K. R. MANGALAM UNIVERSITY

THE COMPLETE WORLD OF EDUCATION

SCHOOL OF MEDICAL

AND

ALLIED SCIENCES

Master of Pharmacy- Pharmaceutics

Program Code: 61

Master of Pharmacy- Pharmacology

Program Code: 65

2020-2022

Approved in the 23rd Meeting of Academic Council held on 23 June 2020

Academic Council
Member Secretary
K.R. Mangalam University

Registrar
K.R. Mangalam University
Sohna Road, Gurugram, (Haryana)

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PREFACE

The KRMU envisions all its programs in the best interest of their students and in this endeavour it offers a new vision to all its courses. Through its programs it aims to provide a focused, student-centric syllabus with an agenda to structure the teaching-learning experiences experientially.

The curriculum strengthens student's experiences and prepares the students for, academia and employability, sustainability and life-long learning.

Each program reflects the promise to accomplish the learning outcomes by studying the courses. The graduate attributes encompass values related to well-being, emotional stability, critical thinking, social justice and also skills for entrepreneurship.

The K.R. Mangalam University hopes the curriculum will help students in making an informed decision at the time of working in the field of pharmacy.

ACKNOWLEDGEMENT

The development of the Curriculum for Post Graduate degree program in Pharmacy is a result of thoughtful deliberations at various stages of dedicated and specialized experts. This curriculum has been framed to meet the expectations of an academically challenging environment, develop problem-solving skills by students, and aligns with current standards and to enrich the students to make them self-enablers and/or match job requirements on successful completion of their degrees.

I wish to acknowledge all our experts who have been involved in the process of developing this outcome-based curriculum for Masters of Pharmacy (M. Pharm). I am thankful to Prof. Manoj M. Gadewar, Dr. Shrestha Sharma, Dr. Urooj A. Khan and Dr. Lakhveer who were devotedly committed towards framing this curriculum.

I am greatly gratified Ms. Manvi Arora for her supervision contribution, guidance, and support throughout the development of this curriculum.

Special thanks and gratitude to Prof. Aditya Malik Vice Chancellor, K.R. Mangalam University, who have been instrumental and encouraging throughout the process of developing this curriculum.

Last, but not the least, I also sincerely thank to Ms. Silky Sethy, Ms. Neha Minocha and Mr. Sanjeev Kumar who have contributed for development of this curriculum.

Dean
School of Medical and Allied Sciences

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1. INTRODUCTION

The K.R. Mangalam Group has made a name for itself in the field of education. The K.R. Mangalam story goes back to the chain of schools that offered an alternative option of world-class education, pitching itself against the established elite schools, which had enjoyed a position of monopoly till then. Having blazed a new trail in school education, the focus of the group was aimed at higher education.

K.R. Mangalam University is the fastest-growing higher education institute in Gurugram, India. K. R. Mangalam University was established under the Haryana Private University Act 2006, received the approval of Haryana Legislature vide Amendment Act # 36 of 2013 and consent of the Hon'ble Governor of Haryana on 11th April 2013, which was published in the Gazette notification vide Leg. No.10/2013, dated 3rd May 2013.

Since its inception in 2013, the University has been striving to fulfil its prime objective of transforming young lives through ground-breaking pedagogy, global collaborations, and world-class infrastructure. Resources at K.R Mangalam University have been continuously upgraded to optimize opportunities for the students. Our students are groomed in a truly interdisciplinary environment where they grow up with integrative skills through interaction with students from engineering, social sciences, management and other study streams.

K. R. Mangalam University is unique because of its

i. Enduring legacy of providing education to high achievers who demonstrate leadership in diverse fields.

ii. Protective and nurturing environment for teaching, research, creativity, scholarship, social and economic justice.

2. OBJECTIVES

To impart undergraduate, post graduate and doctoral education in identified areas of higher education.

- To undertake research programmes with industrial interface.
- To integrate its growth with the global needs and expectations of the major stake holders through teaching, research, exchange & collaborative programmes with foreign, Indian Universities/Institutions and MNCs.

- To act as a nodal center for transfer of technology to the industry.
- To provide job oriented professional education to the Indian student community with particular focus on Haryana.

3. ABOUT THE SCHOOL OF MEDICAL AND ALLIED SCIENCES

School of Medical and Allied Sciences mainly focused on training to students for various subjects and practical aspects related to drug formulation and testing along with co-curricular development. School offers Diploma, undergraduate, post graduate courses in pharmacy and Bachelor degree in physiotherapy post. We provide an extra edge to our students by teaching and training by leading pharma industry experts to facilitate industry academia interaction, participation in conferences / workshops / skill development programs, carrier guidance, coaching for GPAT and other competitive examinations. We encourage students to participate in various health camps organized by School of Medical and Allied Sciences to make general awareness amongst people regarding various diseases like diabetes, hypertension, communicable and non-communicable diseases. We provide placement assistance to students for getting jobs in various government and private laboratories. We have tie up with various pharmaceutical industries like Dabur Research Foundation, Sun Pharma, Arbro Pharma, Indian Pharmacopoeial Commission, Catalyst Clinical Services, Suraksha Pharma, Medicamen Biotech , Mankind Pharma etc. which provide various carrier opportunities in pharmaceutical production, pharmaceutical quality control, quality assurance, pharmaceutical sales & distribution, drug information services, health insurance, medical coding, supply chain management, forensic sciences, pharmacovigilance, product management team, clinical trials, clinical data management and in Indian Pharmacopeia Commission.

3.1. School Vision

To contribute towards healthcare needs of the society by producing a skilled, motivated and accessible workforce dedicated towards achieving health for all.

3.2 School Mission

M1: To produce self-motivated, self-reliant and socially sensitive young healthcare professionals catering to the needs of academia, industry and research.

M2: To create a center of excellence for learning and research in the field of pharmaceutical and allied health sciences with inter-disciplinary approach in emerging area of science and technology with focus on industry-academia interaction.

M3: To nurture transformational research for the benefit of the society.

M4: To interlink pharmaceutical and allied health sciences with interdisciplinary life sciences.

3.3 Aims of Master Degree Program

Since 2018 the School of Medical and Allied Sciences strives to foster and maintain a creative environment with a deep commitment to inculcate excellence in academics and contribute towards students' development. The Master's programme is designed to provide a sound knowledge and training to students to prepare students for high-level research and leadership positions in pharmaceutical and biotechnology companies. The School of Medical and Allied Sciences offers Masters Programs in Pharmaceutics and Pharmacology that are designed to prepare exceptional students for productive and successful careers in pharmaceutical industry, academia, and research.

