BIU COLLEGE OF PHARMACY

Syllabus

of

M. Pharm Program

Choice Based Credit System, (CBCS)

BAREILLY INTERNATIONAL UNIVERSITY

Rohilkhand Medical College and Hospital, Pilibhit
Bypass Road Bareilly, Uttar Pradesh-243006
Website: www.biu.edu.in

(Uday Pratap Singh Bhasker) (CHARU SAXENA) (Babita Sharma) (Dr. P. Kanungja)

(Shailendra Kr. Verma) (Sanjay Kr. Gautam)

SUSHIL KUMAR THAKUR

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M.Pharm Syllabus
(Pharmacology)

(Uday B.S. Bhasker)

(Babita Sharma)

(Dr. P. Kannojia)

Dr Sanjeev

(CHARU SAXENA)

(Rajesh Sharma)

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PROGRAM SPECIFIC OUTCOMES: M. PHARM (PHARMACOLOGY)

After completion of the course the students will be

PSO-1: Understanding the application of pharmacological information of active chemical entity (Drug) present in a medicine that is used for diagnosis, prevention, treatment/cure of a disease.

PSO-2: Illustrating pharmacodynamic and pharmacokinetic investigation to evaluate the efficacy and safety of drugs in animal models.

PSO-3: **Demonstrating** mechanism of action of drug in preclinical research involved in Neurotransmission and Neurohumoral transmission apply in biomedical research.

PSO-4: Practicing animals handling of different species / strains along with their breeding and maintenance as per CPCSEA/international Guidelines/Good laboratory practice (GLP).

PSO-5: Identifying the *in vivo, in vitro*, and other possible animal alternative models for screening of new substances.

PSO-6: Developing the core concept of establishing toxicological profile of a new drug while evaluating during research.

(Uday Pratap Singh Bhasker) (Babita Sharma) (Dr. P. Kamboj)

(Shailendra Kr. Verma)

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CourseCode: MPH101T	M. Pharm- Semester-I **Modern Pharmaceutical Analytical Techniques**	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1.	Understanding the basic concepts and advances in analytical techniques and theoretical skills of the analytical instruments.	
CO2.	Applying advanced analytical instrumental techniques for identification, characterization and quantification of drugs.	
CO3.	Performing quantitative & qualitative analysis of drugs using various analytical instruments in single and combination dosageforms	
CO4.	Evaluating given samples with respect to official standards.	
Course Contents:		
Unit-1	**a) UV-Visible spectroscopy**: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. **b) IR spectroscopy**: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier -Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy. **c) Spectrofluorimetry**: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer. **d) Flame emission spectroscopy and atomic absorption spectroscopy:** Principle, Instrumentation, Interferences and Applications.	**12Hrs**
Unit-2	**NMR spectroscopy:** Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxationprocess, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant,Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ^{13}C NMR. Applications of NMR spectroscopy.	**12Hrs**
Unit-3	**Mass Spectroscopy:** Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy	**12Hrs**
Unit-4	**Chromatography:** Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: **i.** Paper chromatography **ii.** Thin Layer chromatography **iii.** Ion exchange chromatography **iv.** Column chromatography **v.** Gas chromatography **vi.** High-Performance Liquid chromatography **vii.** Affinity chromatography HPTLC	**12Hrs**
Unit-5	a) **Electrophoresis:** Principle, Instrumentation, working conditions, factors affecting separation and applications of thefollowing: i) Paper electrophoresis ii) Gel electrophoresis iii) Capillary electrophoresis iv) Zone electrophoresis v) Moving boundary electrophoresis vi) Isoelectric focusing b) **X ray Crystallography:** Production of X-rays, Different X-ray diffraction methods, Bragg's law, Rotating crystal technique, X-raypowder technique, Types of crystals and applications of X-raydiffraction. c) **Immunological assays:** RIA (Radio immuno assay), ELISA, Bioluminescence assays.	**12Hrs**

Dr Sanjeev

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ReferenceBooks:

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis –Willards, 7th edition, CBSpublishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4thedition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rdEdition, CBS Publishers, New Delhi, 1997.

Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11. Marcel Dekker Series

7. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
8. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

(CHAIRMAN SAGENAM)

Dr Sanjeev

(Uday P.S. Bhasker)

(Babita Sharma)

(Dr. P. Kannojia)

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Course Code: MPL102T	M. Pharm- Semester-I ADVANCED PHARMACOLOGY - I (MPL102T)	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be		
CO1	Understanding the basic knowledge in the field of pharmacology pertaining to the drugs and its therapeutic applications for the treatment of variousdiseases.	
CO2	Analyzing the mechanism of drug actions at cellular and molecular level.	
CO2	Evaluating the adverse effects, contraindications and clinical uses of drugsused in treatment of various diseases	
Course Contents:		
Unit-1:	***General Pharmacology*** **a)** Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding. **b)** Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functionalfamilies of receptors, quantitation of drug receptors interaction and elicited effects.	**12hr**
Unit-2:	***Neurotransmission*** **a)** General aspects and steps involved in neurotransmission. **b)** Neurohumoral transmission in autonomic nervous system (Detailed studyabout neurotransmitters- Adrenaline and Acetyl choline). **c)** Neurohumoral transmission in central nervous system (Detailed studyabout neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and glycine]. **d)** Non adrenergic non-cholinergic transmission (NANC). Co-transmission ***Systemic Pharmacology*** **a)** A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in thefollowing systems Autonomic Pharmacology **b)** Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting neuromuscular junction	**12hr**
Unit-3:	***Central nervous system Pharmacology*** **a)** General and local anaesthetics **b)** Sedatives and hypnotics, drugs used to treat anxiety. **c)** Depression, psychosis, mania, epilepsy, neurodegenerative diseases. **d)** Narcotic and non-narcotic analgesics.	**12hr**
Unit-4:	***Cardiovascular Pharmacology*** Diuretics, antihypertensives, antiischemics, anti- arrhythmics, drugs for heart failure and hyperlipidemia. Hematinics, coagulants , anticoagulants, fibrinolytics and anti- platelet drugs	**12hr**
Unit-5:	***Autocoid Pharmacology*** The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autocoids. Pharmacology of antihistamines, 5HT antagonists.	**12hr**

