1. Program M. Pharm PHARMACEUTICS (MPH)

The course of study for M. Pharm specializations shall include Semester wise Theory & Practical as given in below mentioned Tables.

2.Course structure

Course of structure 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**

Schemes for internal assessments and end semester examinations(Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER III								
MRM301T	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**

3.Program outcomes (PO)

- The Post-Graduate students will acquire adequate scientific information regarding basic principles of Pharmaceutics including Cosmetology, Specialized drug delivery systems.
- The students will be able to think logically and solve the problems, will develop an ability to conduct, analyze and interpret data of pharmaceutical experiments in various departments.
- The students will be capable to demonstrate necessary skills (eg.working

independently, time management and organizational skills).They will demonstrate an adaptable, flexible and effective approach towards organizational development.

- The students will develop interpersonal skills such as influencing others, negotiating and working with others, conflict management and leading others through the problem-solving process.
- They will create awareness of healthcare issues through interactions with others and will gain a sense of self-respect towards community and citizenship
- The students will be able to demonstrate a high-level of understanding of the key stages in drug discovery, development, and commercialization. This will lead to the manufacturing of drugs and pharmaceuticals considering its impact on the environment and surrounding.

4.Program specific outcomes (PSO)

- Postgraduates will gain in depth knowledge about the drug action, drugdelivery and advancement formulation development.
- Postgraduates will be able to apply molecular techniques, bioanalytical methods in new drug designing, formulation, and carry out preclinical testing as per regulatory requirements. Postgraduates can design and participate in clinical research by following regulatory ethical guidelines and pharmacovigilance of target drugs with more emphasize on pharmaceutical care.
- Interpretation of biological variations related to drug action and application of pharmacometrics and genetic variations relating to therapeutics, clinical trial, pharmacy practice and Pharmacoeconomics.
- Postgraduates will be able to follow pharmacopoeia standards andinternational guidelines to emphasize the significance of quality control and assurance in drug analysis and formulation development.
- Develop required skills in formulation and dispensing in catering to patient needs as well as overcoming potential incompatibilities in formulations.

5.Course outcome for M.Pharm Pharmaceutics

MODERN PHARMACEUTICAL ANALYTICALTECHNIQUES (MPH 101T), PHARMACEUTICS PRACTICALS - I (MPH 105P)

CO1- Chemicals and Excipients.

CO2- The analysis of various drugs in single and combination dosage forms.

CO3- Theoretical and practical skills of the instrument.

DRUG DELIVERY SYSTEMS (MPH 102T)

CO1- The various approaches for development of novel drug delivery systems.

CO2- The criteria for selection of drugs and polymers for the development of delivering system.

CO3- The formulation and evaluation of Novel drug delivery systems.

MODERN PHARMACEUTICS (MPH 103T)

CO1- The elements of preformulation studies.

CO2-The Active Pharmaceutical Ingredients and Generic drug Product development.

CO3-Industrial Management and GMP Considerations.

CO4-Optimization Techniques & Pilot Plant Scale Up Techniques.

CO5-Stability Testing, sterilization process & packaging of dosage forms.

REGULATORY AFFAIRS (MPH 104T)

CO1- The Concepts of innovator and generic drugs, drug development process.

CO2- The Regulatory guidance's and guidelines for filing and approval process.

CO3- Preparation of Dossiers and their submission to regulatory agencies in different countries.

CO4- Post approval regulatory requirements for actives and drug products.

CO5- Submission of global documents in CTD/ eCTD formats.

CO6- Clinical trials requirements for approvals for conducting clinical trials.

CO7- Pharmacovigilance and process of monitoring in clinical trials.

MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS) (NTDS) (MPH 201T) PHARMACEUTICS PRACTICALS - II (MPH 205P)

CO1- The various approaches for development of novel drug delivery systems.

CO2- The criteria for selection of drugs and polymers for the development of NTDS.

CO3- The formulation and evaluation of novel drug delivery systems.

ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS (MPH 202T)

CO1- The basic concepts in biopharmaceutics and pharmacokinetics.

CO2- The use raw data and derive the pharmacokinetic models and parameters the best describesthe process of drug absorption, distribution, metabolism, and elimination.

CO3- The critical evaluation of biopharmaceutic studies involving drug product equivalency.

CO4- The design and evaluation of dosage regimens of the drugs using pharmacokinetic andbiopharmaceutic parameters.

CO5- The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic.

COMPUTER AIDED DRUG DEVELOPMENT (MPH 203T)

CO1- History of Computers in Pharmaceutical Research and Development.

CO2- Computational Modelling of Drug Disposition.

CO3- Computers in Preclinical Development.

CO4- Optimization Techniques in Pharmaceutical Formulation.

CO5- Computers in Market Analysis.

CO6- Computers in Clinical Development.

CO7- Artificial Intelligence (AI) and Robotics.

CO8- Computational fluid dynamics (CFD).

