

## Minutes of Board of Studies Meeting

Board of Studies meeting was held on 21.04.2013, 10:00 a.m. at Department of Pharmacy, M. J. P. Rohilkhand University, Bareilly, to initiate start of M. Pharm course in specialization viz Pharmaceutics and Pharmacology with intake of 18 seats in each branch after grant of permission from All India Council for Technical Education vide letter no. F.No.Northern/1-490318252/2013/EOA dated 19.03.2013. The syllabus and ordinance of M. Pharm ( Pharmaceutics), M.Pharm (Pharmacology) were formed, discussed and finalized following members attended the meeting.

- |                          |                        |
|--------------------------|------------------------|
| 1. Shri S. D. Singh      | Convenor               |
| 2. Dr. Vijay Jyoti Kumar | External Expert Member |
| 3. Dr. Sobhna Singh      | Member                 |
| 4. Dr. Kamal Kishore     | Member                 |
| 5. Dr. S. B. Tiwari      | Member                 |
| 6. Mr. Amit Verma        | Member                 |
| 7. Mr. Lakshyaveer Singh | Member                 |
| 8. Mr. Kaushal Kumar     | Member                 |
| 9. Dr. Saurabh Mishar    | Member                 |

The external member Dr. Pawan Krishan Could not come due to unavoidable circumstances.

Following recommendations were made;

- M. Pharm programme should be started from academic session 2013-14 with intake of 18 seats in each branch viz Pharmaceutics and Pharmacology.
- The ordinances, syllabus, teaching and evaluation scheme was finalized by the committee constituted for same.
- These courses should run strictly as per norms laid by statutory bodies (AICTE) in terms and norms of University. The convenor ended the meeting with vote of thanks.

  
( Shri S. D. Singh )

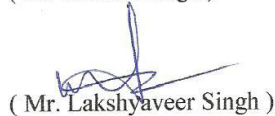
  
( Dr. Vijay Jyoti Kumar )

  
( Dr. Kamal Kishore )

  
( Dr. Sobhna Singh )

  
( Dr. S. B. Tiwari )

  
( Mr. Amit Verma )

  
( Mr. Lakshyaveer Singh )

  
( Mr. Vimal Kumar )

  
( Mr. Kaushal Kumar )

  
( Dr. Saurabh Mishra )



# INSTITUTE OF ENGINEERING & TECHNOLOGY M.J.P. ROHILKHAND UNIVERSITY, BAREILLY



21-04-2013

Ref. No- IET / MJP / .....

Dated .....

## MINUTES

**Sub: Meeting of Faculty Board at 12:30PM on 21-04-2013.**

A meeting of Faculty Board was convened at 12:30PM on 21-04-2013. Various approved proposals submitted by different departments were discussed. The Faculty Board hereby submit the recommendations for further approval by Academic Council and Executive Council. The recommendations made are as following.

1. The minutes of BOS of the Department of Pharmacy (held on 21-04-2013) pertaining to syllabus & semester systems ordinance of M.Pharm. Pharmaceutics and Pharmacology (which have already been approved by AICTE) were discussed and approved as such by the Faculty Board.
2. Minutes of BOS meeting of the Department of Applied Chemistry which was held on 30-08-2012 were discussed and approved.
3. The semester system ordinances of M.Sc course in Applied Chemistry, Applied Mathematics and Applied Physics under the IET were discussed and approved.
4. The Minute of BOS meeting of the Department of Maths (held on <sup>06.08.2012</sup> ~~19-09-2012~~) were discussed and approved.
5. The minutes of BOS meeting of the Department Physics (held on 19-09-2012) were discussed and approved.
6. Minutes of the meeting of all Departmental Coordinators of Training and Placement Centre from all Departments of Faculty of Engineering & Technology which was held at the office of Training & Placement Officer, M.J.P.R. University on 20-4-2013 at 12:00 noon were discussed and approved as such.
7. Syllabus of B.Tech was revised by the department of EI and implemented without the approvals of Faculty Board, Academic Council & Executive Council. Regarding the above issue a letter was sent to the Registrar. The Registrar replied with the information that Hon'ble Vice-Chancellor has the view that syllabus can only be implemented only after the approvals by AC

