, Bioequivalence, Drug Disposition, Pharmacokinetics (LADMER; Liberation, absorption, distribution, metabolism, elimination and response).
2. **GASTRO-INTESTINAL ABSORPTION:** Forces which help in transmembrane movements, Anatomical and physiological factors influencing absorption of drugs. Physicochemical properties of drugs affecting absorption. Absorption of different oral dosage forms.
3. **BIOLOGICAL HALF LIFE AND VOLUME OF DISTRIBUTION:** Introduction, types, methods of determination and application.
4. **DRUG CLEARANCE:** Introduction, Mechanism, Models, determination and relationship of clearance with half-life.
5. **PHARMACOKINETICS:** Introduction, Linear and Non-linear Pharmacokinetics Application of pharmacokinetics in clinical situations.
6. **MULTIPLE DOSAGE REGIMEN:**
    a. Introduction, principles of superposition
    b. Factors: persistent, accumulation and loss factors
    c. Repetitive Intravenous injections – One Compartment Open Model
    d. Repetitive Extravascular dosing – One Compartment Open model
    e. Multiple Dose Regimen – Two Compartment Open Model
7. **CONCEPT OF COMPARTMENT(S) MODELS:**
    I. One compartment open model.
        a. Intravenous Injection (Bolus)
        b. Intravenous infusion.
    II. Multicompartment models.
        a. Two compartment open model.
        b. IV bolus, IV infusion and oral administration
    III. Non-compartmental Model.
        a. Statistical Moment Theory

b. MRT for various compartment models
c. Physiological Pharmacokinetic model

PHARMACEUTICS-VA (Biopharmaceutics & Pharmacokinetics) [Practical]
PHARM 613 **Cr. Hr. 01**

NOTE: Practical of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g. Blood Sampling Techniques (In Laboratory Animals like dog, rabbits, mice etc. in human beings), In-vitro dissolution studies, Optional dose determination, Measurement of rate of Bioavailability, Determination of relative and absolute bioavailability. Plasma level-time curve (Determination of Pharmacokinetic parameters). Determination of plasma protein binding. Urinary sampling techniques in laboratory animals. Renal excretion of drugs or drug disposition in animals and humans.

PHARMACEUTICS-VIA (Pharmaceutical Quality Management) [Theory]
PHARM 614 **Cr. Hr. 03**

1. **INTRODUCTION:**
   (a) Basic concepts and introduction of pharmaceutical industry in relevance to quality assurance and quality control departments, testing, quality management system, quality assurance, quality control and quality standards.
   (b) General understanding of good laboratory practices and validation
2. **QUALITY CONTROL OF SOLID DOSAGE FORMS:**
   (a) Physical tests: Hardness, Thickness and Diameter, Friability, Disintegration, Weight Variation.
   (b) Chemical tests: Content uniformity, Assay of active Ingredient and dissolution tests of Powders, Granules, Tablets and Capsules.
3. **QUALITY CONTROL OF SYRUPS, ELIXIRS and DISPERSE SYSTEM:** Viscosity, its determination and application in the Quality Control of Pharmaceuticals, Weight per ml and Assay of active Ingredient.
4. **QUALITY CONTROL OF SUPPOSITORIES:** Dissolution test, Uniformity of weight, Assay of active Ingredient, Liquefaction time test and Breaking test.
5. **QUALITY CONTROL OF STERILE PRODUCTS (PARENTERALS):** Sterility Test and Sterile section management, Leaker's test, Clarity test, Pyrogen test for Parenteral and other sterile preparations, Assay for active Ingredient.
6. **STANDARDIZATION OF PHARMACEUTICALS:** An understanding of quality assurence system adopted in pharmaceutical industry. Good Manufacturing Practices and Current Good Manufacturing Practices.

PHARMACEUTICS-VIA (Pharmaceutical Quality Management-I) [Practical]
PHARM 614 **Cr. Hr. 01**

NOTE: Practical of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g. Assay of various spirits, tinctures, extracts, syrups and elixirs, Assay of Ointments and suppositories, Assay of tablets and capsules, Test for alkalinity of glass, Determination of alcohol contents in the Pharmaceutical preparations and Pyrogen test. Sterility test, Determination of Ash contents, Determination of Moisture contents, Determination of total solids, Determination of viscosity of syrups, gels, etc., Determination of emulsion types (Note: A minimum of 10 practicals will be performed).

SECOND SEMESTER

PHARMACY PRACTICE-IVB (HOSPITAL PHARMACY)
PHARM 615 **Cr. Hr. 03**

1. **MANUFACTURING BULK AND STERILE:**
2. **THE PHARMACY; CENTRAL STERILE SUPPLY ROOM:**
3. **ASEPTIC DISPENSING:** TPN, I/V Admixtures, Cytotoxic Dispensing, Semi-sterile Dispensing (Eye drops, Ear drops) and Hyperalimentation.
4. **ROLE OF PHARMACIST IN SMALL HOSPITALS, NURSING HOMES etc.**
5. **PURCHASING, DISTRIBUTION AND CONTROL OF HOSPITAL MEDICINES, MEDICAL & SURGICAL SUPPLIES:** Purchasing, Stocking, Stock Control, Inventory Management, Drug Distribution, Relationship between purchasing, Distribution and Clinical Pharmacy Services.
6. **NUCLEAR PHARMACY:**
7. **THE PHYSICAL PLANT AND ITS EQUIPMENT:**
8. **INVESTIGATIONAL USE OF DRUGS:**
9. **HEALTH ACCESSORIES:**
10. **SURGICAL SUPPLIES:**
11. **INSPECTION OF WARDS WITH REFERENCE TO DRUG STORAGE AND ADMINISTRATION:**
12. **MANAGEMENT OF ACCIDENT & EMERGENCY PHARMACY (A & E):**