4. POST GRADUATE PROGRAMS OFFERED BY SCHOOL OF MEDICAL AND ALLIED SCIENCES

SMAS offers M. Pharmacy degree course which is duly approved by the Pharmacy Council of India (F.No.01.106/2020-PCI, minutes of 109thcentral council meeting on 08-09April, 2020, Item No. HR-17/2020-21).The curriculum has been specifically designed so as to impart latest knowledge and skills relevant to Pharmaceutical Sciences including Industrial Visits / Training / Guest Lectures of Experts from Industry and Academia. School of Medical and Allied Sciences offers various courses in Pharmacy, namely:

4.1 M. Pharm (Pharmaceutics)

4.2 M. Pharm (Pharmacology)

4.1 M. PHARM (PHARMACEUTICS) PROGRAM

M. Pharm (Pharmaceutics) program is designed to provide a sound knowledge of principles and applications in the field of pharmaceutics. It develops the ability to analyze the problems related to drug delivery and to come up with Novel Drug Formulation.

4.1.1 Eligibility Criteria

The student should pass in the following examinations:

- B. Pharmacy degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India (PCI) and has scored not less than 55% of the maximum marks (aggregate of 4 years of B.Pharmacy).
- 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.

4.1.2 Course Outline

Modern Pharmaceutical Analytical Techniques, Modern Pharmaceutics, Drug delivery system, Regulatory affairs, Molecular Pharmaceutics (Nano Tech and Targeted DDS), Advanced Biopharmaceutics & Pharmacokinetics, Computer Aided Drug Delivery System, Cosmetics and Cosmeceuticals, Research Methodology and Biostatistics, Pharmaceutics Practical, Seminar/Assignment, Discussion / Presentation (Proposal Presentation), Journal Club, Research work.

4.1.3 Career Opportunities

Academics/Research and development/ Pharmacovigilance/ Clinical Research/ Preclinical data analyst/ Medical writing/ Medical coder/ Toxicology/ Analytical R& D/ Formulation Development/ Drug Regulatory Affairs/ Product Marketing/ Sales and Marketing/ Drug inspectors/ Drug Safety Associate/ Overseas opportunity(GRE).

4.2 M. PHARM (PHARMACOLOGY) PROGRAM

M. Pharm (Pharmacology) Program is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. It will impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development.

4.2.1Eligibility Criteria

The student should pass in the following examinations:

- B. Pharmacy degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India (PCI) and has scored not less than 55% of the maximum marks (aggregate of 4 years of B.Pharmacy).
- 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.

4.2.2 Course Outline

Modern Pharmaceutical Analytical Techniques, Advanced Pharmacology, Pharmacological and Toxicological Screening Methods, Cellular and Molecular Pharmacology, Pharmacology Practical, Principles of Drug Discovery, Research Methodology and Biostatistics Seminar/Assignment, Discussion / Presentation (Proposal Presentation), Journal Club, Research work.

4.2.3 Career Opportunities

Academics/ Research and development/ Pharmacovigilance/ Clinical Research/ Preclinical data analyst /Medical writing/ Medical coder/ Toxicology/ Analytical R& D/ Formulation Development/ Drug Regulatory affairs/ Product Marketing/ Sales and Marketing/ Drug inspectors/ Drug Safety Associate/Overseas opportunity(GRE).

5. CLASS TIMINGS

The class will be held from Monday to Friday from 9.10 A.M. to 4.10 P.M.

6. PROGRAM DURATION

Name of the Program	Duration
Master of Pharmacy	2 Years / 4 Semester

7. PROGRAM SCHEME

The syllabi of the M. Pharm programme offered by School of Medical and Allied Sciences are given in the following pages:

TWO YEAR M.PHARM COURSE AT A GLANCE

	Semester I	Semester II	Semester III	Semester IV	Total
Courses	6	6	4	3	18
Credits	26	26	21	20	93

7.1 SCHEME OF STUDIES FOR M.PHARM (PHARMACEUTICS) PROGRAMME

Semester I

S.No.	Course Code	Course Title	Credits	Hours /week
1	MPH101T	Modern Pharmaceutical Analytical Techniques	4	4
2	MPH102T	Drug Delivery System	4	4
3	MPH103T	Modern Pharmaceutics	4	4
4	MPH104T	Regulatory Affairs	4	4
5	MPH105P	Pharmaceutics Practical I	6	12
6	MPH106S	Seminar	4	7
		TOTAL	**26**	**35**

Semester II				
S.No.	**Course Code**	**Course Title**	**Credits**	**Hours /week**
1	MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	4
2	MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	4	4
3	MPH203T	Computer Aided Drug Delivery System	4	4
4	MPH204T	Cosmetic and Cosmeceuticals	4	4
5	MPH205P	Pharmaceutics Practical II	6	12
6	MPH206S	Seminar/Assignment	4	7
		TOTAL	**26**	**35**

Semester III				
S.No.	**Course Code**	**Course Title**	**Credits**	**Hours /week**
1	MRM301T	Research Methodology and Biostatistics	4	4
2	MPH302S	Journal Club	1	1
3	MPH303S	Discussion / Presentation (Proposal Presentation)	2	2
4	MPH304P	Research Work	14	28
		TOTAL	**21**	**35**

Semester IV				
S.No.	**Course Code**	**Course Title**	**Credits**	**Hours /week**
1	MPH401S	Journal Club	1	1
2	MPH402P	Research Work	16	31

3	MPH403S	Discussion / Final Presentation	3	3
		TOTAL	**20**	**35**

7.2 SCHEME OF STUDIES FOR M.PHARM (PHARMACOLOGY) PROGRAM

Semester I				
S.No.	**Course Code**	**Course Title**	**Credits**	**Hours /week**
1	MPL101T	Modern Pharmaceutical Analytical Techniques	4	4
2	MPL102T	Advanced Pharmacology-I	4	4
3	MPL103T	Pharmacological and Toxicological Screening Methods-I	4	4
4	MPL104T	Cellular and Molecular Pharmacology	4	4
5	MPL105P	Pharmacology Practical I	6	12
6	MPL106S	Seminar/Assignment	4	7
		TOTAL	**26**	**35**

Semester II				
S.No.	**Course Code**	**Course Title**	**Credits**	**Hours /week**
1	MPL201T	Advanced Pharmacology II	4	4
2	MPL 202T	Pharmacological and Toxicological Screening Methods-II	4	4
3	MPL203T	Principles of Drug Discovery	4	4
4	MPL204T	Experimental Pharmacology practical- II	4	4
5	MPL205P	Pharmacology Practical II	6	12
6	MPL206S	Seminar/Assignment	4	7
		TOTAL	**26**	**35**

Semester III				
S.No.	**Course Code**	**Course Title**	**Credits**	**Hours /week**
1	MRM301T	Research Methodology and Biostatistics	4	4
2	MPL302S	Journal Club	1	1
3	MPL303S	Discussion / Presentation (Proposal	2	2

		Presentation)		
4	MPL304P	Research Work	14	28
		TOTAL	**21**	**35**

Semester IV				
S.No.	**Course Code**	**Course Title**	**Credits**	**Hours /week**
1	MPL401S	Journal Club	1	1
2	MPL402P	Research Work	16	31
3	MPL403S	Discussion / Final Presentation	3	3
		TOTAL	**20**	**35**

Pharmaceutics

Programme Educational Objectives (PEO)

PEO1: To produce pharmacy graduates with profound knowledge and high technical skills to meet various aspects in wide areas of pharmaceutical industry.