Chairs Sabeena
Dr Sanjeev
(Uday P.S. Bhaskar)
Babita
(Dr. P. Kamboj)

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Text Books:

1. K D. Tripathi. Essentials of Medical Pharmacology.
2. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastava published by APCAvichal Publishing Company
3. Basic and Clinical Pharmacology by B.G Katzung.

Reference Books:

1. The Pharmacological Basis of Therapeutics, Goodman and Gillman'sPrinciples of Pharmacology.The Pathophysiologic basis of drug Therapy by David E
2. Golan, Armen H, TashjianJr, Ehrin J, Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
4. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew
5. B.C.Yu. Graham Smith. Oxford textbook of Clinical Pharmacology. Avery Drug Treatment
6. Dipiro Pharmacology, Pathophysiological approach.
7. Green Pathophysiology for Pharmacists.
8. Robbins &Cortan Pathologic Basis of Disease, 9 th Ed. (Robbins Pathology)
9. Modern Pharmacology with Clinical Applications, Craig Charles R. &Stitzel Robert E.,Lippincott Publishers.
10. Clinical Pharmacokinetics & Pharmacodynamics: Concepts and Applications
11. Malcolm Rowland and Thomas N.Tozer, Wolters Kluwer, Lippincott Williams & WilkinsPublishers.
12. Applied biopharmaceutics and Pharmacokinetics, Pharmacodynamics and Drug metabolism forindustrial scientists.
13. Modern Pharmacology, Craig CR. &Stitzel RE, Little Brown & Company.

(CHAIRPERSON)

Dr Sanjeev

(Babita Sharma)

(Dr. P. Kanungja)

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Course Code: MPL103T	M. Pharm- Semester-I PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS - I	L-4 T-0 P-0 C-4
Course Outcomes On completion of the course, the students will be:		
CO1	Understanding and evaluating the recent experimental techniques in the drug discovery and development.	
CO2	Understanding the maintenance of laboratory animals as per the guidelines, and various in-vitro and in-vivo preclinical evaluation processes.	
CO2	Applying the various screening methods involved in the drug discovery process	
Course Contents:		
Unit-1:	Laboratory Animals Common laboratory animals: Description, handling and applications of different species and strains of animals. Transgenic animals: Production, maintenance and applications Anaesthesia and euthanasia of experimental animals. Maintenance and breeding of laboratory animals. CPCSEA guidelines to conduct experiments on animals Good laboratory practice. Bioassay-Principle, scope and limitations and methods	**12 hr**
Unit-2:	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. General principles of preclinical screening. CNS Pharmacology: behavioural and muscle co-ordination, CNS stimulants and depressants, anxiolytics, anti-psychotics, anti-epileptics and nootropics. Drugs for neurodegenerative diseases like Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on Autonomic Nervous System.	**12hr**
Unit-3:	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Respiratory Pharmacology: anti-asthmatics, drugs for COPD and anti allergics. Reproductive Pharmacology: Aphrodisiacs and antifertility agents Analgesics, anti-inflammatory and antipyretic agents. Gastrointestinal drugs: anti-ulcer, anti - emetic, anti- diarrheal and laxatives.	**12 hr**
Unit-4:	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Cardiovascular Pharmacology: antihypertensives, antiarrythmics, antianginal, antiatherosclerotic agents and diuretics. Drugs for metabolic disorders like anti-diabetic, antidyslipidemic agents. Anti-cancer agents. Hepatoprotective screening methods.	**12hr**
Unit-5:	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Iimmunomodulators, Immunosuppressants and immunostimulants General principles of immunoassay: theoretical basis and optimization of immunoassay, heterogeneous and homogenous immunoassay systems. Immunoassay methods evaluation; protocol outline, objectives and preparation. Immunoassay for digoxin and insulin Limitations of animal experimentation and alternate animal experiments. Extrapolation of in vitro data to preclinical and preclinical to humans	**12 hr**

(CHARU SAXENA) (Uday P.S. Bhasker) (Babita Sharma) (Dr P. Kannojia)

Dr Sanjeev (Shailendra Kr Verma)

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Text Books:

1. Biological standardization by J.H. Burn D.J. Finney and I.G. Goodwin
2. Fundamentals of experimental Pharmacology by M.N.Ghosh
3. Preclinical evaluation of new drugs by S.K. Gupta

Reference Books:

1. Screening methods in Pharmacology by Robert Turner. A
2. Evaluation of drugs activities by Laurence and Bachrach
3. Methods in Pharmacology by Arnold Schwartz.
4. Pharmacological experiment on intact preparations by Churchill Livingstone Drug discovery andEvaluation by Vogel H.G.
5. Experimental Pharmacology by R.K.Goyal.
6. Handbook of Experimental Pharmacology, S. K. Kulkarni Practical Pharmacology and ClinicalPharmacy, SK.Kulkarni, 3 rd Edition.
7. David R.Gross. Animal Models in Cardiovascular Research, 2 nd Edition, Kluwer AcademicPublishers, London, UK.
8. Screening Methods in Pharmacology, Robert A.Turner.
9. Rodents for Pharmacological Experiments, Dr.Tapan Kumar chatterjee.
10. Practical Manual of Experimental and Clinical Pharmacology by BikashMedhi (Author), AjayPrakash (Author)

* Latest editions of all the suggested books are recommended.

Dr Sanjeev

(Babita Sharma)

(Dr. P. Kanungja)

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Course Code: MPL104T	M. Pharm- Semester-I CELLULAR AND MOLECULAR PHARMACOLOGY	L-4 T-0 P-0 C-4
	Course Outcomes: On completion of the course, the students will be:	
CO-1	Understanding the fundamental knowledge on the structure and functions of cellular components.	
CO-2	Appreciating the interaction of cellular components with drugs and applying the knowledge in drug discovery process.	
CO-3	They would have learnt to explain the molecular pathways affected by drugs	
CO-4	Applying the molecular pharmacology and biomarkers in drugdiscovery process.	
	Course Contents:	
Unit-1:	***Cell biology-*** Structure and functions of cell and its organelles Genome organization. Gene expression and its regulation, importance of siRNA and micro- R N A ,gene mapping and gene sequencing Cell cycles and its regulation. Cell death– events, regulators, intrinsic and extrinsic pathways of apoptosis.Necrosis and autophagy.	**12 Hrs**
Unit-2:	***Cell signaling*** Intercellular and intracellular signalling pathways. Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors. ***Secondary messengers:*** cyclic AMP, cyclic GMP, calcium ion, inositol 1, 4, 5-trisphosphate, (IP3), NO, and diacylglycerol. Detailed study of following intracellular signalling pathways: cyclic AMP signalling pathway, mitogen-activated protein kinase (MAPK) signalling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signalling pathway	**12 Hrs**
Unit-3:	Principles and applications of genomic and proteomic tools DNA electrophoresis, PCR (reverse transcription and real time), micro array technique, SDS page, ELISA and western blotting. Recombinant DNA technology Basic principles of recombinant DNA technology-Restriction enzymes, various types of vectors. Applications of recombinant DNA technology. Gene therapy- Various types of gene transfer techniques, clinical applications and recent advances in gene therapy.	**12 Hrs**
Unit-4:	***Pharmacogenomics*** Cloning of disease gene. Genetic variation and its role in health/ pharmacology Polymorphisms affecting drug metabolism Genetic variation in drug transporters Genetic variation in G protein coupled receptors Applications of proteomics science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics ***Immunotherapeutics:*** Types of immunotherapeutics, humanisation antibodytherapy, Immunotherapeutic in clinical practice.	**12 Hrs**
Unit-5:	***a. Cell culture techniques*** Basic equipment's used in cell culture lab. Cell culture media, varioustypes of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of cells and theirapplication. ***b.*** Principles and applications of cell viability assays, glucose uptake assay, Calcium influx assays Principles and applications of flowcytometry ***c. Biosimilars***	**12 Hrs**

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Text Books:

1. The Cell, A Molecular Approach. Geoffrey M Cooper.
2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L.Wong

Reference Books:

1. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
2. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
3. Basic Cell Culture protocols by CherilD.Helgason and Cindy L.Miller
4. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
5. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
6. Current porotocols in molecular biology vol I to VI edited by Frederick M.Ausuvel et al.

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COURSE CODE: MPL105P	M. Pharm- Semester-I PHARMACOLOGY PRACTICAL - I	L-0 T-0 P-12 C-6
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding the various handling techniques of laboratory animals	
CO2:	Practicing the technique of blood Sampling and route of drug administration	
CO3:	Analysing drugs and Pharmaceuticals	
CO4:	Evaluating drugs in various animal models	
Course Content		

1. Analysis of pharmacopoeial compounds and their formulations by UV Visspectrophotometer.
2. Simultaneous estimation of multi component containing formulations by UVspectrophotometry.
3. Experiments based on HPLC.
4. Experiments based on Gas Chromatography.
5. Estimation of riboflavin/quinine sulphate by fluorimetry. Estimation of sodium/potassium by flame photometry.
6. Handling of laboratory animals.
7. Various routes of drug administration.
8. Techniques of blood sampling, anaesthesia and euthanasia of experimental animals.
9. Functional observation battery tests (modified Irwin test).
10. Evaluationof CNS stimulant, depressant, anxiogenics and anxiolytic,anticonvulsant activity.
11. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and mioticactivity.
12. Evaluation of diuretic activity.
13. Evaluation of antiulcer activity by pylorus ligation method.
14. Oral glucose tolerance test.
15. Isolation and identification of DNA from various sources (Bacteria, Cauliflower,onion, Goat liver).
16. Isolation of RNA from yeast.
17. Estimation of proteins by Braford/Lowry's in biological samples.
18. Estimation of RNA/DNA by UV Spectroscopy.
19. Gene amplification by PCR.
20. Protein quantification Western Blotting.
21. Enzyme based in-vitro assays (MPO, AChEs, α amylase, α glucosidase).
22. Cell viability assays (MTT/Trypan blue/SRB).
23. DNA fragmentation assay by agarose gel electrophoresis.
24. DNA damage study by Comet assay.
25. Apoptosis determination by fluorescent imaging studies.
26. Pharmacokinetic studies and data analysis of drugs given by different routes ofadministration using software's.
27. Enzyme inhibition and induction activity.
28. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (UV.
29. Extraction of drug from various biological samples and estimation of drugs inbiological fluids using different analytical techniques (HPLC).