*Sp*  
*AK*  
*W*  
*SS*  
*Sharma*  
*K. Bandyop*  
*Kaul*



महात्मा ज्योतिबा फुले  
संस्कृत विश्वविद्यालय, बरेली

# INSTITUTE OF ENGINEERING & TECHNOLOGY M.J.P. ROHILKHAND UNIVERSITY, BAREILLY



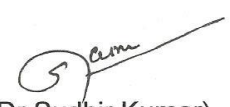
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& EC. All the members of the Faculty Board were of the opinion that matter may be discussed in the meeting of Academic council for final decision.

8. Minutes of BOS meeting of the Department of CSIT which was held on 19-04-2013 were discussed and approved.
9. As per recommendations of the UGC with reference to directive of the Task force on National Security, it is decided that the subject "cyber security/ information security" should be introduced as an elective subject for UG & PG courses.

  
(S.K. Chaurasia)  
HOD ME

  
(Dr. Sudhir Kumar)  
HOD Physics

  
(Sanjay Singh)  
HOD EE

  
(S.D. Singh)  
HOD Pharm


  
(Dr. Saleem Khan)  
Member


  
(Dr. S.K. Pandey)  
HOD Chemistry

  
(Dr. Ravendra Singh)  
HOD CSIT

  
(Dr. S. K. Tomar)  
HOD EC

  
(Dr. Vijay Jyoti Kumar)  
External Expert

  
(Dr. K.K. Maheshwari)  
Member

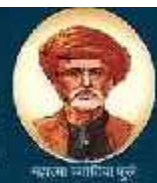
  
(M.S. Karuna)  
HOD Chemical

  
(Dr. A. K. Gupta)  
Dean IET

  
(Dr. A. Prasad)  
HOD Mathematics



महात्मा ज्योतिबा फुले रुहेलखण्ड विश्वविद्यालय, बरेली  
MAHATMA JYOTIBA PHULE ROHILKHAND UNIVERSITY, BAREILLY



**M. J. P. ROHILKHAND UNIVERSITY  
BAREILLY  
DEPARTMENT OF PHARMACY**



**Syllabus  
Master of Pharmacy (M.Pharm)  
(Pharmacology)  
Effective from academic session 2013-14**

## Subject and evaluation scheme, M.Pharm (Pharmacology)

Name of Subject	Marks Allotted				
	Paper	(H/W)	Internal	External	Total
<b>M. Pharm. I<sup>st</sup> Year, I<sup>st</sup> Semester</b>					
Modern Analytical Techniques	1	4	30	70	100
Modern Analytical Techniques Practical	2	6	30	70	100
Pharmaceutical Biotechnology	3	4	30	70	100
Pharmacology and Drug therapy	4	4	30	70	100
Pharmacology and Drug therapy Practical	5	6	30	70	100
<b>M. Pharm Ist Year, II<sup>nd</sup> Semester</b>					
Pharmacotherapeutics	6	4	30	70	100
Pharmacotherapeutic Practical	7	4	30	70	100
Experimental Pharmacology and Drug Evaluation	8	6	30	70	100
Experimental Pharmacology and Drug Evaluation Practical	9	4	30	70	100
Recent Advances in Pharmacology	10	6	30	70	100
<b>M. Pharm II<sup>nd</sup> Year, III<sup>rd</sup> Semester</b>					
Research Methodology	11	4	20	30	50
Workshop on Research Methodology	12	---	20	30	50
Synopsis Presentation & Viva Voce	13	---	---	100	100
<b>M. Pharm II<sup>nd</sup> Year, IV<sup>th</sup> Semester</b>					
Dissertation Work+Presentation+ Viva voce	14	---	---	300	300

**Semester-I**  
**(Pharmacology)**  
**Paper 1-MODERN ANALYTICAL TECHNIQUES**

External Marks: 70

4 hours/week

Internal Marks: 30

Total Marks: 100

1- Theory, instrumentation and applications with regard to drug analysis, decomposition product identification and estimation, metabolite analysis and special methods based on: Ultraviolet-visible spectrophotometry, Infrared spectrophotometry and Fluorimetry.