PEO2: Pharmacy graduates will be able to gain theoretical and practical knowledge in various subjects to discover novel formulation for the benefits of society.

PEO3: Graduates will be able to become entrepreneur in Pharma sector with effective communication skill, teamwork and ethical attitude and high integrity for the betterment of society and community.

PEO4: To promote and train the students towards contribution of health care system and patient counselling for prevention and treatment of diseases.

PEO5: To encourage the students for lifelong learning process for and highly competent carrier prospect related to interdisciplinary pharmaceutical sciences.

Programme Outcomes (PO)

The entire curriculum of M. Pharmacy is planned to have following Programme outcomes

PO1 Possess the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioural, social, and administrative pharmacy sciences; regulatory and manufacturing practices

PO2 Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO3 Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

PO4 Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyse, evaluate and apply information systematically and shall make defensible decisions.

PO5 Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

PO6 Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

PO7 Understand, analyse and communicate the value of their professional roles in society (e.g., health care professionals, promoters of health, educators, managers, employers, employees).

PO8 Understand and consider the human reaction to change, motivation issues, leadership and team building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

PO9 Learn selects, and applies appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

PO10 Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO11 Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Programme Specific Outcomes (PSO)

After completion of the program students are able:

PSO 1: To successfully apply fundamental principles of pharmaceutics in developing entrepreneurial expertise and solving formulation related problems.
PSO 2: To work competently in various areas of pharmaceutical industry and research
PSO 3: To work effectively and ethically in their professional environment
PSO 4: Seek constant improvement and develop new skills to enhance the state of their pharmaceutical practice.
PSO 5:To utilize the soft skills as a part of team in the professional endeavour.
PSO6: To acquire knowledge and skills to work in various aspects of pharmaceutical Industries such as drug regulatory affairs, Analytical R&D, Medical writing.

TWO YEAR M. PHARMA PROGRAMME AT A GLANCE
(PHARMACEUTICS)

	Semester I	Semester II	Semester III	Semester IV	Total
Courses	**6**	**6**	**4**	**3**	**19**
Credits	**26**	**26**	**21**	**20**	**93**

M. Pharmaceutics

Sem-I

MPH 101T	**Modern Pharmaceutical Analytical Techniques (Theory)**	**L**	**T**	**P**	**C**
Version 2.0		4	0	0	4
Total Contact Hours	60 Hrs.				
Pre-requisites/Exposure	Organic chemistry-III				
Co-requisites	Analytical chemistry				
Course Objectives					
Upon completion of this course the student should be able to:					

1. Study of various advanced analytical instrumental techniques
2. Identification, characterization and quantification of drugs by various techniques
3. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:
CO1: Theory and practical knowledge of UV spectrophotometer
CO2: The analysis of various drugs in single and combination dosage forms by various spectroscopic and chromatographic techniques.
CO3: Understanding NMR and Mass spectroscopy.
CO4: Theoretical and practical skills of the instruments.
CO5: Immunological assays

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	**3**		**2**	**1**	**2**		**3**		**2**		**3**	**1**		**2**	**2**		1
CO2	**2**	**1**		**3**	**2**	**1**		**1**	**2**	**1**		**1**		**1**	**2**	**1**	1
CO3	**3**	**2**	**1**		**1**	**2**	**1**					**1**	**2**	**2**	**1**	1	
CO4	**2**				**3**	**2**	**1**		**1**	**2**	**1**						
CO5	**3**	**2**	**1**		**1**	**2**	**1**		**3**	**2**	**1**	**1**	**2**	**1**		**2**	**1**

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPH 102T	**Drug Delivery system (Theory)**	**L**	**T**	**P**	**C**
Version 2.0		4	0	0	4
Total Contact Hours	60 Hrs.				
Pre-requisites/Exposure	Pharmaceutics				

Co-requisites	Novel Drug Delivery Systems

Course Objectives

Upon completion of this course the student should be able to:

1. The various approaches for development of novel drug delivery systems.
2. The criteria for selection of drugs and polymers for the development of delivering system.
3. The formulation and evaluation of Novel drug delivery systems.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

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.
CO4: Knowledge of peptide-based delivery system.
CO5: Knowledge of vaccine delivery system.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**		**1**	**2**		**2**	**2**	**1**	**2**	**1**		**2**	**2**	**1**	**3**	
CO2		**1**	**2**		**2**	**2**	**1**	**1**	**1**			**2**	**1**	**3**			
CO3	**2**	**2**		**1**	**2**	**2**	**1**	**2**			**1**	**2**	**3**		**2**	**1**	1
CO4	**1**	**2**	**2**	**1**	**2**			**1**	**2**	**2**	**3**		**2**	**2**	**1**	**3**	
CO5			**1**	**2**	**2**				**1**	**2**							

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPH 103T	**Modern Pharmaceutics (Theory)**	**L**	**T**	**P**	**C**
Version 2.0		4	0	0	4
Total Contact Hours	60 Hrs.				
Pre-requisites/Exposure	Industrial Pharmaceutics				

Co-requisites	Drug Delivery Systems

Course Objectives

Upon completion of this course the student should be able to:
The elements of Preformulation studies.
1. The Active Pharmaceutical Ingredients and Generic drug Product development
2. Industrial Management and GMP Considerations.
3. Optimization Techniques & Pilot Plant Scale Up Techniques
4. Stability Testing, sterilization process & packaging of dosage forms.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:
CO1. The elements of preformulation studies.
CO 2. The Active Pharmaceutical Ingredients and Generic drug Product development
CO 3. About Industrial Management and GMP Considerations.
CO 4. Optimization Techniques & Pilot Plant Scale Up Techniques
CO 5. Stability Testing, sterilization process & packaging of dosage forms

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**1**	**2**	**2**	**1**		**1**	**2**		**1**	**2**						
CO2	**2**	**1**		**1**	**2**		**1**			**1**		**2**		**1**			
CO3	**1**	**1**	**3**	**2**	**1**		**1**	**2**		**1**							
CO4	**3**		**3**	**2**	**1**		**1**	**2**		**1**	**3**	**1**		**1**	**2**		**1**
CO5	**1**	**3**	**2**	**1**		**1**	**2**		**3**	**2**	**1**	**1**	**2**		**1**	**3**	

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPH 104T	**Regulatory Affairs (Theory)**	**L**	**T**	**P**	**C**
Version 1.0		4	0	0	4

Total Contact Hours	60 Hrs.
Pre-requisites/Exposure	Pharmaceutics
Co-requisites	Regulatory Affairs

Course Objectives

Upon completion of this course the student should be able to:

The elements of Preformulation studies.

1. Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development
2. Various regulatory filings in different countries, different phases of clinical trials and submitting regulatory documents : filing process of IND, NDA and ANDA
3. To know the chemistry, manufacturing controls and their regulatory importance

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

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 indifferent countries
CO4: Post approval regulatory requirements for actives and drug products
CO5: Submission of global documents in CTD/ eCTD formats

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**1**	**2**	**1**		**2**		**1**	**2**		**1**	**3**	**2**		**2**	**1**	1
CO2	**2**	**1**		**2**		**1**	**2**	**1**		**2**		**2**		**1**			
CO3	**1**					**2**	**1**		**2**		**1**		**1**		**2**		
CO4	**2**		**2**	**1**		**2**		**1**	**2**		**1**						1
CO5	**3**							**2**	**1**		**2**	**1**	**2**		**1**		

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPH 105P	Pharmaceutics Practical	L	T	P	C
Version 1.0		0	0	12	6
Total Contact Hours	180 Hrs.				
Pre-requisites/Exposure	Pharmaceutics				
Co-requisites	Novel Drug Delivery Systems				

Course Objectives

Upon completion of this course the student should be able to:

1. To impart practical knowledge about various analytical techniques and formulation and evaluation of various dosage formulations.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: Working of UV, HPLC and chromatographic techniques
CO2: Estimations of formulations by UV and HPLC methods
CO3: Estimation of drugs by fluorimetry and other spectrophotometric drugs.
CO4: Pre formulation studies and dissolution studies of various formulations.
CO5: Formulations and evaluation of various dosage forms

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	3		2	1		2		1	1	1	2	2	2	1	1	2	
CO2	1		2		1	1	1		2		1	1	2		2	2	
CO3	2	1		2		1	1	1	2		2						
CO4	2							1		2		1	1	2		2	2
CO5		2		1	1	1	2		2								

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Sem –II

MPH 201T	**Molecular Pharmaceutics (Nanotechnology & Targeted Drug Delivery Systems; NTDS) Theory**	**L**	**T**	**P**	**C**
Version 1.0		4	0	0	4
Total Contact Hours	60 Hrs.				
Pre-requisites/Exposure	Pharmaceutics				
Co-requisites	Novel Drug Delivery Systems				
Course Objectives					
Upon completion of this course the student should be able to: 1. The various approaches for development of novel drug delivery systems. 2. The criteria for selection of drugs and polymers for the development of NTDS 3. The formulation and evaluation of novel drug delivery systems.					
Course Outcomes (CO)					

On completion of this course, the student-teacher will be able to:
CO1: This subject is designed to impart fundamental knowledge on the formulation of NTDS.
CO2: It also helps in understanding events and biological process involved in drug targeting.
CO3: The subject also aims at imparting knowledge on the evaluation parameters of these drug delivery systems.
CO4: This course is also designed to impart knowledge on the area of advances in novel drug delivery systems.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1								**1**									
CO2			**1**														
CO3											**3**						
CO4					**2**				**2**						**2**		

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPH 202T	**ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS (Theory)**	**L**	**T**	**P**	**C**
Version 1.0		4	0	0	4
Total Contact Hours	60 Hrs.				
Pre-requisites/Exposure	Biopharmaceutics and Pharmacokinetics				
Co-requisites	Clinical Pharmacokinetics				

Course Objectives

Upon completion of this course the student should be able to:

1. The basic concepts in biopharmaceutics and pharmacokinetics.
2. The use raw data and derive the pharmacokinetic models and parameters that best describe the process of drug absorption, distribution, metabolism and elimination.
3. The critical evaluation of biopharmaceutic studies involving drug product equivalency.

4. The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
5. The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO 1. The course gives fundamental learning of basic theoretical discussions of the principles of biopharmaceutics and pharmacokinetics.

CO 2. This course is designed to impart knowledge and skills necessary for dose calculations and dose adjustments and to apply the same to biopharmaceutics theories in practical problem solving.

CO 3. The subject aims at applying biopharmaceutical considerations in drug product designing, thereby predicting its in-vitro behavior.

CO 4. The subject offers to develop an understanding of drug-product performance in vivo, and in-vitro and in-vivo correlation.

CO 5. The course offers to provide knowledge on the pharmacokinetics and pharmacodynamics of biotechnology drugs.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2		2	1		3	1		2		1	2	1		1	2	1
CO2	2	3	1		2	3	1		2	3	1	2	3	1		2	
CO3	2	1		3	1		2	3	1		2						
CO4	1	3	1		2	3	1		3	1		3	1		2	1	
CO5	3	2	1		1		2	1					2	1			

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPH 203T	Computer Aided Drug Development (Theory)	L	T	P	C
Version 1.0		4	0	0	4
Total Contact Hours	60 Hrs.				
Pre-requisites/Exposure	Applications of computers in pharmacy				
Co-requisites					

Course Objectives

Upon completion of this course the student should be able to:

1. History of Computers in Pharmaceutical Research and Development
2. Computational Modelling of Drug Disposition
3. Computers in Preclinical Development
4. Optimization Techniques in Pharmaceutical Formulation
5. Computers in Market Analysis
6. Computers in Clinical Development
7. Artificial Intelligence (AI) and Robotics
8. Computational fluid dynamics (CFD)

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO 1. The course offers to provide knowledge on history of computers in pharmaceutical research.
CO2. The course gives fundamental learning of basic computer skills required in pharmaceutical research and drug development.
CO 3. This course is designed to impart knowledge on the principles of informatics as applicable to the drug development process.
CO 4. The subject aims at imparting knowledge on computational modelling, and computer aided biopharmaceutical characterization.
CO 5. The subject offers to develop an understanding of drug-product performance in vivo, and in-vitro and in-vivo correlation using computer softwares.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**		**1**	**2**		**3**	**2**		**1**	**1**	**2**	**1**	**3**		**1**	2
CO2	**2**	**1**	**2**		**3**	**2**		**1**	**1**			**2**		**2**	**1**		1
CO3	**1**	**2**		**3**	**2**		**1**	**1**			**1**		**3**	**2**		**1**	**1**
CO4	**3**	**1**	**2**		**3**	**2**		**1**	**1**	**1**	**2**	**3**	**2**		**1**	**1**	
CO5	**2**		**1**	**2**		**3**	**2**		**1**	**1**		**2**		**1**	**1**		2