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Reference Books

1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
2. Fundamentals of experimental Pharmacology by M.N.Ghosh
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
4. Drug discovery and Evaluation by Vogel H.G.
5. Spectrometric Identification of Organic compounds - Robert M Silverstein,
6. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler,Timothy A. Nieman,
7. Vogel's Text book of quantitative chemical analysis - Jeffery, Basset,Mendham, Denney,
8. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L.Mille
9. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
10. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
11. Practical Manual of Experimental and Clinical Pharmacology by BikashMedhi(Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

(Pankaj Sharma) (Dr. Sanjeev) (Babita Sharma) (Dr. P. Kanniyga)

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COURSE CODE: MPL201T	M. Pharm- Semester-II ADVANCED PHARMACOLOGY – II	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding the basic knowledge in the field of pharmacologypertaining to the drugs and its therapeutic applications for the treatment of various diseases	
CO2:	Analysing the mechanism of drug actions at cellular and molecular level.	
CO3:	Evaluating the adverse effects, contraindications and clinical uses ofdrugs used in treatment of various diseases.	
Course Contents:		
Unit-1:	Endocrine Pharmacology Molecular and cellular mechanism of action of hormones such as growth hormone, prolactin, thyroid, insulin and sex hormones Anti-thyroid drugs, Oral hypoglycaemic agents, Oral contraceptives, Corticosteroids. Drugs affecting calcium regulation 2	**12hr**
Unit-2:	Chemotherapy Cellular and molecular mechanism of actions and resistance of antimicrobial agents such as ß-lactams, aminoglycosides, quinolones, Macrolide antibiotics. Antifungal, antiviral, and anti-TB drugs.	**12hr**
Unit-3:	Chemotherapy Drugs used in Protozoal Infections Drugs used in the treatment of Helminthiasis Chemotherapy of cancer Immunopharmacology Cellular and biochemical mediators of inflammation and immune response. Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD. Immunosuppressants and Immunostimulants	**12hr**
Unit-4:	GIT Pharmacology Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheal and drugs for constipation and irritable bowel syndrome. Chronopharmacology Biological and circadian rhythms, applications of chronotherapy in various diseases like cardiovascular disease, diabetes, asthma and peptic ulcer.	**12hr**
Unit-5:	Free radicals Pharmacology Generation of free radicals, role of free radicals in etiopathology of various diseases such as diabetes, neurodegenerative diseases and cancer. Protective activity of certain important antioxidant Recent Advances in Treatment: Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus	**12hr**

Text Books

1. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastavapublished by APC Avichal Publishing Company.
2. KD.Tripathi. Essentials of Medical Pharmacology
3. Principles of Pharmacology. The Pathophysiologic basis of drug Therapyby David E Golan, Armen H, TashjianJr, EhrinJ,Armstrong, April W,Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers **References Books**
4. The Pharmacological basis of therapeutics- Goodman and Gill man's
5. Principles of Pharmacology. The Pathophysiologic basis of drug therapy byDavid E Golan et al.
6. Basic and Clinical Pharmacology by B.G -Katzung
7. Pharmacology by H.P. Rang and M.M. Dale.
8. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
9. Text book of Therapeutics, drug and disease management by E T. Herfindaland Gourley.
10. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel andAndrew B.C.Yu.
11. Handbook of Essential Pharmacokinetics, Pharmacodynamics and DrugMetabolism for Industrial Scientists
12. Robbins &Cortan Pathologic Basis of Disease, 9 th Ed. (RobbinsPathology)

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COURSE CODE: MPL202T	M. Pharm- Semester-II PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-II	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding and evaluating the recent experimental techniques in the drug discovery, development and importance of ethical and regulatory requirements for toxicity studies.	
CO2:	Understanding the maintenance of laboratory animals as per the guidelines, and various in-vitro and in-vivo preclinical and toxicological evaluation processes.	
CO3:	Applying the various screening methods involved in the drug discovery process and Demonstrate the practical skills required to conduct the preclinical toxicity studies	
Course Contents:		
Unit-1:	Basic definition and types of toxicology (general, mechanistic, regulatory and descriptive) Regulatory guidelines for conducting toxicity studies OECD, ICH, EPA and Schedule Y OECD principles of Good laboratory practice (GLP) History, concept and its importance in drug development	**12hr**
Unit-2:	Acute, sub-acute and chronic- oral, dermal and inhalational studies as per OECD guidelines. Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity studies. Test item characterization- importance and methods in regulatory toxicology studies	**12hr**
Unit-3:	Reproductive toxicology studies, Male reproductive toxicity studies, female reproductive studies (segment I and segment III), teratogenicity studies (segment II) Genotoxicity studies (Ames Test, in vitro and in vivo Micronucleus and Chromosomal aberrations studies) In vivo carcinogenicity studies	**12hr**
Unit-4:	IND enabling studies (IND studies)- Definition of IND, importance of IND, industry perspective, list of studies needed for IND submission. Safety pharmacology studies- origin, concepts and importance of safety pharmacology. Tier1- CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2- GI, renal and other studies	**12hr**
Unit-5:	Toxicokinetic- Toxicokinetic evaluation in preclinical studies, saturation kinetics Importance and applications of toxicokinetic studies. Alternativemethods to animal toxicity testing.	**12hr**

