

## **THIRD PROFESSIONAL**

### Theory

Paper 1	Pathology	50
Paper 2	Pharmacology and Therapeutics-II	100
Paper 3	Pharmacognosy-II (Advanced)	100
Paper 4	Pharmacy Practice-II (Dispensing, Community, Social & Administrative Pharmacy)	100
Paper 5	Pharmaceutical Chemistry-III (Pharmaceutical Analysis)	100
Paper 6	Pharmacy Practice -III (Computer and its Applications in Pharmacy) Practical	50
Paper 7	Pathology	50
Paper 8	Pharmacology and Therapeutics-II	100
Paper 9	Pharmacognosy-II (Advanced)	100
Paper 10	Pharmacy Practice-II (Dispensing, Community and Social & Administrative Pharmacy)	100
Paper 11	Pharmaceutical Chemistry-III (Pharmaceutical Analysis)	100
Paper 12	Pharmacy Practice -III (Computer and its Applications in Pharmacy)	50
Total Marks:		<b>1000</b>

### **PATHOLOGY (Theory)**

**Paper 1**

**Marks 50**

### **Course Objective:**

The subject of pathology shall enable the students regarding--

- (i) awareness of different diseases;
- (ii) condition of diseases;
- (iii) physiological variation in different diseases; and
- (iv) hormonal changes in different diseases.

1. **SCOPE OF PATHOLOGY & CONCEPT OF DISEASES:**
2. **DEFINITION AND TERMINOLOGY:** Ischemia, Hypoxia, Necrosis, Infarction, Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Aplasia, Anaplasia.
3. **RESPONSE OF BODY TO INJURY AND INFECTION:** Acute and Chronic inflammation, Immunity, Allergy, Hyper Sensitivity.
4. **SPECIFIC DISEASES:** Ulcer (Peptic, Duodenal), Hypertension, Leukemia or Blood Cancer (Malignant Carcinoma, Sarcoma & Lymphomas), Diagnosis and treatment of Cancer in general, fate, survival and prognosis with tumors.

**PATHOLOGY (Practical)**

**Paper 7**

**Marks 50**

**Study of Pathological Slides of various Pathological Conditions:** Acute inflammation, Chronic inflammation, Chronic specific inflammation, Different types of Degeneration, Thrombosis, Embolism, Infarction, Necrosis, Gangrene, Hyperplasia, Metaplasia, Pigmentation, Calcification, CVC, Papilloma, Adenoma, Chondroma, Fibroma, Leiomyoma, Neofibroma, Squamous Cell Carcinoma, Basal Cell Carcinoma, Transitional Cell Carcinoma, Adenocarcinoma, Fibrocarcinoma, Rhabdomyosarcoma, Leiomyosarcoma, Lymphosarcoma, Liposarcoma, Reticular Cell Sarcoma, Hodgkins disease, Breast Carcinoma, Osteogenic Sarcoma, Osteoclastoma, Hepatitis, Diabetes.

**Examination of different body fluids in various Pathological Conditions:** Urine Complete Examination, Stool Examination, Blood Complete Examination, Semen Examination, Cerebrospinal Fluid Examination, Pericardial Fluid Examination, Pleural Fluid Examination, Ascitic Fluid Examination, Blood Sugar, Blood Urea, Blood Cholesterol etc.

**Tests for various specimens of clinical importance:** Techniques of Clinical Blood

Examination for various diseases, Gastric Analysis, Tests for liver function, Renal function test, Tests for endocrine abnormalities, Biopsies and cytologic techniques.

**SUGGESTED READINGS:**

1. Dipiro J, Talbert RL, Yee G, Matzke G, Wells B, Michael PL. **Pharmacotherapy: A Pathophysiologic Approach.** 8<sup>th</sup> Ed. McGraw Hill; 2011.
2. Greene RJ, Harris ND. **Pathology and therapeutics for pharmacists.** 3<sup>rd</sup> Ed. Pharmaceutical press; 2008.
3. Kumar V, Cotran RS, Robbins SL. **Robbin's Basic Pathology.** 8<sup>th</sup> Ed. W. B. Saunders Publishers; 2007.
4. Macfarlane PS, Reid R, Collander R. **Pathology Illustrated.** 5<sup>th</sup> Ed. Churchill Livingstone; 2000.
5. Walter GB. **Walters and Israel General Pathology.** 7<sup>th</sup> Ed. Churchill Livingstone; 1996.

**PHARMACOLOGY AND THERAPEUTICS-II (Theory)**

**Paper 2**

**Marks 100**

**Course Objective:**

The main objective of this course is to introduce the action of drugs in biological systems. It will include both pharmacokinetics and pharmacodynamics studies.