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPH 204T	Cosmetics And Cosmoceuticals- (Theory)	L	T	P	C
Version 1.0		4	0	0	4
Total Contact Hours	60 Hrs.				
Pre-requisites/Exposure	Pharmaceutics				
Co-requisites	Cosmeceuticals				

Course Objectives

Upon completion of this course the student should be able to:
Upon completion of this course the student should be able to
1. Key ingredients used in cosmetics and cosmeceuticals.
2. Key building blocks for various formulations.
3. Current technologies in the market
4. Various key ingredients and basic science to develop cosmetics and cosmoceuticals
5. Scientific knowledge to develop cosmetics and cosmoceuticals with desired Safety, stability, and efficacy.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:
CO1: The course offers to provide knowledge on the Indian and global regulatory requirements for labeling, manufacture, import of cosmetics.
CO2: The course provides to impart knowledge on structure of hair, skin and pathophysiology behind related problems.
CO3: The subject provides fundamentals of formulation of cosmetics.
CO4: The subject offers to develop an understanding of the controversial ingredients and perfumes used in cosmetics.
CO5: The course offers to provide information on the antimicrobials used in cosmetics and their efficacy.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	3		2		1	2	1		2	2	2		1	1	2
CO2	2		1	2	1		2		2	2		1	2				
CO3	3	2			2		1	2	1		2	2	2		1	1	2
CO4	3	1		3			2		1	2	1	2		2	2		1
CO5	1	1			2		1	2	1		2	2	2		1	1	2

1=lightly mapped 2= moderately mapped 3=strongly mapped

1 2

MPH 205P	Pharmaceutical Practical-II	L	T	P	C
Version 1.0		0	0	12	6
Total Contact Hours	180 Hrs.				
Pre-requisites/Exposure	Pharmaceutics Practical - II				
Co-requisites	Novel Drug Delivery Systems				

Course Objectives

Upon completion of this course the student should be able to:

1. To understand the basic components of cosmetics' formulation and their evaluation parameters.
2. To get basic understanding of related formulation optimization softwares.
3. To formulate controlled drug delivery systems.
4. To get well versed with calculations related to drug pharmacokinetics

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO 1. The course offers to provide hands on experience on formulation and evaluation of cosmetics.

CO 2. The course provides to impart necessary basic skills for usage of computer applications in pharmaceutical research.

CO 3. The subject provides learning of formulation data analysis Using Design Expert®

CO 4. The subject intends to provide skills needed to formulate the novel drug delivery systems.

CO 5. The course offers to provide skills required to determine pharmacokinetic parameters and IVIVC.

Programme and Course Mapping																	
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PSO 1**	**PSO 2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**1**	**2**	**2**		**1**		**2**		**1**		**3**	**2**		**1**	**2**	1
CO2	**2**	**2**		**1**		**2**		**1**			**3**		**1**	**2**			
CO3	**3**		**2**	**2**		**1**		**2**		**2**		**3**	**2**		**1**	**2**	
CO4	**3**	**2**	**2**		**1**		**2**		**1**			**2**		**1**	**2**		1
CO5	**2**	**2**		**2**		**2**		**12**			**3**		**1**	**2**			1
1=lightly mapped 2= moderately mapped 3=strongly mapped																	

Sem-III

MRM101T	**Research Methodology and Biostatistics**	**L**	**T**	**P**	**C**
Version 2.0		**4**	**0**	**0**	**4**
Total Contact Hours	60				
Pre-requisites/Exposure	Biostatistics & clinical Regulatory				
Co-requisites	Biostatistics				

Course Objectives

Upon completion of this course the student should be able to:

1. To impart undergraduate, post graduate and doctoral education in identified areas of higher education.
2. To undertake research programmes with industrial interface.
3. To integrate its growth with the global needs and expectations of the major stake holders through teaching, research,
4. Exchange & collaborative programmes with foreign, Indian Universities/Institutions and MNCs.
5. To act as a nodal center for transfer of technology to the industry.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: To recall the concepts of research methodology which includes study design, type of studies, stratifies and different design techniques.

CO2: To infer the data using biostatistics technique like “t” test, ANOVA and chi square tests as well as recognize the importance of samples size and its significances.

CO3: To learn the history of medical research for understanding the values of clinical ethics as well as its importance in communication and sociological relationships.

CO4: To explain the CPCSEA guidelines for laboratory animal facilities which include handling, maintenance, record keeping and transportation of lab animals.

CO5: To discuss the history and basic principles of Declaration of Helsinki for medical research.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	3	2			1				1			1		
CO2		2	2	3	2	2			2			2	2	2	1		3
CO3	1		1	2				1	2	1	3			3		1	2
CO4	1				2									3			2
CO5	1		2			2			1						1		2

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPH 302S	Journal club (Presentation) - 15hrs	L	T	P	C
Version 1.0		0	0	0	1
Total Contact Hours	--				
Pre-requisites/Exposure	Pharmaceutics				
Co-requisites	Pharmaceutics				

MPH 303S	Discussion/ Presentation	L	T	P	C
Version 1.0		0	0	0	2
Total Contact Hours	--				
Pre-requisites/Exposure	Pharmaceutics				
Co-requisites	Pharmaceutics				

MPH 304P	Research Work	L	T	P	C
Version 1.0		0	0	28	14
Total Contact Hours	--				
Pre-requisites/Exposure	Pharmaceutics				

Co-requisites	Pharmaceutics

Sem-IV

MPH 401S	**Journal club (Presentation)**	**L**	**T**	**P**	**C**
Version 1.0		0	0	0	1
Total Contact Hours	--				
Pre-requisites/Exposure	Pharmaceutics				
Co-requisites	Pharmaceutics				

MPH 402P	**Research Work (Practical)**	**L**	**T**	**P**	**C**
Version 1.0		0	0	31	16
Total Contact Hours	--				
Pre-requisites/Exposure	Pharmaceutics				
Co-requisites	Pharmaceutics				

MPH 403S	Discussion/ Presentation	L	T	P	C
Version 1.0		0	0	0	3
Total Contact Hours	--				
Pre-requisites/Exposure	Pharmaceutics				
Co-requisites	Pharmaceutics				

Pharmacology

Programme Educational Objectives (PEO)

PEO1: To produce pharmacy graduates with profound knowledge and high technical skills to meet various aspects in wide areas of pharmaceutical industry.

