

Syllabus of
M. Phil. / Ph.D. COURSES
Session: 2013-2014

Department of Pharmacy
Faculty of Science
University of Rajshahi

Syllabus of M. Phil / Ph.D. Courses in Pharmaceutical Sciences 2013

Session: 2013-2014

Course	Name of paper	Unit	Mark	Credit
601	Basic Pharmacy	1	100	4
602	Medicinal Pharmacy	1	100	4
603	Analytical Pharmacy	1	100	4
604	Pharmacology and Toxicology Pharmacy	1	100	4
605	Molecular Biology and Microbiology	1	100	4
606	Pharmaceutical Technology	1	100	4
607	Bio-pharmaceutics	1	100	4
608	Hospital, Clinical and Community Pharmacy	1	100	4
609	Research work (Thesis) (awarded)			
	Total			

Marks Distribution in each course (100):

$$\begin{array}{r}
 \text{Total marks: Two courses } 100+100 = 200 \\
 \text{Research work} \quad = \text{Awarded} \\
 \hline
 200
 \end{array}$$

A student must complete two courses out of (course 601~608) the above 8 theoretical courses and have to do research work including thesis. The courses will be assigned on the recommendation of supervisor(s) and approved by the Chairman. Eligibility to enrol into M.Phil courses is subject to the approval by the academic committee of the Pharmacy Department.

Admission Criteria: B.Pharm and M.Pharm from any reputed University with Ist class or equivalent to 3.00 GPA in any of the above mentioned degree. Individually 55% or equivalent to 2.75 GPA. is required. No 3rd class in any level of education.

M. Phil / Ph.D
Course : 601 / Unit - 1
Subject: Basic Pharmacy
Full marks - 100

1. Drug and its classification: Definition, scope, historical background and relation to other disciplines
2. General concepts on Mode of action of drug:
3. Basic conception on cell tissue, and organs:
 - a) Structure and function, cell inclusions, division of cells
 - b) Definition, classification, structure and function of epithelial tissues, connective tissue, muscular tissue and nervous tissue.
4. Medicinal plants in Bangladesh: Scope, Importance, Constituents and Uses.
5. Basic concept of separation technique:
 - a) Introduction, principles, procedures and theories of column chromatography and gel filtration techniques, thin layer chromatography, ion exchange chromatography, methods of detection and applications
 - b) Introduction, theory and principle, instrumentation, characteristics of stationary and mobile phases, reversed phase HPLC and application of TLC, Column, HPLC etc.
6. Pharmaceutical doses forms : (Solid dosage form, semi solid dosage and liquid dosage form and tablet, capsule, aerosol, ointment, cream, gel, MDI emulsion, suspension, solution, etc) drug stability and potential as well as biological products.
7. Drug ordinance, 1982, National Drug policy 2005.

M. Phil / Ph.D
Course : 602 / Unit - 1
Subject: Medicinal Pharmacy
Full marks – 100

1. Drug Design: Synthesis of compounds in accordance with the molecular structure, biological activity concept with special references to analgesics, neuromuscular blocking agents, anti-fertility drugs and compounds containing bridge head nitrogen atom and bactericidal & bacteriostatic agents (sulphonamides, mercury compounds and antiseptics).
2. Biosynthesis: Biosynthetic pathways and actions of steroidal hormones, vitamins, alkaloids, carbohydrates and nucleotides.
3. Chemistry of Natural Products:
Alkaloids: Occurance, isolation, classification and properties of alkaloids, structure determination, synthesis and physiological activities of ephedrine, nicotine, atropine and morphine.
Terpenoids: Occurance, isolation and classification, synthesis of geraniol, citral ionones and amyryl.
Antibiotics: Occurance, isolation, structure determination, synthesis and clinical properties of penicillin, streptomycin, chloramphenicol and tetracycline.

Books Recommended:

- An Introduction to Medicinal chemistry, 2nd.ed. 2001, G.L.Patrick, Oxford University press.
Wilson and Gisvold's Text Book of Organic, Medicinal and Pharmaceutical Chemistry, 10th ed. Lippincott-Raven, 1998
Advanced Practical Organic Chemistry, 2nd. ed., by J. Leonard et al.Academic press.
Advanced Organic Chemistry, Bernard Miller, Prentice Hall. 1995
Advanced Organic Chemistry, Jerry march, Wiley Interscience.
Mechanism and theory of Organic Chemistry, Lowry and Richardson, Harper.
Physicochemical Principles of Pharmacy, 3rd ed. 1998, A.T. Florence and A.D. Palgrave.

