SYLLABUS
(2010-2011)

MASTER OF PHARMACY
(Pharmacology)

Rajiv Gandhi Proudyogiki Vishwavidyalaya
(University of Technology of Madhya Pradesh)
Airport Bypass Road, Gandhinagar, Bhopal.
# INDEX

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>SUBJECT</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>First Year 1(^{st}) Semester</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MODERN ANALYTICAL TECHNIQUES</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>BIOTECHNOLOGY &amp; BIOINFORMATICS</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>DRA, INTELLECTUAL PROPERTY RIGHTS AND QUALITY ASSURANCE</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>PRODUCT DEVELOPMENT AND FORMULATION</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><strong>First Year 2(^{nd}) Semester</strong></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Advanced Pharmacology I</td>
<td>8</td>
</tr>
<tr>
<td>6.</td>
<td>Advanced Pharmacology II</td>
<td>10</td>
</tr>
<tr>
<td>7.</td>
<td>Advanced Pharmacology III</td>
<td>11</td>
</tr>
<tr>
<td>8.</td>
<td>Advanced Pharmacology IV</td>
<td>12</td>
</tr>
</tbody>
</table>
First Year 1st Semester
MODERN ANALYTICAL TECHNIQUES (MPY 101)

Theory

1. Theory, Instrumentation, Methods and Applications of VU Spectrophotometer.
2. Theory and Instrumentation of IR and FT-IR, its advantage and applications in Structural elucidation.
3. NMR, C$^{13}$ NMR, Origin of spectra, Chemical shifts, Spin-spin coupling, Coupling constant, Instrumentation and application for Structural elucidation.
5. Theory, Instrumentation and application for the following:
   i) Fluorescence
   ii) X – Ray crystallography
   iii) Atomic spectroscopy
   iv) Ultra centrifugation
   v) ESR
   vi) Liquid Scintillation spectrometry
   vii) Auto radio grapy
5. Separation Techniques; Fundamental principles, Basic instrumentation, Qualitative and Quantitative Pharmaceutical applications of Gas-liquid Chromatography, HPLC, HPTLC, Gel Chromatography, Electrophoresis and Ion-pair Chromatography.
6. General Principle, instrumentation and application of optical rotatory dispersion (ORD) and Circular dichroism (CD).
7. Immunoassay Techniques: Enzyme and Radioimmunoassay techniques. Theory, Methods and applications.
Books and References Recommended:

10. Willard, Merrit and Dean, *Instrumental Methods of Analysis*.
15. Block and Durrum, *Paper Chromatography and Electrophoresis*.
16. Remington’s *Pharmaceutical Sciences*.
17. Sirmer, *Spectroscopic Analysis*.
BIOTECHNOLOGY & BIOINFORMATICS (MPY 102)

1. **Genetics:** Structure & Function of DNA, DNA Replication & Repair, Expression of Genetic Information: Structure & Function of RNA, Transcription, Genetic code, Translation, Post translational modification.

2. **Recombinant DNA Technology:** Constructing Recombinant DNA molecules Restriction enzymes, Vectors, Gene Cloning, Genomic libraries, Polymerase Chain reaction – based DNA cloning, Restriction mapping, Blotting techniques, DNA sequencing, Pharmaceutical applications of recombinant DNA.


4. **Basics of Immunology, Monoclonal antibodies & Hybridoma technology & its Applications.**
   - **Vaccines** – Conventional vaccines, Modern Vaccine technologies, Genetically improved live vaccines, Genetically improved subunit vaccines, Pharmaceutical considerations.

5. **Fundamentals of Cell biology:**
   - **Cell organization and plasma membrane:** Transport of substances across the membrane.
   - **Cellular reproduction:** The Cell cycle, Mitosis & Meiosis, Apoptosis.
   - **Cell Signaling:** Communication between cells and their environment


7. **Molecular, Structural and Chemical Biology in pharmaceutical research:** Molecular biology of disease and invivo transgenic models, Genomic protein targets and recombinant therapeutics, Structural biology and rational drug design, Chemical biology and Molecular diversity, Gene therapy & DNA/ RNA targeted therapeutics. Future of pharmaceutical research.