PEO2: Pharmacy graduates will be able to gain theoretical and practical knowledge in various subjects to discover novel formulation for the benefits of society.

PEO3: Graduates will be able to become entrepreneur in Pharma sector with effective communication skill, teamwork and ethical attitude and high integrity for the betterment of society and community.

PEO4: To promote and train the students towards contribution of health care system and patient counselling for prevention and treatment of diseases.

PEO5: To encourage the students for lifelong learning process for and highly competent carrier prospect related to interdisciplinary pharmaceutical sciences.

Programme Outcomes (PO)

The entire curriculum of M. Pharmacy is planned to have following Programme outcomes

PO1: Possess the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioural, social, and administrative pharmacy sciences; regulatory and manufacturing practices

PO2: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO3: Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

PO4: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyse, evaluate and apply information systematically and shall make defensible decisions.

PO5: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

PO6: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

PO7: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

PO8: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

PO9: Learn select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

PO10: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of,

and need for sustainable development.

PO11: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Programme Specific Outcomes (PSO)

PSO1: Relate the acquired scientific information and principles of pharmacokinetics and pharmacodynamics in drug discovery process.
PSO2: Interpret data of pharmaceutical experiments in drug discovery as per the needs of pharmaceutical industries.
PSO3: To apply knowledge of drug action into various stages in preclinical and clinical research studies
PSO4: To acquire skills required for various aspects of pharmaceutical Industries, including good manufacturing practice, good documentation practices, good laboratory practices and good clinical practices.
PSO5: To identify and resolve the research problems by utilizing the technical skill gained through training and experimentation.
PSO6: To utilize the soft skills as a part of team in the professional endeavour.

TWO YEAR M. PHARM PROGRAMME AT A GLANCE (PHARMACOLOGY)

	Semester I	Semester II	Semester III	Semester IV	Total
Courses	6	6	4	3	19
Credits	26	26	21	20	93

Semester-I

MPL 101T	Modern Pharmaceutical Analytical Techniques	L	T	P	C
Version 2.0		4	0	0	4
Total Contact Hours	60 Hrs				
Pre-requisites/Exposure	Organic Chemistry-III				
Co-requisites	Analytical Chemistry				

Course Objectives

Upon completion of this course the student should be able to:

1. Study of various advanced analytical instrumental techniques
2. Identification, characterization, and quantification of drugs by various techniques
3. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: Theory and practical knowledge of UV spectrophotometer
CO2: The analysis of various drugs in single and combination dosage forms by various spectroscopic and chromatographic techniques.
CO3: Understanding NMR and Mass spectroscopy.
CO4: Theoretical and practical skills of the instruments.
CO5: Immunological assays

Programme and Course Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO 3	PSO4	PSO5	PSO6
CO1	2	1	1	3	2	2	1	2	3	2	1	2	1	3	3	1	2
CO2	3	2		1	3	2	2	1	2	2	3	3	2	2	3	1	3
CO3	1		1	2	2	1	1	2	2	1	2	3	3	2	1	2	1
CO4	2	2	2	1	1	2		2	1	2	1	3	1	2	3	2	1
CO5	3	1	1	2	3	2	1	1	3	1	2	2	3	2	1	3	1

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPL 102T	Advanced Pharmacology-I (Theory)	L	T	P	C
Version 2.0		4	0	0	4
Total Contact Hours	60 Hrs				
Pre-requisites/Exposure	Pharmacology-I				
Co-requisites	Human Anatomy and Physiology -I				

Course Objectives

Upon completion of this course the student should be able to:

1. Discuss the pathophysiology and pharmacotherapy of certain diseases
2. Explain the mechanism of drug actions at cellular and molecular level
3. Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases.
CO2: In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved
CO3: Explain the various types of neurotransmitters and their receptors
CO4: It gives information about the CNS disorders and drugs used for their treatment
CO5: Explain the role of autacoid's and their pharmacology.

Programme and Course Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	3	2	2	3	3	3	3	1	2	1	3	3	1	2
CO2	3	2	1	2	1	2	2	1	2	3	2	3	2	2	3	1	3

CO3	3	1		2		1	3	2	3	2	1	3	3	2	1	2	1
CO4	2	1		1	2		2	2	1	2	3	3	1	2	3	2	1
CO5	3	1	1	2	1	2	2	1	2	1	2	2	3	2	1	3	1
1=lightly mapped 2= moderately mapped 3=strongly mapped																	

MPL 103T	**Pharmacological and Toxicological Screening Methods -I**	**L**	**T**	**P**	**C**
Version 2.0		**4**	**0**	**0**	**4**
Total Contact Hours	60 Hrs				
Pre-requisites/Exposure	Pharmacological and Toxicological Screening Methods -I				
Co-requisites	Fundamentals of Pharmacology, Drug Discovery				

Course Objectives

Upon completion of this course the student should be able to:

1. Upon completion of the course the student shall be able to,
2. Appraise the regulations and ethical requirement for the usage of experimental animals.
3. Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals
4. Describe the various newer screening methods involved in the drug discovery process
5. Appreciate and correlate the preclinical data to humans

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: This subject is designed to impart the knowledge on preclinical evaluation of drugs.
CO2: It focuses on recent experimental techniques in the drug discovery and development.
CO3: The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines,

CO4: Imparts basic knowledge of various in-vitro and in-vivo preclinical evaluation processes

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	1	3	2	2	1	1	3	2	1	2	1	3	3	1	2
CO2	3	2	2	2	1	1	2	3	1	1	2	3	2	2	3	1	3
CO3		2	3	2		3	2	1	2	3	3	3	3	2	1	2	1
CO4	1	3	2	3	2		3	2	1	1	1	3	1	2	3	2	1

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPL 104T	**Cellular and Molecular Pharmacology**	**L**	**T**	**P**	**C**
Version 2.0		**4**	**0**	**0**	**4**
Total Contact Hours	60 Hrs				
Pre-requisites/Exposure	Pharmacology-I, II, III				
Co-requisites	Human anatomy and Physiology -I				

Course Objectives

Upon completion of this course the student should be able to:

1. Explain the receptor signal transduction processes.
2. Explain the molecular pathways affected by drugs.
3. Appreciate the applicability of molecular pharmacology and
4. Biomarkers in drug discovery process.
5. Demonstrate molecular biology techniques as applicable for pharmacology

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs.
CO2: The subject also designed to impart knowledge about the various cell death pathways.
CO3: It helps in detail understanding of molecular biology techniques like western blotting and PCR
CO4: The students will be able to understand about the cell culture techniques.
CO5: This information will further help the student to apply the knowledge in drug discovery