**1. DRUGS ACTING ON CENTRAL NERVOUS SYSTEM:**

- a. Sedatives & Hypnotic
- b. Anxiolytics, antidepressants and anti-manic drugs

- c. Antiepileptics
- d. Antiparkinsonian and drug used in other neurodegenerative diseases.
- e. Antipsychotics
- f. Opioid analgesics
- g. Therapeutic gases (Oxygen, Carbon-dioxide, Nitric oxide and Helium.
- h. Cerebral Stimulants, Medullary stimulants, Spinal Cord Stimulant
- i. Anesthetics: General and local

2. **NON-STEROIDAL ANTI-INFLAMMATORY DRUGS:** Disease modifying antirheumatic drugs, non- opioid analgesics and drugs used in the treatment of gout.

### 3. **CHEMOTHERAPY**

- Basic principles of chemotherapy
- Antibacterials (Folate antagonists :sulphonamides, Cell wall synthesis inhibitors; Penicillin, Cephalosporins, Carbapenam, Monobactam, Protein synthesis inhibitors; Aminoglycosides, Tetracyclines, Chloramphenicol, Macrolides, Nucleic acid synthesis inhibitors; Quinolones and miscellaneous Antibiotics), Anti-mycobacterial drugs, Urinary tract antiseptics,
- Anti-fungals
- Anti-virals
- Anti-protozoals: anti-malarias, anti-amebiasis, anthelmintics and anti-leishmanials.
- Anti-neoplastic drugs

4. **IMMUNOPHARMACOLOGY:** Pharmacology of immune-suppressants and stimulants

### 5. **TOXICOLOGY**

- a. Pollution and its types (water, air, food)
- b. Poison and principle of treatment of poisoning.

- c. Poisoning (Sign & symptom and treatment): Ethanol, Barbiturates, Digitalis, Salicylates, Strychnine, Narcotics, Nicotine, Paracetamol, Benzodiazepines and Organophosphorous compounds.
- d. Chelating agents and their role in poisoning: Dimercaprol, Calciumdisodium Edetate (Calcium EDTA), Pencillamine and Defroxamine.

**NOTE:**

1. Only an introduction will be given of the banned and obsolete drug products.
2. While dealing with Pharmacology stress should be laid to the group actions of related drugs and only important differences should be discussed of the individual drugs placed in same group.
3. Newly introduced drugs should be included in the syllabus while drugs with no clinical and therapeutic values ought to be excluded from syllabus at any time.
4. The prototype drugs in each group from the latest edition of the recommended books.

**PHARMACOLOGY AND THERAPEUTICS-II (Practical)**

**Paper 8**

**Marks 100**

**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.

- To study the convulsant effects of strychnine and picrotoxin in frogs and to determine the site of action.
- To identify the unknown (convulsant) drug and determine its site of action.
- To study the effects of Adrenaline on Human Eyes.
- To study the effects of Pilocarpine on Human Eyes.

- To study the effect of Homatropine on Human Eyes.
- To identify and observe the effects of unknown drugs on Human Eyes.
- To study the effects of local anaesthetic drugs on human and the nerve plexus of frog.
- To identify and differentiate the effects of unknown drug on human and the nerve plexus of frog.
- To demonstrate the effects of Acetylcholine on the Rectus abdominus muscle of frog and competitive pharmacological antagonism by Neuromuscular blocking agent e.g. Gallamine.
- To identify the unknown drug by performing pharmacological competitive antagonism on Rectus abdominus muscle of Frog.
- To study the anti-coagulant effects of Heparin and oral anti-coagulants on Rabbits.
- To identify the unknown anticoagulant drug using Rabbits.
- To demonstrate the Graded Dose-Response curve of Acetylcholine on Rabbit intestine.
- To identify unknown concentration of Acetylcholine from Graded Dose Response curves.
- To demonstrate the general anesthetic effect on rabbits.
- To demonstrate the effect of sedatives and hypnotics on rabbits.
- To demonstrate the anti-nociceptive (analgesic) effect on mice.
- To demonstrate antidepressant effect in rats (forced swimming test, tail suspension test Yohimbine lethality test).

(Note: A minimum of 20 practicals will be conducted).