8. **Introduction to Bioinformatics:** Biological databases, Sequence analysis, Protein structure, Genetic and physical mapping, Application of bioinformatics in pharmaceutical industries.

Recommended Readings

1. Lehninger., *Principles of Biochemistry*
6. Watson and Trooze, *Recombinant DNA Techniques*
7. Lesk., *Introduction to Bioinformatics.*
10. Watson, J.D., Gilman, M., *Recombinant DNA Technology*
13. Paul, W.E, *Fundamentals of Immunology*
DRA, INTELLECTUAL PROPERTY RIGHTS AND QUALITY ASSURANCE  
(MPY -103)

Theory

1. Requirements of GMP, CGMP, GLP, USFDA, WHO guidelines and ISO 9000 Series.
6. Sewage disposal and Pollution control.
8. Basic concept of Quality Control and Quality Assurance systems, Source and Control of Quality variation of Raw materials, Containers, Closures, Personnel, Environmental, etc.
10. Master formula generation and Maintenance, Standard Operating Procedure (SOP) for different dosage forms.

Books and References Recommended:

3. Bharathi, Drugs and Pharmacy Laws in India.
4. Patel, Industrial Microbiology.
8. OPPI, Quality Assurance.
11. Indian Pharmacopoeia.
PRODUCT DEVELOPMENT AND FORMULATION (MPY-104)

Theory

1. **Preformulation studies**: Study of physical, chemical and pharmaceutical factors influencing formulation of drugs.


4. **Dissolution Technology**: Design of dissolution apparatus, dissolution media, dissolution testing of different types of dosage formulations, data interpretation, *in-vitro* and *in-vivo* correlation.

5. **Tablets**: Recent advances in tablet technology and automation in manufacturing process, formulation and evaluation of dispersible, effervescent, floating and multilayers tablets.

6. **Formulation consideration and evaluation**: Parenterals and Ophthalmics.


8. **Nutraceuticals**: Introduction, formulations, uses, recent developments and law governing nutraceuticals.

9. **Pharmaceutical packaging**: Packaging materials, type and tests of containers and closures, Pilot plant scale up technique.


Books and References Recommended:


M. Pharm (Pharmacology) II semester

Advanced Pharmacology – I (MPY-201 Pcl)

1. Introduction to Pharmacokinetics
   Biological half-life, Area under curve, Apparent volume of distribution, Concept of drug clearance, Drug disposition.
   Compartment models and their limitations—one compartment open model and multi compartment models. Kinetics of i.v infusion and multiple dose regimens.
   Physiological factors related to drug absorption.
   Drug distribution and protein binding.
   Bioavailability and bioequivalence.

2. The Basics of Drug Interactions

3. Therapeutic Drug Monitoring
   Introduction, Necessity of TDM, Criteria for valid TDM, Essential for effective TDM, Organization of TDM service, Effectiveness of TDM.


5. Analytical aspects of TDM, Use of HPLC and Immunoassays in TDM.

6. TDM of selected individual drugs. Aminoglycosides, Carbamazepine, Theophylline, Digoxin, Phenytoin, Methotrexate, Lithium, Valproic acid.
Book and Reference Recommended:

1. Applied Biopharmaceutics and Pharmacokinetics by Leon Shargel and B.C. Andrew
2. Therapeutic Drug Monitoring and Clinical Biochemistry by Mike Halworth and Nigel Capps.
3. Biopharmaceutics and Pharmacokinetics by Robert E. Notari
4. Pharmaceutics and Pharmacy Practice by Gilbert S. Banker
5. Remington’s Pharmaceutical Sciences.
6. Dissolution, Bioavailability and Bioequivalence by Abdou
7. Drug Disposition and Pharmacokinetics by Stephen H. Curry
9. Simkin: Handbook of TDM
Advanced Pharmacology – II (MPY-202 Pcl)

1. Care, Handling and breeding techniques of laboratory animals. Regulations for laboratory animal care and ethical requirements. CPCSEA guidelines for performing experiments on animals. Alternatives to animal studies.

