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

2022-2024

Approved in the 29th Meeting of Academic Council Held on 09 August 2022

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

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; behavioral, 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 behavior 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, analyze, 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 fulfillment 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)

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. PHARMACY 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 students 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																	

Unit	**Relevance to the local, national, regional and global developmental needs**	**Relevance To the Employability/ Entrepreneurship/ Skill Development**	**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**	**SDG**	**NEP**	**POE/4th IR**

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I	-	-	-	identification, characterization and quantification of drugs using UV-Visible spectroscopy, IR, Spectrofluorimet	-	-	Theoretical and practical skills of the instruments	-	-	Right Conduct, Truth – Contains values like accuracy, fairness, honesty, justice, quest for knowledge, determination.	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development

				ry and Flame emission spectroscopy and Atomic absorption spectroscopy										
Unit II		-	-	Identification, characterization and quantification of drug using NMR Spectroscopy.	-	-	The analysis of various drugs in single and combination dosage form, Theoretical and practical skills of the instruments	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development
Unit III		-	-	Identification, characterization and	-	-	Theoretical and practical skills of the instruments	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development

				quantification of drug using Mass Spectroscopy.										
Unit IV		-	-	Quantitative and Qualitative analysis of Drugs using Chromatographic techniques.	-	-	The analysis of various drugs in single and combination dosage form using Chromatographic techniques.	-	-	Right Conduct, accuracy, fairness, honesty, justice	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Employability
Unit v	-	-	-	Use of Electrophoresis in separation and Quantitative analysis of Drugs		-	Quantitative analysis of Drugs	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development, Employability

Unit-VI				Immunological assays in diagnosis of diseases, therapeutic drug monitoring, clinical pharmacokinetic and bioequivalence studies in drug discovery and pharmaceutical industries.			Develop skills for diagnosis of diseases, therapeutic drug monitoring, clinical pharmacokinetic and bioequivalence studies in drug discovery and pharmaceutical industries					Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development

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 students 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		2	2				1	2									

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

Unit	Relevance to the local, national, regional and global developmental needs				Relevance To the Employability/ Entrepreneurship/ Skill Development			Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability				SDG	NEP	POE/4th IR
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability		Professional Education (17.1-17.5)	Practical Courses from Industry/Alumni
Unit I				Global Heathcare Needs. It will bring revolution in the novel			It will increase the skill among the students for formulation of different sustained and	-	-	-	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Practical Courses from Industry/Alumni

				drug delivery systems by formulation of differed dosage forms			controlled release dosage forms							
Unit II		-	-	Global Health care Needs. Needs. It will bring revolution in the novel drug delivery systems by			It will increase the skill among the students for formulation of different sustained and controlled release dosage forms	-	-	-	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Practical Courses from Industry/Alumni

				formulation of differed dosage forms										
Unit III		-	-	Global Health care Needs.			Assignments and webinars	No	No	No	No	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Practical Courses from Industry/Alumni
Unit IV		-	-	Global Health care Needs. It will remove the problems associated			It will generate the skill of making the novel gastroretentive oral dosage forms for better patient complaiance.	-	-	-	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Practical Courses from Industry/Alumni

				with conventional dosage forms by formulation into newly gastroretentive drug dosage forms by various method.										
Unit v				Global Health care Needs. It will lead to formulation of			It will create the skill among the students to develop in the various industries which actually	-	-	-	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5	Practical Courses from Industry/Alumni

				transdermal drug products with lower side effects and toxicity and also eradicate the stability problems associated with many drugs.			are actively involved in making transdermal patches of those drugs which are highly bitter or unstable in the acidic media.						)	

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 students will be able to:
The various approaches for development of novel drug delivery systems.
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 students 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																		

Unit	**Relevance to the local, national, regional and global developmental needs**				**Relevance To the Employability/ Entrepreneurship/ Skill Development**		**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**				**SDG**	**NEP**	**POE/4th IR**
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit-I	-	-	-	the global needs for Unit-I topics revolve around ensuring access to safe, effective, and affordable medicines, promoting regulatory harmonization, and fostering global collaboration to address public health challenges worldwide.	Regulatory affairs expertise is highly valued in employability within the pharmaceutical and healthcare industries. Professionals in this field contribute to regulatory compliance, product development, global market access, risk assessment, post-market surveillance, effective communication, and strategic decision-			Regulatory affairs professionals can promote ethical conduct, maintain trust and credibility, and contribute to the responsible and effective regulation of pharmaceutical and healthcare products. Upholding professional ethics is essential for ensuring the safety, efficacy, and quality of regulated products and	-	-	-	SDG 3: The topics covered in Unit-I of the Pharmaceutical industry align with SDG 3 by addressing the need for accessible, affordable, and high-quality medicines to improve health outcomes and promote well-being worldwide.	Transforming the Regulatory System (20.1-	Skill Embedded Courses Developme