Programme and Course Mapping

CO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO1 1	PS O 1	PS O 2	PSO3	PSO 4	PSO 5	PSO 6
CO1	2	1	1	3	2	2	1	2	3	2	1	2	1	3	3	1	2
CO2	3	2	2	1	3	1	2	1	2	1	3	3	2	2	3	1	3
CO3	1	2	3	2	2	1		3	1	3	2	3	3	2	1	2	1
CO4	1	3	1	1	3	3	2		2	2	2	3	1	2	3	2	1
CO5	3	1	2	3	1	2	2	1	3	1	1	2	3	2	1	3	1

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPL 105P	**Pharmacology Practical -I**	**L**	**T**	**P**	**C**
Version 2.0		**0**	**0**	**12**	**6**
Total Contact Hours	180 Hrs				
Pre-requisites/Exposure	Pharmacology Practical -I				
Co-requisites	Human Anatomy and Physiology -I				

Course Objectives

Upon completion of this course the student should be able to:

1. Analysis of pharmacopeial compounds and their formulations by UV Vis
2. spectrophotometer
3. Simultaneous estimation of multi component containing formulations by UV
4. spectrophotometry

5. Experiments based on HPLC
6. Experiments based on Gas Chromatography
7. Estimation of riboflavin/quinine sulphate by fluorimetry
8. Estimation of sodium/potassium by flame photometry
9. Handling of laboratory animals.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: This subject is designed to impart fundamental knowledge about the pharmacological experiments, animal's handlings and about different animals used in the experimental pharmacology.
CO2: It imparts the practical knowledge on molecular biology techniques
CO3: It helps the students to learn about different roots drug administration and methods of blood withdrawal
CO4: The subject also designed to impart knowledge about the regulatory bodies governing experiments on animals like CPCSEA.

Programme and Course Mapping

CO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PS O 1	PS O 2	PSO 3	PSO 4	PSO5	PSO 6
CO1	2	1	1	3	2	2	1	2	3	2	1	2	1	3	3	1	2
CO2	3	2	2	1	1	1	2	2	2	3	2	3	2	2	3	1	3
CO3	2	3	1	3	2	3	1	1	2	3	2	3	3	2	1	2	1
CO4	1	2	3	2	2	1	2	3	1	2	3	3	1	2	3	2	1

1=lightly mapped 2= moderately mapped 3=strongly mapped

Semester-II

MPL 201T	**Advanced Pharmacology-II (Theory)**	**L**	**T**	**P**	**C**
Version 2.0		**4**	**0**	**0**	**4**
Total Contact Hours	60 Hrs				
Pre-requisites/Exposure	Advanced Pharmacology -I				

Co-requisites	Cellular and Molecular Pharmacology

Course Objectives

Upon completion of this course the student should be able to:

1. Explain the mechanism of drug actions at cellular and molecular level
2. Discuss the Pathophysiology and pharmacotherapy of certain diseases
3. Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases.
CO2: In addition, the subject helps the student to understand the concepts of drug action and mechanism involved.
CO3: This subject provides the knowledge of endocrine pharmacology, chemotherapy, antibiotics, and immunology.
CO4: Student can understand the diseases like Parkinsonism, cancer, Alzheimer, diabetes mellitus and its treatment.
CO5: It also deals with the free radical pharmacology, its etiology and pathophysiology in various neurodegenerative diseases

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	1	3	2	2	1	2	3	2	1	2	1	3	3	1	2
CO2	3	2		1	3	2	2	1	2	2	3	3	2	2	3	1	3
CO3	1		1	2	2	1	1	2	2	1	2	3	3	2	1	2	1
CO4	2	2	2	1	1	2		2	1	2	1	3	1	2	3	2	1
CO5	3	1	1	2	3	2	1	1	3	1	2	2	3	2	1	3	1

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPL 202T	PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-II (Theory)	L	T	P	C
Version 2.0		4	0	0	4
Total Contact Hours	60 Hrs				
Pre-requisites/Exposure	Pharmacological and Toxicological Screening Methods -I				
Co-requisites	Fundamentals of Pharmacology, Drug Discovery				

Course Objectives

Upon completion of this course the student should be able to:

1. Explain the various types of toxicity studies.
2. Appreciate the importance of ethical and regulatory requirements for toxicity studies.
3. Demonstrate the practical skills required to conduct the preclinical toxicity studies

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: This subject imparts knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity.
CO2: This knowledge will make the student competent in regulatory toxicological evaluation.
CO3: It deals with animal models used for pre-clinical studies of various diseases and involves the ethical issues related with the animals.
CO4: Students will also study about the various guidelines for safety use of animals during experimentation.
CO5: It also enlightens the students about filing the IND application to FDA for the approval of pre-clinical data submitted.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	1	3	2	2	1	1	3	2	1	2	1	3	3	1	2
CO2	3	2	2	2	1	1	2	3	1	1	2	3	2	2	3	1	3
CO3		2	3	2		3	2	1	2	3	3	3	3	2	1	2	1
CO4	1	3	2	3	2		3	2	1	1	1	3	1	2	3	2	1

CO5	**2**	**3**	**3**	**2**		**3**	**1**		**3**	**2**		**2**	**3**	**2**	**1**	**3**	1
1=lightly mapped 2= moderately mapped 3=strongly mapped																	

MPL 203T	**Principles of Drug Discovery**	**L**	**T**	**P**	**C**
Version 2.0		**4**	**0**	**0**	**4**
Total Contact Hours	60 Hrs				
Pre-requisites/Exposure	Medicinal Chemistry -III				
Co-requisites	Basic Chemistry				

Course Objectives

Upon completion of this course the student should be able to:

1. Explain the various stages of drug discovery.
2. Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
3. Explain various targets for drug discovery.
4. Explain various lead seeking method and lead optimization
5. Appreciate the importance of the role of computer aided drug design in drug discovery

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: The subject imparts basic knowledge of drug discovery process. This information will make the student competent in drug discovery process.
CO2: It enlightens the students about the lead identification, target identification, target validation, molecular docking, QSAR.
CO3: It also deals with the Role of Genomics, Proteomics and Bioinformatics in drug discovery system.
CO4: It deals with the combinatorial chemistry and high throughput screening, assay development in detection of various lead components like proteins
CO5: It gives the knowledge about the rational drug design development, virtual screening technique. Also provides the knowledge about

the rigid docking, flexible docking, de novo drug design and 3D-QSAR approaches like COMFA and COMSIA, Prodrug design-Basic concept, Prod rugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site, specific drug delivery and sustained drug action.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	1	3	2	2	1	2	3	2	1	2	1	3	3	1	2
CO2	3	2	2	1	3	1	2	1	2	1	3	3	2	2	3	1	3
CO3	1	2	3	2	2	1		3	1	3	2	3	3	2	1	2	1
CO4	1	3	1	1	3	3	2		2	2	2	3	1	2	3	2	1
CO5	3	1	2	3	1	2	2	1	3	1	1	2	3	2	1	3	1