2- Theory, instrumentation and basic principles and recent advances of:

1. <sup>1</sup>H Nuclear Magnetic Resonance Spectroscopy (<sup>1</sup>H NRM): Concepts of chemical shift, spin-spin coupling, coupling constant, shielding and deshielding effects.
2. Mass Spectroscopy: Introduction, different techniques of ionization (CI, EI & FABMS) isotopic abundance, molecular ion fragmentation, base peaks etc, Nitrogen rule.
3. Chromatographic methods, principles and applications of: Gas-chromatography including GC-MS; High performance liquid chromatography; Electrophoresis (gel and capillary) with an emphasis on specific examples of biological assay methods by HPTLC.

**Books Recommended:**

1. Willard H.H., Merrit L.L., Dean J.A., Settle P.A., Instrumental Methods of Analysis, Van Nostrand.
2. Skoog D.A., Heller F.J., Nieman T.A., Principles of Instrumental Analysis, WB Saunders.
3. Hunson J.W., ed. Pharmaceutical Analysis, Modern Methods, part A & B, Marcel Dekker.
4. Schirmer R.E., ed. Modern Methods of Pharmaceutical Analysis, Vols 1, 2. Boca Raton F.L., CRC Press.
5. Mann C.K. et al., Instrumental Analysis Harper & Row.
6. Jaffe H.H., Orchin M., Theory & Applications of Ultraviolet Spectroscopy, Willy.
7. Silverstein, Spectrometric identification of Organic Compounds, Willy.
8. Bovey F., Jelinski L., Miran P., Nuclear Magnetic Resonance Spectroscopy, San Diego Academic.
9. Stothers J.B., Carbon-13 NMR Spectroscopy, Academic.
10. Gordy W., Theory & Applications of Electron Spin Resonance, Willy.
11. Haswell S.J., ed. Atomic Absorption Spectroscopy, Elsevier.
12. Ardrey R.E., Pharmaceutical Mass Spectra, Pharmaceutical Press, London.
13. Budzikiewicz et al., Interpretation of Mass Spectra of Organic Compounds, Holden-Day San Francisco.
14. Beckett and Stenlake, Practical Pharmaceutical Chemistry, CBS.
15. Stahl E., Thin Layer Chromatography- A laboratory Handbook, Springer-Verlag
16. Giddings J.C., Principles and Theory- Dynamics of Chromatography, Marcel Dekker.
17. Sethi P.D., Quantitative Analysis of Pharmaceutical formulations, CBS Publishers, New Delhi.
18. Kemp William, Organic spectroscopy, Palgrave, New York.
19. Kalsi P.S., Spectroscopy of organic compounds, New age publishers, New Delhi.
20. Gross - Mass Spectrometry
21. WHO - Quality Assurance of Pharmaceuticals, Vol. I, II.
22. Sethi P.D., HPLC, Quantitative Analysis of Pharmaceutical Formulations, CBS Publishers, Delhi.
23. Sethi P.D., HPTLC, Quantitative Analysis of Pharmaceutical Formulations, CBS Publishers, Delhi.
24. Haffmann, Chromatography.
25. Sethi and Chaugankar, Identification of Drugs in Pharmaceutical Formulations by TLC.
26. Robert D. Braun, Introduction to Instrumental Analysis.
27. Wilfried M.A. Niessen- Liquid Chromatography-Mass Spectrometry.