					making. By staying abreast of regulatory requirements and ensuring compliance, regulatory affairs professionals enhance the employability of organizations and contribute to the safe and successful commercialization of healthcare products.			fostering public confidence in regulatory processes.					20.15)	nt
Unit II	-	-	-	Overall, the global needs of Unit II encompass harmonization of regulations, standardization of submission formats, effective post-approval regulatory oversight, collaboration between industry and regulatory agencies, and the adoption and implementation of international guidelines. These needs aim to ensure the quality, safety, and efficacy of pharmaceutical products, enhance regulatory processes, and facilitate	Regulatory affairs expertise is highly valued in employability within the pharmaceutical and healthcare industries. Professionals in this field contribute to regulatory compliance, product development, global market access, risk assessment, post-market surveillance, effective communication, and strategic decision-making. By staying abreast of regulatory requirements and ensuring compliance, regulatory affairs professionals enhance the			Regulatory affairs professionals can promote ethical conduct, maintain trust and credibility, and contribute to the responsible and effective regulation of pharmaceutical and healthcare products. Upholding professional ethics is essential for ensuring the safety, efficacy, and quality of regulated products and fostering public confidence in regulatory processes.	-	-	-	SDG 3: Unit II of the Pharmaceutical industry align with SDG 3 by promoting the regulation, quality control, and proper use of pharmaceutical products, combination products, and medical devices. These efforts contribute to improving health outcomes, ensuring access to safe and effective healthcare interventions, and promoting overall well-being for individuals and communities.	Transforming the Regulatory System (20.1-20.15)	Skill Embedded Courses Development

				global access to safe and effective medicines and medical devices.	employability of organizations and contribute to the safe and successful commercialization of healthcare products.										
Unit III	-	-	-	Global needs of Unit III revolve around efficient global submission processes, comprehensive evaluation of non-clinical data, standardized preparation and submission of investigational product dossiers, and ensuring the safety and efficacy of new drugs. Harmonization of regulatory requirements, data transparency, and international collaboration play crucial roles in meeting these needs and facilitating the development of safe and effective medicines.	Regulatory affairs expertise is highly valued in employability within the pharmaceutical and healthcare industries. Professionals in this field contribute to regulatory compliance, product development, global market access, risk assessment, post-market surveillance, effective communication, and strategic decision-making. By staying abreast of regulatory requirements and ensuring compliance, regulatory affairs professionals enhance the employability of organizations and contribute to the safe and successful commercialization of			Regulatory affairs professionals can promote ethical conduct, maintain trust and credibility, and contribute to the responsible and effective regulation of pharmaceutical and healthcare products. Upholding professional ethics is essential for ensuring the safety, efficacy, and quality of regulated products and fostering public confidence in regulatory processes.	-	-	-	SDG 3: The topics covered in Unit-III of the Pharmaceutical industry align with SDG 3 by addressing the need for accessible, affordable, and high-quality medicines to improve health outcomes and promote well-being worldwide.	Transforming the Regulatory System (20.1-20.15)	Skill Embedded Courses Development

					healthcare products.									
Unit IV	-	-	-	Global needs of Unit IV encompass the development of robust clinical trial protocols, ethical review by IRBs/IECs, informed consent processes, adherence to HIPAA requirements, implementation of standardized clinical study processes, robust pharmacovigilance safety monitoring, data sharing and transparency, and training and capacity building initiatives. Addressing these needs ensures the ethical conduct of clinical trials, protection of participant rights, generation of reliable data, and the advancement of medical knowledge for the benefit of global healthcare.	Regulatory affairs expertise is highly valued in employability within the pharmaceutical and healthcare industries. Professionals in this field contribute to regulatory compliance, product development, global market access, risk assessment, post-market surveillance, effective communication, and strategic decision-making. By staying abreast of regulatory requirements and ensuring compliance, regulatory affairs professionals enhance the employability of organizations and contribute to the safe and successful commercialization of healthcare products.			Regulatory affairs professionals can promote ethical conduct, maintain trust and credibility, and contribute to the responsible and effective regulation of pharmaceutical and healthcare products. Upholding professional ethics is essential for ensuring the safety, efficacy, and quality of regulated products and fostering public confidence in regulatory processes.	-	-	-	SDG 3: The topics covered in Unit-IV of the Pharmaceutical industry align with SDG 3 by addressing the need for accessible, affordable, and high-quality medicines to improve health outcomes and promote well-being worldwide.	Transforming the Regulatory System (20.1-20.15)	Skill Embedded Courses Development

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:

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 students 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	1		2		2	1	2	2		2	2	2	2		2	2	