### **SUGGESTED READINGS:**

1. Brunton L, Lazo J, Parker K. **Goodman & Gilman's Pharmacological Basis of**

- Therapeutics**. 11<sup>th</sup> Ed. McGraw Hill Book Company; 2005.
2. Chang HM, But PPH, Yao SC, Wang LL, Yeung SCS. **Pharmacology and applications of Chinese Materia Medica**. 3<sup>rd</sup> Ed. World Scientific Pub Co Inc; 2000.
  3. Ebadi M. **Pharmacology**. 3<sup>rd</sup> Ed. Little Brown & Company; 1996.
  4. Harvey RA, Champe PC. **Lippincott's Illustrated Reviews: Pharmacology**. 4<sup>th</sup> Ed. Lippincott William & Wilkins; 2008.
  5. Humphrey P. **Rang & Dale's Pharmacology**. 6<sup>th</sup> Ed. Churchill Livingstone; 2007.
  6. Katzung BG, Masters SB, Trevor AJ. **Basic & Clinical Pharmacology**. 11<sup>th</sup> Ed. McGraw Hill; 2009.
  7. Koda KMA, Young LY, Kradjan WA, Guglielmo BJ, Alldredge BK, Corelli RL. **Applied therapeutics: the clinical use of drugs**. 9<sup>th</sup> Ed. Lippincott Williams & Wilkins; 2008.
  8. Laurence DR. **Clinical Pharmacology**. 8<sup>th</sup> Ed. ELBS Publishers; 1998.
  9. Ritter JM, Levis LD. **A Text Book of Clinical Pharmacology**. 5<sup>th</sup> Ed. Oxford University Press; 2008.
  10. Satorkar RS, Bhandarkar SD. **Pharmacology and Pharmacotherapeutics**. 19<sup>th</sup> Ed. Bomby: Popular Prakashan; 1998.
  11. Tripathi JD. **Essentials of Medical Pharmacology**. 6<sup>th</sup> Ed. Jaypee Brothers; 2008.
  12. Wecker L, Crespo L, Dunaway G, Faingold C, Watts S. **Brody's Human Pharmacology**. 5<sup>th</sup> Ed. Mosby Inc; 2009.

**PHARMACOGNOSY-II (ADVANCED) (Theory)**

**Paper 3**

**Marks 100**

**Course Objective:**

The main objective of this course work is to enhance the knowledge of plants having medicinal activity.

**1. SEPARATION AND ISOLATION OF PLANT CONSTITUENTS:** Introduction and use of spectroscopic and chromatographic techniques for the identification of natural products. Description and interpretation of ultraviolet, infrared, mass, nuclear magnetic resonance ( $^1\text{H}$ -NMR and  $^{13}\text{C}$ -NMR) and other advance techniques to elucidate the structure of natural products.

**2. CARBOHYDRATES AND RELATED COMPOUNDS:** Introduction and classification of carbohydrates, sugars as adjuvant in drugs, role of impurities in sugar substances.

- a. Sucrose and Sucrose containing drugs: Sucrose, Dextrose, Liquid glucose, Fructose, Lactose, Xylose, Caramel, Starch, Inulin, Dextrine etc.
- b. Cellulose and Cellulose Derivatives: Powdered cellulose, microcrystalline cellulose, Methyl cellulose, Sodium Carboxy-methyl cellulose.
- c. Gums and Mucilage: Tragacanth, Acacia, Sodium Alginate, Agar, Pectin.

**3. ALKALOIDS:** Introduction, Properties, Classification, Function of alkaloids in plants, Methods of extraction and identification tests.

- (a) Pyridine Piperidine Alkaloids: Areca nut, Lobelia.
- (b) Tropane Alkaloids: Belladonna, Hyoscyamus, Stramonium.
- (c) Quinoline Alkaloids: Cinchona.
- (d) Isoquinoline Alkaloids: Ipecacuanha, Opium.
- (e) Indole alkaloids: Rauwolfia, Catharanthus, Nux vomica, Physostigma, Ergot.
- (f) Imidazole alkaloids: Pilocarpus.
- (g) Steroidal alkaloids: Veratrum.



(h) Alkaloidal amines: Ephedra, Colchicum.

(i) Purine Bases: Tea, Coffee.

4. **GLYCOSIDES**: Introduction, classification, chemistry, extraction, isolation and medicinal uses of:

a)	<u>(Cardioactive glycosides:</u>	Digitalis, Strophanthus and white squill.
b)	<u>Anthraquinone glycosides:</u>	Cascara, Aloe, Rhubarb, Cochineal and Senna.
c)	<u>Saponin glycosides:</u>	Glycyrrhiza, Sarsaparilla.
d)	<u>Cyanophore glycosides:</u>	Wild cherry.
e)	<u>Isothiocyanate glycosides:</u>	Black mustard.
f)	<u>Lactone glycosides:</u>	Cantharide
g)	<u>Aldehyde glycosides:</u>	Vanilla.
h)	<u>Miscellaneous glycosides:</u>	Gentian, Quassia, Dioscorea

5. **PLANT STEROIDS**: Introduction, extraction, isolation, nomenclature, sources and uses of bile acids, plant sterols, steroidal sapogenins, steroid hormones, withanolides and ecdysons.