28. Harry G. Brittain, Spectroscopy of Pharmaceutical Solids.
29. George S., Steroid Analysis in Pharmaceutical Industry.
30. Higuchi, Pharmaceutical Analysis.
31. Bidingmeyer, Practical HPLC Methodology and Applications.
32. Hoffmann, Mass Spectrometry: Principle and Application.
33. Scott, Techniques and Practice of Chromatography.
34. Wilkins, Identification of Microorganism by Mass Spectrometry.
35. Wu, Handbook for Size Exclusion Chromatography and related Techniques.

## **Paper 2: PRACTICALS OF MODERN ANALYTICAL TECHNIQUES**

External Marks: 70

6 hours/week

Internal Marks: 30

Total Marks: 100

Practical Based on theory

## **Paper 3: PHARMACEUTICAL BIOTECHNOLOGY**

External Marks: 70

4 hours/week

Internal Marks: 30

Total Marks: 100

1. Status and Scope of Biotechnology in Pharmacy Enzyme immobilization-Principles and Pharmaceutical applications.
2. Biotechnology based pharmaceutical using recombinant DNA Technology, interferons and reverse transcriptase.
3. Optimization of fermentation processes-Ethyl Alcohol, Antibiotics, Vitamins, Amino acids and Pharmaceutical solvents-raw materials, process and process validation.
4. Bo-technology & GMP Formulation approaches to protein stabilization. Regulatory aspects of Biotechnology based pharmaceuticals.
5. Introduction to Bioinformatics.

### **Book Recommended:**

1. Wiseman A.,ed, Principles of Bio-technology”, Chapman & Hall.
2. Antebi E, Fishlock D. Biotechnology-Strategies for life. Cambridge.
3. Higgins I. I., Best, DJ & Jones. Biotechnology, Principles & Applications. Blackwell Scientific Publications, Oxford.
4. Stanbary P.F. and Whitaker. A Principles of Fermentation Technology. Pergamon Press, Oxford.
5. Golub E. The limits of Medicine: How Science shapes our Hope for the cure. Time Books, New York.
6. Bickerstaff GF. Enzymes in Industry and Medicine, New Studies in Biology. Edwin Arnold, London.

7. Glick. BR, Pasternak J.I. Molecular Biotechnology-Principles and Applications of Recombinant DNA. ASM Press Washington.

## **PAPER 4: PHARMACOLOGY AND DRUG THERAPY**

External Marks: 70

4 hours/week

Internal Marks: 30

Total Marks: 100

### **1: Principles of General Pharmacology**

1. Introduction
2. Sources of drugs
3. Dosage forms of drugs
4. Routes of drug administration
5. Mechanisms of drug actions
6. Factors affecting drug actions
7. Biotransformation of drugs
8. Pharmacokinetics of drugs
9. Pharmacodynamics of drugs
10. Drug interactions
11. Adverse drug reactions

### **2: Drugs acting on Autonomic nervous system**

1. Introduction
2. Parasympathetic nervous system
3. Sympathetic nervous system
4. Ganglionic stimulating agents
5. Ganglionic blocking agents
6. Adrenergic neuron blocking agents

### **3: Drugs acting on Peripheral nervous system**

1. Skeletal muscle relaxants
2. Local anaesthetics

### **4: Drugs acting on Central nervous system**

1. Introduction
2. General anaesthetics
3. Alcohol
4. Anxiolytics and hypnotics
5. antidepressants
6. Antimanics
7. Antipsychotics
8. CNS stimulants
9. Psychomimetics
10. Antiepileptics
11. Opioid analgesics
12. Drug dependence and drug abuse



### **5: Drugs acting on Gastrointestinal tract**

1. Introduction
2. Peptic ulcer
3. Antiemetics
4. Anti-constipation agents
5. Antidiarrhoeals

### **6: Miscellaneous topics**

1. Drug use in the pediatrics
2. Drug use in the geriatrics
3. Vitamins and antioxidants
4. Essential medicines
5. Rational use of drugs
6. Gene therapy
7. Drug patents