References Books

1. Hand book on GLP, Quality practices for regulated non-clinical research and development (http://www.who.int/tdr/publications/documents/glp- handbook.pdf).
2. Schedule Y Guideline: drugs and cosmetics (second amendment) rules,n 2005, ministry of health and family welfare (department of health) New Delhi
3. OECD test guidelines.
4. Principles of toxicology by Karen E. Stine, Thomas M. Brown.Guidance for Industry M3(R2) Nonclinical Safety Studies for the Conductof Human Clinical Trials and Marketing Authorization for Pharmaceuticals

(Uday P.S. Bhaskar) (Dr Sanjeev Sharma) (Babbi Sharma) (Dr. P. Kanungja)

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COURSE CODE: MPL203T	M. Pharm- Semester-II PRINCIPLES OF DRUG DISCOVERY	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding the importance of the role of genomics, proteomics and bioinformatics in drug discovery	
CO2:	Understanding and explain various targets for drug discovery.	
CO3:	Evaluation of various lead seeking method and lead optimization	
CO4:	The various computer aided drug design in drug discovery	
Course Contents:		
Unit-1:	An overview of modern drug discovery process: Target identification, target validation, lead identification and lead Optimization. Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.	**12hr**
Unit-2:	Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques, Assay development for hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modelling methods. Application of NMR and X-ray crystallography in protein structure prediction	**12hr**
Unit-3:	Rational Drug Design Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening,	**12hr**
Unit-4:	Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis and relationship between them.	**12hr**
Unit-5:	QSAR Statistical methods – regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design	**12hr**

References Books

1. Mouldy Sioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targetsand Treatment Options. 2007 Humana Press Inc.
2. Darryl León. Scott MarkelIn. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC.
3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH.

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COURSE CODE: MPL204T	M. Pharm- Semester-II CLINICAL RESEARCH AND PHARMACOVIGILANCE	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1:	Understanding the regulatory requirements for conducting clinical trial.	
CO2:	Understanding the types of clinical trial designs and explain theresponsibilities of key players involved in clinical trials.	
CO3:	Applying the safety monitoring, reporting and close-out activities inclinical trials	
CO4:	Evaluation Pharmacovigilance, detect new adverse drug reactions and their assessment, reporting of ADR.	
Course Contents:		
Unit-1:	Regulatory Perspectives of Clinical Trials: Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH- GCP) guidelines Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant Schedule Y, ICMR Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process	**12 hr**
Unit-2:	Clinical Trials: Types and Design Experimental Study- RCT and Non RCT, Observation Study: Cohort, Case Control, Cross sectional Clinical Trial Study Team Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management	**12 hr**
Unit-3:	Clinical Trial Documentation- Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment. Predictability and preventability assessment, Management of adverse drug reactions; Terminologies of ADR.	**12 hr**
Unit-4:	Basic aspects, terminologies and establishment of Pharmacovigilance History and progress of Pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR,evaluation of medication safety, Establishing Pharmacovigilance centres in Hospitals, Industry and National programmes related to Pharmacovigilance. Roles and responsibilities of Pharmacist, Community Pharmacist and Clinical Pharmacist in Pharmacovigilance	**12 hr**
Unit-5:	Methods, ADR reporting and tools used in Pharmacovigilance International classification of diseases, International Non- proprietary names for drugs, Passive and Active surveillance, Comparative observational studies, Targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety data. Pharmacoepidemiology, pharmacoeconomics, safety pharmacology	**12 hr**

(Udaya P.S. Bhaskar)

(Babita Sharma)

(Dr P Kanungo)

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Text books

1. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.

2. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovannaand Haynes.

References Books

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health; 2001.

2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.

3. Ethical Guidelines for Biomedical Research on Human Subjects 2000.Indian Council of Medical Research, New Delhi.

4. Textbook of Clinical Trials edited by David Machin, Simon Day and SylvanGreen, March 2005, John Wiley and Sons.

5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs.
Second Edition, Jan 2000, Wiley Publications.