6. **LIPIDS**: Introduction, classification, source, active constituents and pharmacological uses of:

a. Fixed Oils: Castor oil, Cotton seed oil, olive oil, Peanut oil, Sun flower oil, Corn oil, Coconut oil, Almond oil, Linseed oil, Mustard oil, Sesame oil and Soybean oil.

- b. Fats and Related Compounds: Theobroma oil and Lanolin. (c) Waxes: Bees wax, carnauba wax, spermaceti and Jojoba oil.

7. **VOLATILE OILS (ESSENTIAL OILS)**: Introduction, significance, sources, active constituents, methods of obtaining volatile oils, chemistry and classification of:

- a. Hydrocarbon volatile oils: Cubeb and Turpentine oil.
- b. Alcoholic volatile oils: Peppermint, Coriander and Cardamom.
- c. Aldehydic volatile oils: Bitter orange peel, Sweet orange peel, Lemon Cinnamon and Bitter almond oil
- d. Ketonic volatile oils: Camphor, Spearmint, Caraway, Buchu
- e. Phenolic volatile oils: Clove, Thyme.
- f. Phenolic ether volatile oils: Fennel, Anise, Myristica. (g) Oxide volatile oils: Eucalyptus, Chenopodium.
- g. Ester volatile oils: Rosemary.
- h. Miscellaneous volatile oils: Allium, Anethum.

8. **RESINS AND OLEORESINS**: Introduction, classification, active constituents and pharmacological uses of jalap, turpentine, asafoetida, benzoin, rosin, cannabis, podophyllum, ipomea, myrrh, and balsam.

9. **TANNINS**: Introduction, classification, biosynthesis, extraction, identification, occurrence in plants, role in plant life and chemical study of tannins in Kino, Myrobalan, Catechu, Nutgall, Castanea and krameria.

10. **NATURAL TOXICANTS**:

- a. General Introduction to Plant Toxicology: Definition, classification and chemical nature of plant toxins. Plant toxicities in humans and animals
- b. Higher Plant Toxins: Essential oils: Terpene (cineol, pine oil), Phenyl propane (apiol, safrole, myristicin), Monoterpene (thujone, menthafuran) Plant acids (oxalic acid, amino acid, resin acid), Glycosides (cardiotonic, cyanogenic), Alkaloids (imidazole, pyrrolizidine, tropane).

- c. Lower Plant Toxins: Bacterial toxins (Staphylococcus aureus, Clostridium botulinum), Algal toxins (Microcystis aeruginosa, Cyanobacteria, Gonyaulax cantenella).
- d. Mycotoxins: Fungal toxins (Aspergillus spp., Claviceps purpurea), Mushrooms (Amanita spp.).
- e. Study of Toxins, their Prevention and Control Methods: Description, pharmacognostic features, pharmacological actions, chemical constituents, treatment, side-effects, contra-indications, warnings, prevention and control methods of Abrus precatorius, Papaver somniferum, Eucalyptus spp., Nicotiana tabaccum, Cannabis sativa, Digitalis purpurea, Datura stramonium etc. poisoning.

## **11. AN INTRODUCTION TO NUTRACEUTICALS AND COSMECEUTICALS:**

**12. TUMOUR INHIBITORS FROM PLANTS:** Introduction of anticancer agents of natural origin, as Catharanthus roseus, Colchicum autumnale, Podophyllum peltatum, rifamycin antibiotics, macrolide antibiotics, anti-AIDS agents and immunostimulants.

**13. INTRODUCTION TO CLINICAL PHARMACOGNOSY:** General introduction and historical background of clinical Pharmacognosy. Study of treatment by herbal medicines.

## **14. CLINICAL USE OF HERBS & HERBAL MEDICINE:**

Diabetes:	<i>Gymnema sylvestre, Melia azadirachta, Momordica charantia, Syzygium jambulana.</i>
Cardiac diseases:	<i>Digitalis spp., Convallaria majalis, Urgenia indica, Allium sativum, Punica granatum.</i>
Hepatitis:	<i>Berberis vulgaris, Picrorhiza kurroa, Lawsonia in.</i>
Respiratory diseases:	<i>Ficus religiosa, Adhatoda vasica</i>
Skin diseases:	<i>Aloe vera, Angelica archangelica, Mentha piperita, Citrus spp., Commiphora mukul</i>