COSMETICS AND COSMECEUTICALS (MPH 204T)

CO1- Key ingredients used in cosmetics and cosmeceuticals.=

CO2- Key building blocks for various formulations.

CO3- Current technologies in the market.

CO4-Various key ingredients and basic science to develop cosmetics and cosmeceuticals.

CO5- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

1. Program M. Pharm PHARMACEUTICAL CHEMISTRY (MPC)

The course of study for M. Pharm specializations shall include Semester wise Theory & Practical as given in below mentioned Tables.

2. Course structure

Course of structure for M. Pharm. (Pharmaceutical Chemistry)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPC101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPC1012T	Advanced Organic Chemistry –I	4	4	4	100
MPC103T	Advanced Medicinal chemistry	4	4	4	100
MPC104T	Chemistry of Natural Products	4	4	4	100
MPC105P	Pharmaceutical Chemistry Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		**35**	**26**	**35**	**650**
Semester II					
MPC201T	Advanced Spectral Analysis	4	4	4	100
MPC202T	Advanced Organic Chemistry –II	4	4	4	100
MPC203T	Computer Aided Drug Design	4	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	**35**	**26**	**35**	**650**

Schemes for internal assessments and end semester examinations(Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER III								

MRM301T	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**

3. Program outcomes (PO)

a. The post graduate student will be able to develop analytical instrumental techniquesfor identification, characterization, and quantification of drugs.

b. The post graduate student will be able to operate equipment / instruments required forthe characterization and quantification of organic compounds.

c. The post graduate student will be able to design new techniques of organic synthesisusing green chemistry.

d. The post graduate student will be able to design and implement research projects independently.

4. Program Specific outcomes (PSO)

i. Postgraduates will be able to follow pharmacopoeia standards and international guidelines to emphasize the significance of quality control and assurance in drug analysis and formulation development.

ii. Postgraduates will be able to apply molecular techniques, bioanalytical methods in new drug designing, formulation, and carry out preclinical testing as per regulatory requirements.

iii. To create a knowledge with various hyphenated analytical instrumental techniques for identification, characterization, and quantification of drugs

iv. Postgraduates can design and participate in clinical research by following regulatory ethical guidelines and pharmacovigilance of target drugs with more emphasize on pharmaceutical care.

1. Course outcome

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPC 101T) PHARMACEUTICAL CHEMISTRY PRACTICAL - I (MPC 105P)

CO1- Know about chemicals and excipients.

CO2- The analysis of various drugs in single and combination dosage forms.

CO3- Theoretical and practical skills of the instruments.

ADVANCED ORGANIC CHEMISTRY - I (MPC 102T)

CO1- The principles and applications of retrosynthesis.

CO2- The mechanism & applications of various named reactions.

CO3- The concept of disconnection to develop synthetic routes for small target molecule.

CO4- The various catalysts used in organic reactions.

CO5- The chemistry of heterocyclic compounds.

ADVANCED MEDICINAL CHEMISTRY (MPC 103T)

CO1- Different stages of drug discovery.
CO2- Role of medicinal chemistry in drug research.
CO3- Different techniques for drug discovery.
CO4- Various strategies to design and develop new drug like molecules for biological targets.
CO5- Peptidomimetics.

CHEMISTRY OF NATURAL PRODUCTS (MPC 104T)

CO1- Different types of natural compounds and their chemistry and medicinal importance.

CO2- The importance of natural compounds as lead molecules for new drug discovery.

CO3- The concept of rDNA technology tool for new drug discovery.

CO4- General methods of structural elucidation of compounds of natural origin.

CO5- Isolation, purification, and characterization of simple chemical constituents from naturalsource.

ADVANCED SPECTRAL ANALYSIS (MPC 201T) PHARMACEUTICAL CHEMISTRY PRACTICALS – II (MPC 205P)

CO1- Interpretation of the NMR, Mass and IR spectra of various organic compounds.

CO2- Theoretical and practical skills of the hyphenated instruments.

CO3- Identification of organic compound.

ADVANCED ORGANIC CHEMISTRY - II (MPC 202T)

CO1- The principles and applications of green chemistry.

CO2- The concept of peptide chemistry.

CO3- The various catalysts used in organic reactions.

CO4- The concept of stereochemistry and asymmetric synthesis.

COMPUTER AIDED DRUG DESIGN (MPC 203T)

CO1- Role of CADD in drug discovery.

CO2- Different CADD techniques and their applications.

CO3- Various strategies to design and develop new drug like molecules.

CO4- Working with molecular modellingsoftwares to design new drug molecules.

CO5- The in silico virtual screening protocol.

PHARMACEUTICAL PROCESS CHEMISTRY (MPC 204T)

At completion of this course, it is expected that students will be able to understand

CO1- The strategies of scale up process of APIs and intermediates.

CO2- The various unit operations and various reactions in process chemistry.

1. Program PHARMACOLOGY (MPL)

The course of study for M.Pharm specializations shall include Semester wise Theory & Practical as given in below mentioned Tables.