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

Unit	Relevance to the local, national, regional and global developmental needs				Relevance To the Employability/ Entrepreneurship/ Skill Development			Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability				SDG	NEP	POE/4th IR
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Analysis of pharmacopoeial compounds and their formulations	-	-	-	Helps in Quality Control Globally	-	-	Hands on training on various instruments	-	-	Right Conduct, Truth – Contains values like accuracy, fairness, honesty,	-	Skills for Decent Work (SDG 4.4) (To develop qualitative/quantitave instrumental anlytical skill for	Professional Education (17.1-17.5)	Skill Development

by UV Vis spectro photo meter										justice, quest for knowledge, determination.		future job)		
Simultaneous estimation of multi component containing formulations by UV spectro photo metry	-	-	-		-	-	Hands on training on various instruments	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4) (To develop qualitative/quantitave instrumental anlytical skill for future job	Professional Education (17.1-17.5)	Skill Development
Experiments based on HPLC	-	-	-		-	-	Hands on training on various instruments	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4) (To develop qualitative/quantitave instrumental anlytical	Professional Education (17.1-17.5)	Skill Development

												skill for future job		
4. Experiments based on Gas Chromatography	-	-	-		-	-	Hands on training on various instruments	-	-	Right Conduct, accuracy, fairness, honesty, justice	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Employability
5. Estimation of riboflavin/quinine sulphate by fluorimetry	-	-	-			-	Hands on training on various instruments	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development, Employability
Estimation of sodium/potassium by flame	-	-	-				Hands on training on various instruments			Right Conduct, accuracy, fairness,		Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development

photo metry										honesty, justice				
To perform In-vitro dissolution profile of CR/ SR marketed formulation	-	-	-									Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5) (The topic covered theoretical/ practical aspects of instrumen that helps in future job in pharmaceutical Anaysis)	"Skill Development: students learn through Problem solving /critical thinking, communication skill by working on projects / assignments /reports Employ

														bility Skill Embedded Courses Development"
Formulation and evaluation of sustained release matrix tablets	-	-	-										Professional Education (17.1-17.5) (The topic covered theoretical/ practical aspects of instrumen that helps in future job in pharmaceutical Anaysis)	Skill Development, Employbility
Formulation and evaluation osmoti														

cally controlled DDS														
Preparation and evaluation of Floating DDS-hydrodynamically balanced DDS												Ensure healthy lives & Promote well-being (Combat the epidemics like validation, CGMP, etc) SDG 3.3 Gender Equality and Equal Access for All (SDG 4.5) Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5) core concepts in Moderm pharmaceutics being taught Technology Use & Integration (23.1-23.13) Optimal Learning Environments and Support for Students (12.1-12.10) Transforming the Regulatory System (20.1-20.15)	"Skill Development: students learn through Problem solving /critical thinking, communication skill by working on projects / assignments /reports
Formulation and evaluation of Mucoadhesive tablets.	-	-	-											
Formulation and evaluat	-	-	-											

ion of transdermal patches.												Safe and Inclusive Learning Environments (SDG 4.a) (Students express their ideas, beliefs, requirements, and identities)		Employability Skill Embedded Courses Development"
To carry out preformulation studies of tablets.	-	-	-											
To study the effect of compressional force on tablets disintegration time.	-	-	-											
To study Micromeritic	-	-	-											

properties of powders and granulation.														
To study the effect of particle size on dissolution of a tablet.	-	-	-											
To study the effect of binders on dissolution of a tablet.	-	-	-											
To plot Heckal plot,	-	-	-											Skill Development

Higuchi and peppas plot and determine similarity factors.														

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 students 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**												**3**			
CO2											**3**						
CO3																	
CO4									**2**							**2**	

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

Unit	Relevance to the local, national, regional and global developmental needs	Relevance To the Employability/ Entrepreneurship/ Skill Development	Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability	SDG	NEP	POE/4th IR

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability		Professional Education (17.1-17.5)	Technical Skills that match Industry Needs
Unit I				Global Health care Needs. It will create revolution in the global heathcare services by targeting	It will generate different modules for emplomentsin	-	-	-	-	-	-	Ensure healthy lives and promote well-being for all at all ages	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				some drugs like anti cancer drugs etc for better therapeutic and target oriented delivery	the pharmaceutical industry dealing with anti cancer drug products							(SDG 3)		
Unit II				Global Health care Needs. It will create revolution in	It will generate different	-	-	-	-	-	-	Ensure healthy lives and promot	Professional Education (17.1-	Technical Skills that match Industry Needs

				the global heathcare services by targeting some drugs like anti cancer drugs etc for better therapeutic and target oriented delivery	modules for emplomentsin the pharmaceutical industry dealing with anti cancer drug products							e well-being for all at all ages (SDG 3)	17.5)	