CNS disorders:	<i>Strychnos nux-vomica, Datura stramonium, Cannabis sativa, Papaver somniferum, Atropa belladonna</i>
Musculo-skeletal disorders:	<i>Nigella sativa, Phycotis ajowan, Trigonella foenum-graecum, Zingiber officinale.</i>
Renal disorders:	<i>Cucumis melo, Berberis vulgaris, Zea mays, Tribulus terrestris</i>
Reproductive disorders:	<i>Saraca indica, Ruta graveolens, Nigella sativa, Glycyrrhiza glabra, Claviceps purpurea, Myristica fragrance.</i>
G.I.T. disorders:	<i>Foeniculum vulgare, Ferula foetida, Cuminum cyminum, Aegle marmelos, Prunus domestica.</i>

### **PHARMACOGNOSY-II (ADVANCED) (Practical)**

**Paper 9**

**Marks 100**

**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. Extraction of the active constituents of crude drugs and chemical tests for their identification. Isolation and separation of active constituents of crude drugs by paper and thin layer chromatography.

**Also include the following experiments;**

- Determination of Iodine value; Saponification value and unsaponifiable matter; ester value; Acid value.
- Chemical tests for Acacia, Tragacanth, Agar, Starch, Lipids, (Castor oil, Sesame oil, Shark liver oil, Bees wax), Gelatin.

(Note: A minimum of 20 practicals will be conducted).

### **SUGGESTED READINGS:**

1. Anonymous. **Monographs of Unani Medicine**. Hamdard Foundation Pakistan; 2003.
2. Baker BM, Bender DA. **Vitamins in Medicine**. 12<sup>th</sup> Ed. Academic Press; 1982.
3. Brain KR, Turner TD. **The Practical Evaluation of Phytopharmaceuticals**. 1<sup>st</sup> Ed. Scientechnica Publishers; 1975.
4. Braun L, Cohen M. **Herbs and Natural Supplements: An Evidence Based Guide**. 3<sup>rd</sup> Ed. London: Elsevier Mosby; 2010.
5. Chauhan P. **Ayurvedic Pharmacognosy**. 1<sup>st</sup> Ed. Sonali Publications; 2007.
6. Cutler SJ, Cutler HG. **Biologically Active Natural Products: Pharmaceuticals**. 1<sup>st</sup> Ed. CRC Press Publisher; 1999.

**PHARMACY PRACTICE-II (DISPENSING, COMMUNITY, SOCIAL & ADMINISTRATIVE PHARMACY) (Theory)**

**Paper 4**

**Marks 40+60**

**Course Objective:**

The main objective of this course is to improve dispensing services with special reference to community health.

**PART A: (DISPENSING):**

**(40 MARKS)**

1. **BASIC PRINCIPLES OF COMPOUNDING AND DISPENSING INCLUDING:** Fundamental operations in Compounding, Containers and closures for Dispensed Products, Prescription-Handling (Parts of Prescription, Filling, Interpretation, Pricing) and Labelling of Dispensed Medication.
2. **EXTEMPORANEOUS DISPENSING:** Solutions, Suspensions, Emulsions, Creams, Ointments, Pastes and gels, Suppositories and pessaries, Powders and granules and Oral unit dosage form.
3. **PHARMACEUTICAL INCOMPATIBILITIES:** Types of Incompatibilities, manifestations, Correction and Prevention with reference to typical examples.

**PART B: (COMMUNITY, SOCIAL & ADMINISTRATIVE PHARMACY):** (60 MARKS)

1. **DEFINITIONS AND BACKGROUND:**
2. **PUBLIC HEALTH AND COMMUNITY PHARMACY:** Epidemiology & its Control, Epidemiological methodology with a focus on specific disease states, Pharmacoepidemiology (including Drug Utilization Review). Preventive Health (EPI & CDC), Family Planning and Health Policy.
3. **MEDICAL COMPLICATION OF DRUG TAKING:** General and Socio-economic Aspects.
4. **PATIENT EDUCATION AND COUNSELLING:**
5. **CONTROL OF DRUG ABUSE AND MISUSE:**
6. **ROLE OF PHARMACIST:** As Public Health Educator in the Community for Drug Monitoring and Drug Information.
7. **HEALTH SYSTEM RESEARCH:** Knowledge skills of research methods, epidemiologic study design, experimental study design, Pre- and post-marketing surveys, Application of various statistical procedures in Pharmacy and Medical Research, causality assessment as well as the sensitivity and specificity tests in pharmacy practice.
8. **PHARMACOECONOMICS:** Pharmacoeconomic modelling and interpretation.
9. **ALTERNATIVE THERAPIES:** Background, philosophy and use of complementary and alternative therapies including herbal medicines, homoeopathy, acupuncture, acupressure, Bach Flower remedies, aromatherapy and reflexology.
10. **PHARMACY LAYOUT DESIGN:** Objectives of Layout Design, Types of Community Pharmacies (Pharmaceutical Centre, Prescription-oriented Pharmacies, Traditional Pharmacies and The Super Drug Store), Consumer goods and purchases, Classes of Layout designs, Principles and characteristics of Layout Design and Traffic Flow analysis.