M. Phil / Ph.D
Course : 603 / Unit - 1
Subject: Analytical Pharmacy
Full marks –100

1. Nuclear Magnetic Resonance (NMR) Spectroscopy: Advanced Techniques and Applications
NMR: ^1H and ^{13}C NMR, principles, instrumentation, principles of decoupling, gated decoupling, relaxation process, population transfer, selective polarization transfer, INEPT, basic two dimensional sequence, heteronuclear shift correlation, application of DEPT, ^1H - ^1H COSY, HMBC, HMQC, HOHAHA (TOCSY), NOE's in structure elucidation of organic compounds. NMR in drug screening, reaction monitoring etc Applications of NMR in medical sciences.
2. Mass Spectroscopy (MS): Theory, instrumentation and ionization methods (FAB, ESI, MALDI, FD, etc.). Application of HRIEMS, MS-MS, GC-MS, LC-MS. Mass spectrometers (MALDI TOF, ES) in structure elucidation of small and macromolecules .
3. Gas Chromatography (GC): Instrumentation, operating condition, detector system and applications. Application of GC in fatty acid analysis.
4. UV and IR spectroscopy and its application for structure determination.

Books Recommended:

1. One and two Dimensional NMR spectroscopy. By Atta-ur-Rahman, Elsevier, 1989.
2. Organic Spectroscopy. By D.W. Brown, A.J. Floyd, and M.Sainsbury, John Wiley and Sons, 1988.
3. Modern NMR Spectroscopy. By J.K.M Sanders and B.K Hunter.
4. Modern NMR Techniques for Chemistry Research, by A.E. Hunter.
5. Proton and Carbon-13 NMR Spectroscopy. By R.J. Abraham and P.Loftus.
6. Principles of Instrumental Analysis. By D.A. Skoog.
7. Spectroscopy. by B.K. Sharma.
8. Introduction to Organic Laboratory Techniques. By D.L. Pavia, G.M. Lampman and G. S. Criz. W.B. Saunders Company, 1976.
9. Natural Products-a Laboratory Guide. By Raphael Lkan, Academic Press Inc, 1991.
10. Practical Pharmaceutical Chemistry. 4th Edition, Part-1. By A.H. Beckett and J.B. Stenlake. The Athlone press, 1989.

M. Phil / Ph.D
 Course : 604 / Unit – 1
 Subject: Pharmacology & Toxicology
 Full marks - 100

1. Molecular Mechanism of Drug Action: Binding forces in drug receptor interactions, structure activity relationship and the conformation of the receptor surface, application of computational chemistry in drug receptor action, consequences of drug receptor interaction, analysis of graded dose response relationship, drug actions that are not mediated directly by the receptor.

2. Pharmacological studies on various groups of Drugs

i) Cardiovascular pharmacology.

ii) Vasodilators: Nitric oxide - Biosynthesis of nitric oxide and its control, Degradation and carriage of nitric oxide, Effects of nitric oxide, Therapeutic use of nitric oxide and nitric oxide donors, Inhibition of nitric oxide, Clinical conditions in which nitric oxide may play a part.

3. Ion channels, exchangers and pumps:

i) Transduction mechanisms as targets of drug action, voltage sensitive ion channels—structure and function, K⁺ channels. Voltage sensitive Ca⁺² channels and the pharmacology of their inhibitors.

Agonists at β-adrenoceptors. Pharmacology of Na⁺/K⁺ ATPase and gap junctions.

ii) Antidiabetic drugs.

iii) Chemotherapeutic agents:

4. Cancer biology and therapy: Introduction to biology of cancer, modes of treatment: radiotherapy, chemotherapy, surgery, biological therapy including immunology and gene therapy.

5. Clinical Toxicology

Basic concept in toxicology, The mechanism of toxin action: General mechanisms of toxin-induced cell damage and death hepatotoxicity and nephrotoxicity, The biotransformation of toxins, their inactivation and removal from the body, Epoxidation and drug toxicity, N-oxidation and drug toxicity, toxicity and sulphur xenobiotics.

References of Books:

The Pharmacological Basis of Therapeutics – by Goodman and Gilman.

Pharmacology – by H.P. Rang et al.

Pharmacology – by Lippincott et al.