2. Preclinical evaluation of following categories of drugs
   - Sedatives, hypnotics, anxiolytics, antidepressant, antipsychotics, antiparkinsonism agent, analgesics, antipyretics.
   - Anti-inflammatory agents, Anticonvulsants, local anaesthetics, CNS stimulants.
   - Antiulcer agents, laxatives, bronchodilators, antitussives
   - Diuretics
   - Histamine antagonists
   - Muscle relaxants, Anticholinesterases, anticholinergics, adrenolytics.
   - Hypoglycemics, antifertility agent, androgens.
   - Antithyroid agent, Dermatological agents, antitumor agents.
   - Anthelmintics, Antimalarials, Antileprotics.


Book and Reference Recommended

Advanced Pharmacology – III (MPY-203 Pcl)


2. **General Principles of Toxicology:** General Reproductive Toxicology, Carcinogenicity, Mutagenicity, Teratogenicity and Immunotoxicology.

3. Clinical pharmacology of drugs used in the treatment of following diseases
   
   a. **CVS diseases:** Hypertension, Congestive cardiac failure, Angina Pectoris, Acute Myocardial Infarction, Cardiac Arrhythmia, Atherosclerosis, Peripheral Vascular disorders, Coagulation disorders.


   c. **Immunopharmacology:** AIDS, Drug Allergy, Tissue transplantation, Immunostimulants, Immunosuppressants, vaccines and Sera.

   d. **Gastrointestinal diseases:** Peptic Ulcer, Nausea and Vomiting, diarrhea and Constipation.

   e. **Renal disease:** Acute and Chronic Renal failure

   f. **Respiratory disease:** Asthma, Chromic Obstructive Pulmonary Edema, Pulmonary Embolism.

   g. **Hepatic disorder:** Cirrhosis, Hepatitis.

   h. **Infectious Disease:** General guidelines for rational use of antibiotics. Resistance to antibiotics. Respiratory tract infections, Meningitis, Gastroentritis, Pneumonia, Bacterial Endocarditis, Septicemia, Otitis media, Urinary tract infection, Tuberculosis, Leprosy, Protozoal infection, HIV and Opportunistic infections, Fungal Infections.

   i. **Neoplastic disorders:** General principles of Cancer chemotherapy, Chemotherapy of Lung, Breast, Head and Neck Cancer, Leukemia, Liver and Prostate cancer.
Book and Reference Recommended

7. Oxford Medicine, Blackwell Science
8. Panda, U.N. Textbook of Medicine, CBS.
10. Amdur, M.O., Duol, J. and Klassen, C.D. Casarett and Doull’s Toxicology.
Advanced Pharmacology – IV (MPY-204 Pcl)

1. Molecular mechanism of drug action. Receptor Occupancy and Cellular Signaling systems, such as G-Proteins, Cyclic nucleotides, Calcium and Phosphatidyl inositol, Ionic channel and their modulators.

2. Endogenous bioactive molecules as TNF-α, Interleukins, Process of Apoptosis, Arachidonic acid metabolites, COX-2 regulators and their role in inflammation.

3. Recent trends on different classes of receptors and drug acting on them.
   a) Cholinergic receptors
   b) Dopamine receptors
   c) Serotonin receptors
   d) Hormone receptors
   e) GABA receptors
   f) Opioid receptors
   g) Purinergic receptors
   h) Glutamate receptors

4. Neurosteroids, Nitric Oxide

5. Endothelium derived vascular substances (NO, endothelins) and their modulators. Pharmacology of Atrial Peptides, Reactive Oxygen intermediates, Anti oxidants and their therapeutic implications.

6. Fc receptors on T and B-lymphocytes, Antibody Dependent and Cellular Cytotoxicity.


8. General Principles of Clinical Laboratory tests.

Book and Reference Recommended:

1. Katzung, B.G. Basic and Clinical Pharmacology (Lange Medical Publication, California)