**PHARMACY PRACTICE-II (DISPENSING, COMMUNITY, SOCIAL &  
ADMINISTRATIVE PHARMACY (Practical)**

**Paper 10**

**Marks 100**

**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. Practical introduction to prescription-handling, interpretation, filling and labelling.

**Mixtures:** Dispensing of simple mixtures containing soluble substances only, mixtures containing diffusible substances, in-diffusible substances and mixtures forming precipitate.

**Powders:** Dispensing of simple powders, compound powders and effervescent powders for external use.

**Incompatibility:** Practical Importance of Incompatibilities

**Ointments And Creams:** Dispensing of iodine and methyl salicylate ointment. Dispensing of cold cream and vanishing creams.

**Cosmetics:** Lipstick, talcum powder, after shave lotion, shaving cream. (Note: A minimum of 20 practicals will be conducted).

**Health Science Research Project:** In the area of health care system, community pharmacy. Establishment of DIC, PCC,

**SUGGESTED READINGS:**

1. Armstrong NA, James KC. **Understanding experimental design and interpretation in pharmaceuticals.** 1<sup>st</sup> Ed. Taylor & Francis Publishers; 1990.
2. Gennaro AR. **Remington: The science and practice of pharmacy.** 21<sup>st</sup> Ed. Lippincott Williams & Wilkins; 2011.

3. Marriott JF, Wilson KA, Langley CA, Belcher D. **Pharmaceutical compounding and dispensing**. 2<sup>nd</sup> Ed. Pharmaceutical Press; 2010.
4. Cooper JW, Gunn C, Carter SJ. **Cooper and Gun's Dispensing for Pharmaceutical Students**. 12<sup>th</sup> Ed. CBS Publishers & Distributors; 2008.
5. Lund W. **The Pharmaceutical Codex: Principles and practice of pharmaceutics**. 16<sup>th</sup> Ed. Co CBS Publishers; 2009.
6. Mehta DK. **British national formulary (BNF)**. 54<sup>th</sup> Ed. Pharmaceutical Press; 2007.
7. Rowe RC. **Handbook of pharmaceutical excipients**. 6<sup>th</sup> Ed. Pharmaceutical press; 2009.
8. Winfield AJ, Rees J, Smith I. **Pharmaceutical Practice**. 4<sup>th</sup> Ed. Churchill Livingstone; 2009.
9. Allen LV, Popovich NG, Ansel HC. **Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems**. 9<sup>th</sup> Ed. Lippincott Williams & Wilkins; 2010.
10. Armstrong NA, James KC. **Understanding Experimental Design and Interpretation in Pharmaceutics**. 1<sup>st</sup> Ed. Taylor & Francis publishers; 1990.
11. Cooper JW, Gunn C, Carter SJ. **Cooper and Gun's Dispensing for Pharmaceutical Students**. 12<sup>th</sup> Ed. CBS Publishers & Distributors; 2008.
12. Desselle SP, Zgarrick DP. **Pharmacy Management: Essentials for all Practice Settings**. 2<sup>nd</sup> Ed. McGraw Hill; 2008.
13. Gennaro AR. **Remington: The science and Practice of Pharmacy**. 21<sup>st</sup> Ed. Lippincott Williams & Wilkins; 2011.
14. Lund W. **The pharmaceutical Codex: Principles and Practice of Pharmaceutics**. 16<sup>th</sup> Ed. Co. CBS Publishers; 2009.
15. Marriott JF, Wilson KA, Langley CA, Belcher D. **Pharmaceutical Compounding and Dispensing**. 2<sup>nd</sup> Ed. Pharmaceutical Press; 2010.
16. Martindale W, Westcoot W. **Martindale: The Complete Drug Reference**. 1<sup>st</sup> Ed. Pharmaceutical Press; 2008.
17. Mehta DK. **British National Formulary (BNF)**. 54<sup>th</sup> Ed. Pharmaceutical Press; 2007.