Pharmacology – by Kalant et al.

Basic and Clinical Pharmacology – by Bertram G. Katzung.

Pharmacology and Therapeutics – by R.S. Satoskar et al.

Medical Pharmacology – by Goth.

Essentials of Medical Pharmacology – by K.D. Tripathi.

M. Phil / Ph.D
 Course : 605 / Unit - 1
 Subject: Molecular Biology and Microbiology
 Full marks – 100

Molecular Biology

1. Introduction to Molecular Biology:

2. Gene Therapy and Gene Expression: Central concept of gene therapy, basic molecular mechanism of gene transfer, prerequisite of human gene therapy, biological basis of gene therapy strategies, vehicles for gene transfer, clinical gene therapy studies, gene therapy for hereditary disease, gene therapy for cancer, AIDS and neurodegenerative disorders.

3. Biotechnology: Definition and historical perspective, scope, potential and achievements, Pharmacist and biotechnology, Biotechnology and industry; GMP compliance and Biopharmaceutical facilities, biotechnology and biodiversity Fermentation technology and Recombinant DNA technology.

5. Microbiology:

- a) General characteristics of bacteria, General and cellular morphology - size, shape, fine structures and movement. Cultivation of bacteria: nutritional requirements, factors affecting growth, bacteriological media. Pure culture and cultural characteristics: Methods of isolation, maintenance and preservation of pure cultures, colony characteristics and characteristics of broth culture.
- b) Fungi- morphology, classification, pharmaceutical importance, etc. Brief study of rickettsia and actinomycetes

Books Recommend:

1. Cellular and Molecular Immunology by Abul K Abbas, Andrew H Lichtman, Jordan S Pober
2. Immunology by Ivan Roitt, Jonathan Brostoff, David Male
3. Molecular Biology by PC Turner, AG McLennam, AD Bates
4. The Cell: A molecular Approach by Alberts B et al
5. Molecular Cell Biology by Lodish et al
6. Molecular Biology of Cells by Alberst et al
7. Applied therapeutics by young kode kihble et.al.
8. Hand book of Drug Interaction by karalliedde & Hanry

M. Phil / Ph.D
Course : 606 / Unit - 1
Subject: Pharmaceutical Technology
Full marks - 100

1. Advanced Tablet Technology:

- a) Manufacturing of tablets by wet granulation, dry granulation & direct compression. Granulation of powders for tableting. Advantages and disadvantages of different processes, processes and machineries used in tablet manufacturing
- b) Physics of tablet compression, different stages of tablet compression, effect of compression force on tablet properties, strength of tablet, factors affecting the strength of tablet, mechanism of bonding to tablets, problems associated with large scale manufacturing of tablet.

2. Advanced drug Delivery Systems

Transdermal drug delivery system, mucosal drug delivery system, nasal drug delivery system, ocular drug delivery system, intrauterine drug delivery system, liposomes and nanoparticles drug delivery system, biodegradable drug delivery system, hydrogel based drug delivery system, drug delivery to the lungs, metered dose inhalers and dry powder inhalers.

3. Pilot Plant Scale-Up Techniques

Primary function of the pharmaceutical pilot plant, factors to be considered during development, reporting responsibilities, personnel requirements, space requirements, review of the formula, raw materials, relevant processing equipments, production rates, process evaluation, master manufacturing procedures, GMP considerations, pilot plant design for tablet development.

4. Biotechnology Preparations/ Formulation of Biotech Products

Definitions, historical use and applications, composition, preparation, physicochemical considerations, short study of current biotech products e.g. hematopoietic growth factors, interleukins and interferons, insulin, growth hormones, vaccines, monoclonal antibody-based pharmaceuticals, recombinant tissue type plasminogen, recombinant human deoxyribonuclease, follicle stimulating hormone(FSH), quality control, storage and stability of biotech products.

Recommended books:

1. Remington's Pharmaceutical Sciences
2. Dispensing of Pharmaceutical Students – Cooper and Gunn
3. Dispensing of Medication
4. Bentley's Textbook of Pharmaceutics
5. An Introduction to Pharmaceutical Formulations – Fishburn
6. Pharmaceutical Dosage Forms – Ansel
7. Pharmaceutics and Pharmacy Practice – Banker and Chalmers
8. The Art, Science and Technology of Pharmaceutical Compounding – Loyd V. Allen Jr.
9. Theory and practice of Industrial Pharmacy – Lachmann
10. American Pharmacy- Sprowl
11. Pharmaceutics – Aulton
12. Targeted and controlled Drug Delivery, Novel.