### **Books Recommended**

1. K.K. Maheshwari. Drugs Pharmacology, 1<sup>st</sup> edition, Vallabh Publication, New Delhi. India.
2. Goodman and Gillman's. The pharmacological basis of therapeutics, 10<sup>th</sup> edition, Pergamon press, New York, U.S.A., 2001
3. Dipiro, J.T., Pharmacotherapy: A Pathologic Approach, Appleton Lange, U.S.A., 1997.
4. Munson, P.L., Principles of pharmacology, Chapman and Hall, ITP an international publishing company, New York.

## **PAPER 5: PRACTICAL OF PHARMACOLOGY AND DRUG THERAPY**

External Marks: 70

6 hours/week

Internal Marks: 30

Total Marks: 100

Practicals based on theory

## **SEMESTER-II**

### **(PHARMACOLOGY)**

## **PAPER 6: PHARMACOTHERAPEUTICS**

External Marks: 70

4 hours/week

Internal Marks: 30

Total Marks: 100

### **1: Drugs acting on Renal system**

1. Diuretics
2. Antidiuretics

### **2: Drugs acting on Cardiovascular system**

1. Pharmacotherapeutic of angina pectoris
2. Pharmacotherapeutic of hypertension

3. Pharmacotherapeutic of cardiac arrhythmias
4. Pharmacotherapeutic heart failure
5. Pharmacotherapeutic of hyperlipidaemia and hypercholestromia

### **3: Drugs acting on Respiratory system**

1. Pharmacotherapeutic of asthma
2. Pharmacotherapeutic of cough

### **4: Drugs acting on Endocrinal system**

1. Introduction
2. Hormones
3. Thyroid and antithyroid drugs
4. Vitamin-D
5. Calcitonin and calcium balance
6. Insulin
7. Hypoglycaemic agents
8. Contraceptives
9. Anabolics and catabolics

### **5: Drugs acting on Hematopoietic system**

1. Hematopoietic agents
2. Coagulants and anticoagulants
3. Fibrinolytics, thrombolytics and antiplatelets

### **6: Pharmacotherapeutics of microbial diseases**

1. Chemotherapy
2. Sulfonamides
3. Tetracyclines and chloramphenicol
4. Quinolones and fluoroquinolones
5. Aminoglycosides
6. Penicillins
7. Cephalosporins
8.  $\beta$ -Lactam antibiotics
9. Macrolides
10. Tuberculosis
11. Leprosy
12. Fungal infections
13. Viral Infections
14. Sepsis
15. Malaria
16. Helminthes
17. Anticancer agents

### **Books Recommended**

1. K.K. Maheshwari. Drugs Pharmacology, 1<sup>st</sup> edition, Vallabh Publication, New Delhi. India.
2. Goodman and Gillman's. The pharmacological basis of therapeutics, 10<sup>th</sup> edition, Pergamon press, New York, U.S.A., 2001
3. Dipiro, J.T., Pharmacotherapy: A Pathologic Approach, Appleton Lange, U.S.A., 1997.

- Munson, P.L., Principles of pharmacology, Chapman and Hall, ITP an international publishing company, New York.

### **PAPER 7: PRACTICAL OF PHARMACOTHERAPEUTICS**

External Marks: 70

6 hours/week

Internal Marks: 30

Total Marks: 100

Practicals based on theory

### **PAPER 8: EXPERIMENTAL PHARMACOLOGY AND DRUG EVALUATION**

External Marks: 70

4 hours/week

Internal Marks: 30

Total Marks: 100

#### **1. Principles of experimental pharmacology-**

- 1.1 Outline of experimental pharmacology.
- 1.2 Principles of experimental pharmacology.
- 1.3 Euthanasia of experimental animals
- 1.4 Common laboratory animals in pharmacological research.
- 1.5 Anaesthetics used in laboratory animals.
- 1.6 Standard techniques used in laboratory animals.
- 1.7 Limitation of animal tests.
- 1.8 Statistical design and analysis.
- 1.9 Regulations for care and use of laboratory animals.