18. O'Donohue WT, Levensky ER. **Promoting Treatment Adherence:** A practical handbook for health care providers. 1<sup>st</sup> Ed. Sage Publications; 2006.
19. Osol A. **Remington's Pharmaceutical Sciences.** 17<sup>th</sup> Ed. Mack Publishing Company; 2001.
12. Spivey RN, Wertheimer AI, Donald RT. **International pharmaceutical services:** The Drug
20. Industry and Pharmacy Practice in Twenty Three Major Countries of the World. 1<sup>st</sup> Ed. Informa Healthcare; 1996.
21. Robertson R. **Management of Drug Users in the Community:** A practical Handbook. 1<sup>st</sup> Ed. Hodder Arnold Publishers; 1998.
22. Rowe RC. **Handbook of Pharmaceutical Excipients.** 6<sup>th</sup> Ed. Pharmaceutical Press; 2009.
15. Saha GB. **Fundamentals of Nuclear Pharmacy.** 6<sup>th</sup> Ed. Springer Verlag; 2010.
23. Desselle SP, Zgarrick DP. **Pharmacy management:** Essentials for all practice settings. 2<sup>nd</sup> Ed. McGraw Hill; 2008.
24. Spivey RN, Wertheimer AI, Donald RT. **International Pharmaceutical Services: The Drug Industry and Pharmacy Practice in Twenty Three Major Countries of the World.** 1<sup>st</sup> Ed. Informa Healthcare; 1996.
25. Martindale W, Westcoot W. **Martindale: The Extra Pharmacopeia.** 31<sup>st</sup> Ed. Pharmaceutical Press; 2008.
26. O'Donohue WT , Levensky ER. **Promoting treatment adherence:** A practical handbook for health care providers. 1<sup>st</sup> Ed. Sage Publications; 2006.
27. Winfield AJ, Rees J, Smith I. **Pharmaceutical Practice.** 4<sup>th</sup> Ed. Churchill Livingstone; 2009.

**PHARMACEUTICAL CHEMISTRY-III (PHARMACEUTICAL ANALYSIS)**

**Paper 5**

(Theory)

**Marks 100**

## **Course Objective:**

In this subject all topics of analytical method will be taught with special reference to their Pharmaceutical Applications.

1. **SPECTROSCOPIC METHODS:** Theory, Instrumentation and Pharmaceutical applications of the following Spectroscopic Methods:
  - a. Atomic Absorption and Emission Spectroscopy
  - b. Molecular fluorescence spectroscopy
  - c. Flame Photometry
  - d. I.R. Spectroscopy
  - e. Mass Spectroscopy
  - f. NMR Spectroscopy
  - g. U.V./Visible Spectroscopy
2. **CHROMATOGRAPHIC METHODS:** Column Chromatography, Thin Layer Chromatography, Gas Liquid Chromatography, HPLC, LCMS, GCMS, Capillary Electrophoresis.
3. **ELECTRO CHEMICAL METHODS:** Potentiometry, Polarography and Radiochemical Techniques.
4. **THERMAL ANALYSIS:** Differential Scanning Calorimetry, Differential Thermal Analysis, Thermo Gravimetric Analysis.
5. **OCCURENCE, PROPERTIES, PREPARATION AND APPLICATION OF OFFICIAL INORGANIC COMPOUNDS:** Aluminium Hydroxide, Ammonium Chloride, Sodium Carbonate, Magnesium Carbonate, Lithium Carbonate, Sodium Nitrite, Calcium Gluconate, Antimony Gluconate, Ferrous Fumarate, Ferrous Sulfate and Silver Nitrate.
6. **TITRIMETRIC ANALYSIS:** Acid-basetitration, Oxidation-reduction titration, Argentometric titration, Complexometric titration, Non-aqueous titration etc.

**PHARMACEUTICAL CHEMISTRY-III (PHARMACEUTICAL ANALYSIS)**

**(Practical)**

**Paper 11**

**Marks 100**

**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 requirements e.g. Determination of the Purity and Composition of the unknown drugs by using at least each of the above techniques. (Note: A minimum of 20 practicals will be conducted).

**SUGGESTED READINGS:**

1. Ahuja S, Scypinski S. **Handbook of modern pharmaceutical analysis**. 2<sup>nd</sup> Ed. Academic Press; 2010.
2. Armstrong NA, James KC. **Understanding experimental design and interpretation in pharmaceuticals**. 1<sup>st</sup> Ed. Taylor & Francis Publishers; 1990.
3. Beckett AH, Stennlake JB. **Practical Pharmaceutical Chemistry**. 4<sup>th</sup> Ed. The Aulton Press; 2001.
4. Braithwaite A, Smith FJ. **Chromatographic Methods**. 5<sup>th</sup> Ed. Chapman and Hall; 1995.
5. Brittain HG. **Spectroscopy of pharmaceutical solids**. 1<sup>st</sup> Ed. Taylor & Francis; 2006.
6. Hamilton R, Sewell PA. **Introduction to HPLC**. 1<sup>st</sup> Ed. Chapman & Hall; 1982.
7. Heftmann E. **Chromatography**. 6<sup>th</sup> Ed. Von Nostrand Reinhold Co; 2004.
8. Kazakevich Y, LoBrutto R. **HPLC for pharmaceutical scientists**. 1<sup>st</sup> Ed. John Wiley and Sons; 2007.
9. Kemp W. **Organic Spectroscopy**. 3<sup>rd</sup> Ed. Ellis Horwood; 2008.
10. Knevel AM, Digangi FE. **Jenkin's quantitative Pharmaceutical Chemistry**. 7<sup>th</sup> Ed.