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPL 204T	**Clinical Research and Pharmacovigilance (Theory)**	**L**	**T**	**P**	**C**
Version 2.0		**4**	**0**	**0**	**4**
Total Contact Hours	60 Hrs				
Pre-requisites/Exposure	Pharmacology, Drug Discovery				
Co-requisites	Fundamental of Pharmacology, Drug Regulatory Affairs, Drug Discovery				

Course Objectives

Upon completion of this course the student should be able to:

1. Explain the regulatory requirements for conducting clinical trial
2. Demonstrate the types of clinical trial designs
3. Explain the responsibilities of key players involved in clinical trials
4. Execute safety monitoring, reporting and close-out activities
5. Explain the principles of Pharmacovigilance
6. Detect new adverse drug reactions and their assessment

7. Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance.
CO2: It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials.
CO3: This subject also focuses on global scenario of Pharmacovigilance in different methods that can be used to generate safety data.
CO4: It will teach the students in developing drug safety data in Pre-clinical, Clinical phases of Drug development and post market surveillance
CO5: It enlightens the students about the ethics and the guidelines regarding the safety of human beings and animals during the trials, also deals with the responsibilities and role of various members of clinical research team.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	3	2	2	2	2	3	2	1	2	1	3	3	3	2
CO2	3	2	2	3	1	1	2	2	2	3	2	3	2	2	3	1	3
CO3	2	3	1	3	2	3	1	2	3	3	2	3	3	2	1	2	1
CO4	1	2	3	2	2	3	2	3	1	2	3	3	1	2	3	2	2
CO5	3	1	2	1	1	2	2	2	2	2	1	2	3	3	1	3	1

1=lightly mapped 2= moderately mapped 3=strongly mapped

MPL 205P	**Pharmacology Practical -II (Practical)**	**L**	**T**	**P**	**C**
Version 2.0		**0**	**0**	**12**	**6**
Total Contact Hours	180 Hrs				
Pre-requisites/Exposure	Pharmacology Practical-I				
Co-requisites	Human Anatomy and Physiology -II				

Course Objectives

Upon completion of this course the student should be able to:

1. Calculate the PA_2 values and demonstrate the DRC.
2. Appreciate the importance of ethical and regulatory requirements for animal studies.
3. Demonstrate the practical skills required to conduct the preclinical toxicity studies.
4. Record the various physiological parameters (BP, ECG, Heart rate) of animals.
5. Conduct the bioassay and standardization of drug.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: This subject imparts knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity.
CO2: It deals with animal models used for pre-clinical studies and involves the ethical issues related with the animals.
CO3: Students will also study about the various guidelines for safety use of animals during experimentation.
C04: It involves the determination of various bioassays, estimation of PA_2 value, and various toxicological studies.
C05: It also deals with the ADR reporting, drug mutagenicity studies, protocol design, QSAR studies.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	3	2	2	2	2	3	2	1	2	1	3	3	3	2
CO2	3	2	2	3	1	1	2	2	2	3	2	3	2	2	3	1	3
CO3	2	3	1	3	2	2	1	2	2	2	2	3	3	2	1	2	1
CO4	1	2	3	2	2	3	2	3	1	2	3	3	1	2	3	2	2
CO5	3	1	2	1	1	2	2	2	2	2	1	2	3	3	1	3	1

1=lightly mapped 2= moderately mapped 3=strongly mapped

Semester-III

MRM101T	Research Methodology and Biostatistics	L	T	P	C
Version 2.0		4	0	0	4
Total Contact Hours	60 hrs				
Pre-requisites/Exposure	Biostatistics & clinical Regulatory				
Co-requisites	Biostatistics & clinical Regulatory -				

Course Objectives

Upon completion of this course the student should be able to:

1. To impart undergraduate, post graduate and doctoral education in identified areas of higher education.
2. To undertake research programmes with industrial interface.
3. To integrate its growth with the global needs and expectations of the major stake holders through teaching, research, Exchange & collaborative programmes with foreign, Indian Universities/Institutions and MNCs.
4. To act as a nodal center for transfer of technology to the industry.
5. To provide job oriented professional education to the Indian student community with particular focus on Haryana.

Course Outcomes (CO)

On completion of this course, the student-teacher will be able to:

CO1: To recall the concepts of research methodology which includes study design, type of studies, stratifies and different design techniques.

CO2: To infer the data using biostatistics technique like "t" test, ANOVA and chi square tests as well as recognize the importance of samples size and its significances.

CO3: To learn the history of medical research for understanding the values of clinical ethics as well as its importance in communication and sociological relationships.

CO4: To explain the CPCSEA guidelines for laboratory animal facilities which include handling, maintenance, record keeping and transportation of lab animals.

CO5: To discuss the history and basic principles of Declaration of Helsinki for medical research.

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	3	2			1				1			1		

CO2		2	2	3	2	2			2			2	2	2	1		3
CO3	1		1	2				1	2	1	3			3		1	2
CO4	1				2									3			2
CO5	1		2			2			1						1		2
1=lightly mapped 2= moderately mapped 3=strongly mapped																	

MPL 302S	**Journal club**	**L**	**T**	**P**	**C**
Version 1.0	**Discussion/**	0	0	0	1
MPL3035	**Presentation**				
Total Contact Hours	-	**L**	**T**	**P**	**C**
Pre-requisites/Exposure	Pharmacology	0	0	0	2
Total Contact Hours1					
Co-requisites	-Pharmacology				
Pre-	Pharmacology				

requisites/Exposure	
Co-requisites	Pharmacology

MPL 304P	**Research Work**	**L**	**T**	**P**	**C**
Version 1.0		0	0	28	14
Total Contact Hours	-				
Pre-requisites/Exposure	Pharmacology				
Co-requisites	Pharmacology				

MPL 401S	Journal club (Presentation)	L	T	P	C
Version 1.0		0	0	0	1
Total Contact Hours	-				
Pre-requisites/Exposure	Pharmacology				
Co-requisites	Pharmacology				

MPL 402P	Research Work (Practical)	L	T	P	C
Version 1.0		0	0	31	16
Total Contact Hours	-				
Pre-requisites/Exposure	Pharmacology				
Co-requisites	Pharmacology				

MPL 403S	Discussion/ Presentation	L	T	P	C
Version 1.0		0	0	0	3
Total Contact Hours	-				
Pre-requisites/Exposure	Pharmacology				
Co-requisites	Pharmacology				