2. Course structure

Course of structure for M. Pharm. (Pharmacology)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPL 101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPL 102T	Advanced Pharmacology-I	4	4	4	100
MPL 103T	Pharmacological and Toxicological Screening Methods-I	4	4	4	100
MPL 104T	Cellular and Molecular Pharmacology	4	4	4	100
MPL 105P	Pharmacology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		**35**	**26**	**35**	**650**
Semester II					
MPL 201T	Advanced Pharmacology II	4	4	4	100
MPL 102T	Pharmacological and Toxicological Screening Methods-II	4	4	4	100
MPL 203T	Principles of Drug Discovery	4	4	4	100
MPL 204T	Experimental Pharmacology practical- II	4	4	4	100
MPL 205P	Pharmacology Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	**35**	**26**	**35**	**650**

Schemes for internal assessments and end semester examinations(Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER III								
MRM301T	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**

3. Program outcomes (PO)

- The post graduate students will be capable of building core concept on mechanism, toxicities and evaluation of drugs through pharmacological and toxicological models via comprehensive understanding of cellular and molecular pharmacology based pharmacotherapy for drug discovery and development.
- The students will understand the principles of pharmaceutical analysis and apply the modern instruments, computational and informatics tools, and techniques for target and lead optimization in quantification of drugs.

- The students will understand, apply and appraise regulatory and ethical concepts in preclinical and clinical research for pharmaceutical and healthcare domain in relation to society.
- The students will understand, apply and appraise concepts of research methodology & biostatistics, as well as apply computational and informatics tools in clinical and pharmacovigilance research.
- The students will have ability to create an inquisitive mind thorough appraisal of journals and develop technical communication skills to able to interact with broad scientific audience through scientific writing in form of reports/thesis or presentations.

4. Programme Specific outcomes (PSO)

- Impart basic knowledge and skills to practice quality use of medicines, in clinical practice, analysis of risk and benefits, and identify medication related problems.
- Interpretation of biological variations related to drug action and application of pharmacometrics and genetic variations relating to therapeutics, clinical trial, pharmacy practice and pharmacoeconomics.
- Post graduates can design and participate in clinical research by following regulatory ethical guidelines and pharmacovigilance of target drugs with more emphasize on pharmaceutical care.
- Create, select and apply appropriate resources such as modern, molecular and IT tools to predict, model and understand the behaviour of cellular systems activities and limitations.

5.COURSE OUTCOMES

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES(MPL 101T)

CO1- Chemicals and Excipients.

CO2- The analysis of various drugs in single and combination dosage forms.

CO3- Theoretical and practical skills of the instruments.

ADVANCED PHARMACOLOGY - I (MPL 102T)

CO1- Discuss the pathophysiology and pharmacotherapy of certain diseases.

CO2- Explain the mechanism of drug actions at cellular and molecular level.

CO3- Understand the adverse effects, contraindications and clinical uses of drugs used intreatment of diseases.

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS - I(MPL 103T)

CO1- Appraise the regulations and ethical requirement for the usage of experimental animals.

CO2- Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals.

CO3- Describe the various newer screening methods involved in the drug discovery process.

CO4- Appreciate and correlate the preclinical data to humans.

CELLULAR AND MOLECULAR PHARMACOLOGY (MPL 104T)

CO1- Explain the receptor signal transduction processes.

CO2- Explain the molecular pathways affected by drugs.

CO3- Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.

CO4- Demonstrate molecular biology techniques as applicable for pharmacology.

ADVANCED PHARMACOLOGY - II (MPL 201T)

PHARMACOLOGICALPRACTICAL - II (MPL 205P)

CO1- Explain the mechanism of drug actions at cellular and molecular level.

CO2- Discuss the Pathophysiology and pharmacotherapy of certain diseases.

CO3- Understand the adverse effects, contraindications and clinical uses of drugs used intreatment of diseases.

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-II(MPL 202T)

CO1- Explain the various types of toxicity studies.

CO2- Appreciate the importance of ethical and regulatory requirements for toxicity studies.

CO3- Demonstrate the practical skills required to conduct the preclinical toxicity studies.

PRINCIPLES OF DRUG DISCOVERY (MPL 203T)

CO1- Explain the various stages of drug discovery.

CO2- Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery.

CO3- Explain various targets for drug discovery.

CO4- Explain various lead seeking method and lead optimization.

CO5- Appreciate the importance of the role of computer aided drug design in drug discovery.

CLINICAL RESEARCH AND PHARMACOVIGILANCE (MPL 204T)

CO1- Explain the regulatory requirements for conducting clinical trial.

CO2- Demonstrate the types of clinical trial designs.

CO3- Explain the responsibilities of key players involved in clinical trials.

CO4- Execute safety monitoring, reporting and close-out activities.

CO5-Explain the principles of Pharmacovigilance.

CO6- Detect new adverse drug reactions and their assessment.

CO7--Perform the adverse drug reaction reporting systems and communication inPharmacovigilance.