McGraw Hill; 1977.

11. Lough WJ, Wainer WI. **High Performance Liquid Chromatography**. 1<sup>st</sup> Ed. Blacki Academic Press; 1995.
12. Moffat AC, Osselton DM, Widdop B. **Clarke's Analysis of Drugs and Poisons**. 4<sup>th</sup> Ed. Pharmaceutical Press; 2011.
13. Pryde A, Gilbert MJ. **Applications of High Performance Liquid Chromatography**. 1<sup>st</sup> Ed. Chapman & Hall; 1979.
14. Snyder LR, Kirkland JJ, Dolan JW. **Introduction to modern liquid chromatography**. 3<sup>rd</sup> Ed. John Wiley & Sons Inc; 2009.
15. Stahl E. **Thin Layer Chromatography**. 2<sup>nd</sup> Ed. Berlin: Springer Verlag; 1969.
16. Williams DH, Fleming I. **Spectroscopic methods in organic chemistry**. 6<sup>th</sup> Ed. McGraw Hill; 2007.

**PHARMACY PRACTICE-III (COMPUTER AND ITS APPLICATION IN  
PHARMACY) (Theory)**

**Paper 6**

**Marks 50**

**Course Objective:**

In this subject all topics of computer sciences will be taught with special reference to their Pharmaceutical Applications.

**1. FUNDAMENTALS BASIC CONCEPT OF COMPUTERS:** History of Data Processing, Types of Computers, Components of a Computer, Computer System and Business Computer System, Backing Storage Devices, Unit of Memory, Viruses and Anti-viruses Issues.

**2. RESEARCH METHODOLOGIES:**

**3. SYSTEM ANALYSIS AND DESIGN:** What is a System?, Steps in system life cycle, Data Gathering and Data Analysis, Designing a New System, Development and Implementation of New System, Documentation.

**4. DATA PROCESSING:** Data Processing, The Data Processing Cycle, The Collection and Computing of data, Manual collection of data, The main methods of data input, Devices used to collect data, Data Verification, Data Validation, Output and Recording of data, Types of data processing systems, Types of Computer Operation, Batch Processing and Real-time Processing.

**5. APPLICATION OF COMPUTERS IN HOSPITAL PHARMACY:** Patterns of Computer use in Hospital Pharmacy, Patient record database management, Medication order entry, Drug labels and list, Intravenous solution and admixture, Patient Medication profiles, Inventory control, Management report & Statistics.

**6. APPLICATION OF COMPUTER IN COMMUNITY PHARMACY:** Computerizing the Prescription Dispensing process, Use of Computers for Pharmaceutical Care in community pharmacy, Accounting and General Ledger system.

**7. APPLICATION OF DRUG INFORMATION RETRIEVAL & STORAGE:** Introduction Advantages of Computerized Literature Retrieval use of Computerized Retrieval.

**8. DATA ANALYSIS:** Introduction and implementations of statistical design and test. Students T-test, Chi Square, ANOVA using statistical packages like SPSS, Med Calc, Kinetica etc.

**PHARMACY PRACTICE-III (COMPUTER AND ITS APPLICATION IN  
PHARMACY) Practical**

**Paper 12**

**Marks 50**

1. **INTERNET AND E-MAIL:** Internet and Microsoft Internet Explorer 5, Addresses, Links and Downloading, Searching the Internet, E-mail and Newsgroups, Favourites, security and Customizing Explorer.

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.

**SUGGESTED READINGS:**

1. Dennis N. **Programmer's Guide to MS-DOS.** 2<sup>nd</sup> Ed. BradyGames; 1987.
2. Elias M. **System Analysis and design.** 2<sup>nd</sup> Ed. Award Galgotia Publications; 1985.
3. Norton P, Clark S. **Peter Norton's Complete Guide to DOS 6.22.** 1<sup>st</sup> Ed. Sams Publishers; 1994.
4. Norton P, Clark S. **Peter Norton's New Inside the PC.** 1<sup>st</sup> Ed. Sams Publishers; 2002.