#### **2. Drug discovery-**

Bio-assays.

Preclinical (biological and safety evaluation).

Clinical evaluation (clinical trials) of new drugs.

Transgenic animal in the development of new drugs.

#### **3. Receptor-ligand binding assays**

1. General principle and techniques
2. Specific assay design for adrenoceptors, dopamine receptors, histamine receptors, GABA and benzodiazepine receptors.

#### **4. Basics of biotechnology, and biotechnological tools in drug development**

#### **5. Basics of nanotechnology, and nano-techniques in drug development.**

#### **6. Pharmacological techniques to evaluate the following class of drugs**

1. Analgesics
2. Anthelmintics
3. Antianginals
4. Anti-anxiety or anxiolytics
5. Antiarrhythmics
6. Anti-cancers

7. Antidepressants
8. Anti-epileptics
9. Anti-fertility
10. Anti-hypertensives
11. Anti-parkinsonian agents
12. Anti-thrombotics
13. Anti-psychotics
14. Anti-ulcer agents
15. Antiviral
16. Atherosclerosis and Hyperlipidemics
17. Anti-diabetics
18. Diuretics
19. Hypno-sedatives
20. Anti-pyretics
21. Anti-inflammatory agents
22. Local anaesthetics
23. Neuromuscular blockers
24. Nootropic and cerebroactive agents
25. Skeletal muscle relaxants

### **Books Recommended**

1. K.K. Maheshwari. Drug Screening Techniques, 1<sup>st</sup> edition, Vallabh Publication, New Delhi. India.
2. Drug Discovery and Evaluation by Vogel HG. Springer, N Y
3. Practical Pharmacology by Burn, J.H. Blackwell Scientific Co. Oxford
4. Screening Methods in pharmacology. Vols I and II by A. Turner, Academic Press.
5. Evaluation of Drug Activities: Pharmacometrics by Lawrence and Bacharach, Academic Press.
6. Drug Bioscreening by Thompson, E.B. VCH, New York
7. Various regulatory guidelines like ICH, GCP, Helsinki, USFDA etc.
8. Pharmacopoeia: IP, BP, USP etc.
9. Transgenic Animal Technology, Second Edition: A Laboratory Handbook by Carl A. Pinkert, Academic press
10. Handbook of Experimental Pharmacology by Hofmann, F.B., Springer
11. Fundamentals of Experimental Pharmacology by Gohsh, M.N., Scientific Book Agency, Calcutta.

## **PAPER 9: PRACTICAL OF EXPERIMENTAL PHARMACOLOGY AND DRUG EVALUATION**

External Marks: 70

6 hours/week

Internal Marks: 30

Total Marks: 100

Practicals based on theory

## PAPER 10: RECENT ADVANCES IN PHARMACOLOGY

External Marks: 70

4 hours/week

Internal Marks: 30

Total Marks: 100

### 1. Molecular Pharmacology

1.1 Receptor occupancy and cellular signaling systems: G-proteins, cyclic nucleotides, calcium and calcium binding proteins, protein kinases, phosphatidylinositol, phospholipases.

### 2. Pharmacology of Receptors-

Classification, cellular signaling systems, pharmacology of agonists and antagonists of the following receptors types-

Angiotensin receptors

Excitatory amino acid receptors

Purinoreceptors

Serotonin receptors

Dopamine receptors

Adrenoceptors

GABA and Benzodiazepine receptors

Canabinoid receptors

Neurosteroid receptors

Erb B-receptors

### 3. Ionic channels and their modulators-

Classification and biology of ionic channels. Pharmacology of substances which modulate the following channels

Calcium channels

Potassium channels

Sodium channels

Chloride channels

### 4. Neuropeptides-

Neuropeptide-Y, Calcitonin gene related peptide, Cholecystokinin, endogenous opioids, substance-P, ATP binding cassette proteins family.