(CHARU SAXENA)

(Uday P. S. Bhaskar)

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COURSE CODE: MPL205P	M. Pharm- Semester-II PHARMACOLOGY PRACTICAL – II	L-0 T-0 P-12 C-6

Course outcomes
On Completing the Course, the student will be:

CO1:	Understanding the concept of bioassay in experimental pharmacology **CO2:**	
CO2:	Applying various techniques to determine the strength of drugs in isolatedtissues	
CO3:	Predicting the dose toxicity studies	
CO4:	Evaluating the various effect of drugs on different animal models	

Course Content

1. To record the DRC of agonist using suitable isolated tissues preparation.
2. To study the effects of antagonist/potentiating agents on DRC of agonistusing suitable isolated tissue preparation.
3. To determine to the strength of unknown sample by matching bioassay byusing suitable tissue preparation.
4. To determine to the strength of unknown sample by interpolation bioassayby using suitable tissue preparation
5. To determine to the strength of unknown sample by bracketing bioassay byusing suitable tissue preparation
6. To determine to the strength of unknown sample by multiple point bioassayby using suitable tissue preparation.
7. Estimation of PA2 values of various antagonists using suitable isolatedtissue preparations.
8. To study the effects of various drugs on isolated heart preparations
9. Recording of rat BP, heart rate and ECG.
10. Recording of rat ECG
11. Drug absorption studies by averted rat ileum preparation.
12. Acute oral toxicity studies as per OECD guidelines.
13. Acute dermal toxicity studies as per OECD guidelines.
14. Repeated dose toxicity studies- Serum biochemical, haematological, urine analysis, functional observation tests and histological studies.
15. Drug mutagenicity study using mice bone-marrow chromosomalaberration test.
16. Protocol design for clinical trial. (3 Nos.)
17. Design of ADR monitoring protocol.
18. In-silico docking studies. (2 Nos.)
19. In-silico pharmacophore-based screening.
20. In-silico QSAR studies.
21. ADR reporting

Reference Books

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. Text book of in-vitro practical Pharmacology by Ian Kitchen
4. Bioassay Techniques for Drug Development by Atta-ur-Rahman,Iqbalchoudhary and William Thomsen
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargeland Andrew B.C.Yu.
6. Handbook of Essential Pharmacokinetics, Pharmacodynamics andDrug Metabolism for Industrial Scientists.

(Rabita Sharma)

(Dr. P. Kanungia)

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COURSE CODE: MRM301T	M. Pharm- Semester-III RESEARCH METHODOLOGY & BIOSTATISTICS	L-4 T-0 P-0 C-4
Course Outcomes: On completion of the course, the students will be:		
CO1.	Understanding the basic concept of research methodology	
CO2.	Applying skills in qualitative and quantitative data analysis and presentation	
CO3.	Understanding and applying the maintenance of laboratory animals of laboratory animals	
Course Contents:		
UNIT 1	General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.	**12 hr**
UNIT 2	Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests(students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxan rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.	**12 hr**
UNIT 3	Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.	**12 hr**
UNIT 4	CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anaesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.	**12 hr**
UNIT 5	Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medicalcare.	**12 hr**

Text books

- Cooper & Schindler, Business Research Methods, Tata McGraw Hill.
- Saunders, Research Methods for Business Students, Pearson Education
- Allen T Harrell, New Methods in Social Science Researches, Praeger Publishers, New York
- Beri, G.C., Statistics for Management, Tata MacGraw-Hill
- Chandan J. S., Statistics for Business and Economics, Vikas Publications.
- Broota, K.D., Experimental Designs in Behavioural Research, New Age International
- Singh A. K., Test Measurement and Research Methods in Behaviours Sciences,BhartiBhawan
- Joyce Cox & Polly Urban, Microsoft Office, Galgotia Publishing
- Sinha P.K., Computer Fundamentals, BPB Publishing.

*Latest editions of all the suggested books are recommended.

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PAPER CODE: ……..

BAREILLY INTERNATIONAL UNIVERSITY, BAREILLY

MASTER OF PHARMACY (M.PHARM)

University Examination: ……..

Subject Name: ……

Time: 03 Hours **M.M: 75**

Question No. – 1

Note: Attempt all questions. (Very Short Questions) **(10 x 2 =20)**

a) ……

b) ……

c) ……

d) ……

e) ……

f) ……

g) ……

h) ……

i) ……

j) ……

Question No. – 2

Note: Attempt any seven questions. (Short Questions) **(5 x 7 =35)**

a) ……

b) ……

c) ……

d) ……

e) ……

f) ……

g) ……

h) ……

i) ……

Question No. – 3

Note: Attempt any two questions. (Long Questions) **(10 x 2 = 20)**

a) ……

b) ……

c) ……

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PAPER CODE: ……..

BAREILLY INTERNATIONAL UNIVERSITY, BAREILLY

MASTER OF PHARMACY (M.PHARM)

Non - University Examination: ……..

Subject Name: ……

Time: 03 Hours **M.M: 75**

Note: Answer any Five Questions. All Questions Carry Equal Marks.

1. a) ……
   b) ……..(7.5x2=15)

2. a) ……..
   b) ……..(7.5x2=15)

3. a) ……
   b) ……..(7.5x2=15)

4. a) ……..
   b) ……..(7.5x2=15)

5. a) ……..
   b) ……..(7.5x2=15)

6. a) ……
   b) ……..(7.5x2=15)

7. a) ……
   b) ……..(7.5x2=15)

8. a) ……..
   b) ……..(7.5x2=15)

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BAREILLY INTERNATIONAL UNIVERSITY
Ordinance effective from session 2023-24
Master of Pharmacy (M.Pharm)

Scope

This ordinance shall apply to the program leading to Master of Pharmacy degree.

Eligibility for admission:

A Pass in the following examinations

1. B.Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B.Pharm.)
2. There shall be reservation of seats for the students belonging to the scheduled Castes, Scheduled Tribes and other backward classes in accordance with the instruction issued by the central Government/state Government/Union Territory Administration, as the case may be, from time to time.
3. For SC/ST candidates the prescribed percentage of marks will be 50% of the maximum marks (aggregate of four years of B. Pharm).
4. For candidates having not less than 5 years professional experience, after passing B. Pharm course, there shall be a relaxation in pass percentage from 55% to 50% for admission to M. Pharm programme.
5. Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

Duration of the program:

The program of study for M. Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi & Bareilly International University, Bareilly.