M. Phil / Ph.D
Course : 607 / Unit - 1
Subject: Bio-Pharmaceutics
Full marks – 100

1. Introduction to Biopharmaceutics and Drug administration

2. Absorption of Drugs:

- a) Biological Consideration: Membrane physiology, gastrointestinal physiology, mechanism of absorption etc.
- b) Physicochemical Consideration: pKa and gastrointestinal absorption, pH-partition theory and other physicochemical factors.
- c) Dosage form consideration: Role of different dosage form like solution, suspension, tablet, capsule, emulsion etc. on gastrointestinal absorption.
- d) Disintegration and dissolution of drugs.

3. Distribution of Drugs:

- a) Important Pharmacokinetic Parameters: Biological half-life, apparent volume of distribution, area under the curve, absorption and elimination rate constant etc.
Interpretation of drug-plasma level curve.

4. Pharmacokinetics and Pharmacodynamics of Peptide and Protein Drugs : Elimination of protein therapeutics, distribution of protein therapeutics, pharmacodynamics of protein therapeutics, protein binding of protein therapeutics, interspecies scaling, heterogeneity of protein therapeutics, chemical modification of protein therapeutics, immunogenicity.

5. Design of Experiments and Collection of Data : Sampling by questionnaire, sampling in the chemical laboratory, sampling in biological and clinical experiments, design and conduct of clinical trials.

Recommended books:

1. Biopharmaceutics and Clinical pharmacokinetics-M. Gibaldi
2. Biopharmaceutics and Clinical pharmacokinetics-Notari
3. Biopharmaceutics and relevant pharmacokinetics-T. G. Wagner
4. Biopharmaceutics and Drug interactions-Cadwallader
5. Pharmacokinetics-M. Gibaldi and D. Perrier

M. Phil / Ph.D
Course : 608 / Unit - 1
Subject: Hospital , Clinical and Community Pharmacy
Full marks - 100

1. Hospital Pharmacy:

A) Introduction: Goals, minimum standards, abilities required for a hospital pharmacist. Hospital as an organization, classification, organizational patterns, management and administration, different departments and services, role of a pharmacist in the hospital. Hospital pharmacy, organizational and personnel, supportive personnel, pharmacy education, job descriptions.

B) Pharmacy and Therapeutics Committee: Description and purpose, membership and functions. Hospital formulary, guiding principles, legal basis, principles for admission or deletion of drugs, selection of text.

C) Control of Special Classes of Drugs: Use of samples, in-patient drug orders, out-patient prescriptions, ward stock drugs, label symbols. Narcotics and their control, classes, procurement and execution of order forms, dispensing, hospital narcotic regulations, new systems. Floor stock drugs, selection, charge and non-charge, labeling, regulations concerning narcotics, inspection of nursing drug cabinets.

2. Community Pharmacy:

Concept of community health care, health needs of the community, different levels of health care, elements of primary health care. Principles of primary health care: Equitable distribution, community participation, intersectoral coordination, appropriate technology, health manpower, health care delivery at different levels, community pharmacy in dealing with communicable diseases problem, nutritional problems, environmental sanitation problems and indigenous systems of medicine, development of community pharmacy infrastructure, participation of non-governmental voluntary health agencies.

3. Clinical Pharmacy:

A) Introduction: Clinic, hospital, clinical pharmacy, scope, importance and application of clinical pharmacy, diagnosis & routine tests for diagnosis, enzyme, coenzyme & isoenzyme and their role in diagnosis of disease, pharmacokinetics of few drugs.

B) Drug abuse, drug addiction, drug habituation, drug dependence and drawbacks of self-medication.

a) Clinical chemistry & interpretation of clinical laboratory tests

i). Blood chemistry, ii) Hematology and iii) Urinalysis

b) Clinical interpretation of pathophysiology of the following diseases

i) Diabetes, ii) Essential hypertension, iii) Anaemia, iv) AIDS, v) Tuberculosis, vi) Peptic ulcer and vii) Veneral diseases (UTI, RTI, etc.)

M. Phil / Ph.D
Course : 609
Subject: Research work (Thesis)
(Awarded)

Research work including thesis

1. Research proposal and Presentation
2. Progress report with presentation
3. Final submission with presentation