### 5. Biology of vascular endothelium-

EDRF, EDCF, EDHF. Pharmacology of endothelins and nitric oxide. Clinical implications of endothelial dysfunctions.

### 6. Cytokinins and chemokines-

Pharmacological, pathological and clinical implications of various cytokinins and chemokines.

### 7. Cell adhesion molecules and matrix proteins-

Biological role of cell adhesion molecules and matrix proteins in various diseases. Potential target sites to develop new drugs for various disorders. GP IIb/IIIa receptors antagonists. Anti-integrin therapy.

### 8. Growth factors-

Biology of various growth factors and their therapeutic potentials. Pharmacology of cardiac and vascular remodeling.

### **Books Recommended**

1. Goodman and Gillman's. The pharmacological basis of therapeutics, 10<sup>th</sup> edition, Pergamon press, New York, U.S.A., 2001
2. Dipiro, J.T., Pharmacotherapy: A Pathologic Approach, Appleton Lange, U.S.A., 1997.
3. Munson, P.L., Principles of pharmacology, Chapman and Hall, ITP an international publishing company, New York.
4. Latest Reviews of pharmacology, medicine, toxicology, physiology etc.

## **SEMESTER-III (PHARMACOLOGY)**

### **Paper 11: RESEARCH METHODOLOGY**

External Marks: 30

4 hours/week

Internal Marks: 20

Total Marks: 50

1. Research: meaning, purpose, types, objectives of research.
2. Literature survey: use of library, books, journal, medlines, internet
3. Selecting a problem and preparing research proposal
4. Documentation: Research paper/thesis writing (different parts, key words, implementation of statistics discussion, support or non support of hypothesis, practical and theoretical implications.
5. Statistical Analysis of data including standard deviation, standard error, student t-test, chi-square test, confidence level, null hypothesis, analysis of variance(one and two way), factorial design, ANOVA(one way and two way), multiple comparison procedures
6. Application of software for statistical calculations like SPSS, foxtron

### **Book Recommended:**

1. Bolton, Pharmaceuticals Statistics- Practical & Clinical Applications, Marcel Dekker, New York.
2. Fisher, R.A., Statistical Methods for Research Works, Oliver & Boyd, Edinburgh.
3. Chow, Statistical Design and Analysis of Stability Studies, Marcel Dekker, New York.
4. Buncher, Statistics in the Pharmaceutical Industry, Marcel Dekker, New York.
5. Finney, D.J., Statistical Methods in Biological Assays, Hafner, New York.
6. Montgomery, D.C., Introduction to Statistical Quality Control, Willy.
7. Khan, Irfan A., Biostatistics for Pharmacy.
8. Khan, Irfan, A., Fundamentals of Biostatistics.
9. Gauthaman, Biostatistics for Pharmacy students.
10. Lipschutz, Introduction to Probability and Statistics.
11. Liwan Po, Statistics for Pharmacist.
12. William E. Fassett, Computer Application in Pharmacy.
13. Ekins, S., Computer Application in Pharmaceutical Research & Development, Wiley.
14. Nageswara Rao and Tiwari, Biostatistics and Computer Applications.

**Paper 12: WORKSHOP ON RESEARCH METHODOLOGY**

External Marks: 30

Internal Marks: 20

Total Marks: 50

Workshop on research methodology

**Paper 13: SYNOPSIS PRESENTATION & VIVA-VOCE**

External Marks: 100

Total Marks: 100

**SEMESTER-IV  
(PHARMACOLOGY)**

**Paper 14: DISSERTATION+PRESENTATION+VIVA-VOCE**

External Marks: 300

Total Marks: 300