Medium of instruction and examinations:

Medium of instruction and examination shall be in English.

Working days in each semester:

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of August/September to January/February and the even semesters shall be conducted from the month of February/March to June/July in Academic calendar year - 2023-24.

(Uday P.S. Bhaskar) (Uday P.S Bhaskar) (Dr. P. Kanungja)

(Shailendra Kr. Verma)

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Attendance and progress:

A candidate is required to put in at least 75% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations. In special circumstances, short-fall in attendance can be condoned on case's merit to the extent of 5% by the Principal. If the short-fall is more than 5%, but not more than 10%, the Principal may recommend on case's merit to the Vice Chancellor for condonation. The order of Vice Chancellor shall be final.

Program/Course credit structure:

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra- curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

Credit assignment

Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However, based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments, Research work, Discussions with the supervisor, Co-Curricular activities over the duration of four semesters. The credits are distributed semester-wise as shown in Table

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1. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

Table – 1: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*
Total Credit Points	Minimum=95 Maximum=100*

*Credit Points for Co-curricular Activities

Academic work:

A regular record of attendance both in Theory, Practical, Seminar, Assignment, and Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective course.

Course of study:

The specializations in M. Pharm program is given in Table 2.

Table – 2: List of M. Pharm. Specializations and their Codes.

S. No.	Specialization	Code	Total Seats
1.	Pharmaceutics	MPH	15
2.	Pharmacology	MPL	15

The course of study for M. Pharm specializations shall include Semester wise Theory & Practical as given in Table – 3 to 6. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table – 3 to 6.

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Table – 3: Course of study for M. Pharm. (Pharmaceutics)

Course Code	Course	Credit Hours	Credit Points	Hrs./ wK	Marks
Semester I					
MPH101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPH102T	Drug Delivery System	4	4	4	100
MPH103T	Modern Pharmaceutics	4	4	4	100
MPH104T	Regulatory Affair	4	4	4	100
MPH105P	Pharmaceutics Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	**650**
Semester II					
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	4	4	100
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	4	4	4	100
MPH203T	Computer Aided Drug Delivery System	4	4	4	100
MPH204T	Cosmetic and Cosmeceuticals	4	4	4	100
MPH205P	Pharmaceutics Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	**650**

Table – 4: Course of study for M. Pharm. (Pharmacology)

Course Code	Course	Credit Hours	Credit Points	Hrs./ wK	Marks
Semester I					
MPL101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPL102T	Advanced Pharmacology-I	4	4	4	100
MPL103T	Pharmacological and Toxicological Screening Methods-I	4	4	4	100
MPL104T	Cellular and Molecular Pharmacology	4	4	4	100
MPL105P	Pharmacology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	**650**
Semester II					
MPL201T	Advanced Pharmacology II	4	4	4	100
MPL202T	Pharmacological and Toxicological Screening Methods-II	4	4	4	100
MPL203T	Principles of Drug Discovery	4	4	4	100
MPL204T	Clinical Research and Pharmacovigilance	4	4	4	100
MPL205P	Pharmacology Practical II	12	6	12	150

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-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	**650**

Table – 5: Course of study for M. Pharm. III Semester
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
MRM 301T	Research Methodology and Biostatistics*	4	4
-	Journal club	1	1
-	Discussion / Presentation (Proposal Presentation)	2	2
-	Research Work	28	14
	Total	35	21

* Non-University Exam

Table – 6: Course of study for M. Pharm. IV Semester
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
-	Journal Club	1	1
-	Research Work	31	16
-	Discussion/Final Presentation	3	3
	Total	35	20

Table – 7: Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit PointsEligible / Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	01
Participation in international Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	02
Academic Award/Research Award from State Level/National Agencies	01
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	01
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science)	02

Note: International Conference: Held outside India

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*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.
2. The composition of the Programme Committee shall be as follows: A teacher at the cadre of Professor shall be the Chairperson; One Teacher from each M.Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.
3. Duties of the Programme Committee:

a) Periodically reviewing the progress of the classes.
b) Discussing the problems concerning curriculum, syllabus and the conduct of classes.
c) Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
d) Communicating its recommendation to the Head of the institution on academic matters.
e) The Programme Committee shall meet at least twice in a semester preferably at the end of each sessional exam and before the end semester exam.

Examinations/Assessments

The schemes for internal assessment and end semester examinations are given in Table- 8,9 & 10.

a) **End semester examinations:** The End Semester Examinations for each theory and practical course through semesters I to IV shall be conducted by the respective university except for the subject with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Table - 8 : Scheme internal assessment and end semester examinations of Pharmaceutics

Course Code	Course	Internal Assessment				End Semester Exam		Total Marks
		Continuous Mode	Sessional Exam		Total	Marks	Duration	
			Marks	Duration				
Semester I								
MPH101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPH102T	Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH103T	Modern Pharmaceutics	10	15	1 Hr	25	75	3 Hrs	100
MPH104T	Regulatory Affair	10	15	1 Hr	25	75	3 Hrs	100

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MPH105P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar/Assignment	-	-	-	-	-	-	100
							Total	**650**
Semester II								
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MPH203T	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH204T	Cosmetic and Cosmeceuticals	10	15	1 Hr	25	75	3 Hrs	100
MPH205P	Pharmaceutics Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar/Assignment	-	-	-	-	-	-	100

Table - 9 : Scheme internal assessment and end semester examinations of Pharmacology

Course Code	Course	Internal Assessment				End Semester Exam		Total Marks
		Continuous Mode	Sessional Exam		Total	Marks	Duration	
			Marks	Duration				
Semester I								
MPL101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPL102T	Advanced Pharmacology-I	10	15	1 Hr	25	75	3 Hrs	100
MPL103T	Pharmacological and Toxicological Screening Methods-I	10	15	1 Hr	25	75	3 Hrs	100
MPL104T	Cellular and Molecular Pharmacology	10	15	1 Hr	25	75	3 Hrs	100
MPL105P	Experimental Pharmacology I	20	30	6 Hrs	50	100	6 Hrs	150
	Seminar/Assignment	-	-	-	-	-	-	100
							Total	**650**
Semester II								
MPL201T	Advanced Pharmacology II	10	15	1 Hr	25	75	3 Hrs	100
MPL202T	Pharmacological and Toxicological Screening Methods-II	10	15	1 Hr	25	75	3 Hrs	100
MPL203T	Principles of Drug Discovery	10	15	1 Hr	25	75	3 Hrs	100
MPL204T	Clinical research And pharmacovigilance	10	15	1 Hr	25	75	3 Hrs	100
MPL205P	Experimental Pharmacology practical- II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar/Assignment	-	-	-	-	-	-	100
							Total	**650**

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Table 10: Schemes for internal assessments and end semester (III & IV Semester) for each specialization

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER III								
MRM 301T	Research Methodology and Biostatistics*	10	15	1 Hr	25	75	3 Hrs	100
-	Journal club	–	–	–	25	–	–	25
-	Discussion / Presentation (Proposal Presentation)	–	–	–	50	–	–	50
-	Research work*	–	–	–	–	350	1 Hr	350
Total								**525**
SEMESTER IV								
-	Journal club	–	–	–	25	–	–	25
-	Discussion / Presentation (Proposal Presentation)	–	–	–	75	–	–	75
-	Research work and Colloquium	–	–	–	–	400	1 Hr	400
Total								**500**

***Non University Examination**

Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table – 11: Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria Maximum Marks	Criteria Maximum Marks
Attendance (Refer Table – 28) 8	Attendance (Refer Table – 28) 8
Student – Teacher interaction 2	Student – Teacher interaction 2
Total	10
Practical	
Attendance (Refer Table 28	10
Based on Practical Records, Regular viva voce, etc.	20

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Table - 12: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95-100	8	10
90-94	6	7.5
85-89	4	5
80-84	2	2.5
Less than 80	0	0

Sessional Exams

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given in the table. The average marks of two sessional exams shall be computed for internal assessment as per the requirements given in tables.

Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of M.Pharm. programme if he/she secures at least 50% marks in that particular course including internal assessment.

Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next end semester theory examinations.

Reexamination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table 13. The exact dates of examinations shall be notified from time to time.

Table – 13: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I	December/January	June/July
II	June/July	December/ January
III	November/ December	May/ June
IV	June/July	December/ January

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Allowed to keep terms (ATKT) : No student shall be admitted to any examination unless he/she fulfills the norms given as per the attendance and progress of individual courses . ATKT rules applicable are as follows:

a) A student shall be eligible to carry forward all the courses of I and II semesters till the III semester examinations. However, he/she shall not be eligible to attend the courses of IV semester until all the courses of I, II and III semesters are successfully completed.

b) A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters within the stipulated time period as per the norms.

Note: Grade AB should be considered as failed and treated as one head for deciding ATKT. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

Grading of performances

Letter grades and grade points allocations: Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – 14.

Table – 14: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C1, C2, C3 and C4 and the student's grade points in these courses are G1, G2, G3 and G4, respectively, and the [illegible] equal to:

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$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4G4}{C1 + C2 + C3 + C4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4^{*}\ ZERO}{C1 + C2 + C3 + C4}$$

Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the IV semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all IV semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$CGPA = \frac{C1S1 + C2S2 + C3S3 + C4S4}{C1 + C2 + C3 + C4}$$

where C1, C2, C3,…. is the total number of credits for semester I,II,III,…. and S1,S2, S3,….is the SGPA of semester I,II,III,…. .

Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction = CGPA of. 7.50 And above

First Class = CGPA of 6.00 to 7.49

Second Class = CGPA of 5.00 to 5.99

Project work

All the students shall undertake a project under the supervision of a teacher in Semester III to IV and submit a report. 4 copies of the project report shall be submitted (typed & bound copy not less than 75 pages). The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done	50 Marks
Methodology adopted	150 Marks
Results and Discussions	250 Marks
Conclusions and Outcomes	50 Marks
Total	500 Marks

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Evaluation of Presentation:

Presentation of work	100 Marks
Communication skills	50 Marks
Question and answer skills	100 Marks
Total	250 Marks

Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the M.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the M. Pharm program in minimum prescribed number of years, (two years) for the award of Ranks.

Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

Revaluation and Retotaling of answer papers

There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for retotaling by paying prescribed fee.

Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

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