Unit III				Global Heathcare Services. It will improve the drugs delivery through respiratory systems, to improve quality and delivery with respect to aerosols, propell	It will create employability drive among the candidates in the industries dealing with the drug	-	-	-	-	-	-	Ensure healthy lives and promote well-being for all at all ages (SDG 3)	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				ants and containers.	products for interventional respiratory disorders and diseaaes.									
Unit IV				Global Heathcare Services. It will improve the drugs deliver	It will create employability drive	-	-	-	-	-	-	Ensure healthy lives and promote well	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				y through respiratory systems, to improve quality and delivery with respect to aerosols, propellants and containers.	among the candidates in the industries dealing with the drug products for interventional respirat							- being for all at all ages (SDG 3)		

					ory disorders and diseaaes.									
Unit v				Global Heathcare Services. It will improve the drugs delivery through respiratory systems, to improve quality	It will create employability drive among the candidates in the industr	-	-	-	-	-	-	Ensure healthy lives and promote well-being for all at all ages (SDG 3)	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				and delivery with respect to aerosols, propellants and containers.	ies dealing with the drug products for interventional respiratory disorders and diseaaes.									

MPH 202T	ADVANCED BIOPHARMACEUTICS &	L	T	P	C

	PHARMACOKINETICS (Theory)				
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 students 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	PS O 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																	

Unit	Relevance to the local, national, regional and global developmental needs				Relevance To the Employability/ Entrepreneurship/ Skill Development			Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability				SDG	NEP	POE/4th IR
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I				Global Health care Needs. It will	It will bring emp	-	-	-	-	-	-	Ensure healthy live	Professional Educati	Technical Skills that match

				give the abosrption of all the oral dosage forms, in order to make the better formulations products.	loyability opportunities in the CROs							s and promote well-being for all at all ages (SDG 3)	on (17.1-17.5)	Industry Needs
Unit II		-	-	Global Health care Needs. It will give the distribution of all	It will bring employability opportu	-	-	-	-	-	-	Ensure healthy lives and promote	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				the oral dosage forms, in order to make the better formulations products.	nities in the CROs							well-being for all at all ages (SDG 3)		
Unit III		-	-	Global Health care Needs. It will give the elimination of all the oral dosage forms, in order	It will bring employability opportunities in the CR	-	-	-	-	-	-	Ensure healthy lives and promote well-being for	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				to make the better formulations products.	Os							all at all ages (SDG 3)		
Unit IV		-	-	Global Health care Needs. It will give the pharmacokinetics of all the oral dosage forms, in order to make the better	It will bring employability opportunities in the CROs	-	-	-	-	-	-	Ensure healthy lives and promote well-being for all at all ages (SD	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				formulations products.								G 3)		
Unit v				Global Health care Needs. It will give the non-linear pharmacokinetics of all the oral dosage forms, in order to make the better formulations	It will bring employability opportunities in the CROs	-	-	-	-	-	-	Ensure healthy lives and promote well-being for all at all ages (SDG 3)	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				products.										

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	Drug Delivery Systems				

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 students 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

Unit	**Relevance to the local, national, regional and global developmental needs**				**Relevance To the Employability/ Entrepreneurship/ Skill Development**			**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**				**SDG**	**NEP**	**POE/4th IR**
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			

Unit I				CADD has revolutionized the field of pharmacy by leveraging computational power to enhance drug discovery and development. Its global impact includes accelerated timelines, increased success rates, cost reduction, personalized medicine, and improved knowledge in pharmaceutical sciences.	Employability: Drug design and drug discovery research institutes Pharmaceutical sectors Academics	Entrepreneurship: Research consultancy	Skilled person in Computer aided drug delivery molecular modeling softwares work in drug design, pharmaceuticals research and academic sectors.	-	-	-	-	Sustainable Development and Global Citizenship (SDG 4.7) Youth and Adult Literacy (SDG 4.6) Scholarships for Higher Education (SDG 4.b) Revita	Quality Universities and Colleges: A New and Forward-looking Vision for India's Higher Education System (9.1- 9.3) Professional Education (17.1-17.5) Promoting Highj-quality research (18.1-18.9) Technology Use & Integration (23.1-23.13)	Global Education Knowledge Practical Courses from Industry/Alumni Technical Skills that match Industry Needs Focus on Employability Skills (Local/ Regional and

												lize the global partnership for sustainable development (SDG 17)		Global) Internship Programs Consulting Field Projects Simulations Entrepreneurship Program through Innovation System

Unit II		-	-	Computational modeling of drug disposition has had a profound impact on pharmacy by improving drug dosing strategies, predicting drug interactions, optimizing therapy in special populations, reducing the need for animal testing, and accelerating the drug development process.	Employability: Drug design and drug discovery research institutes Pharmaceutical sectors Academics	Entrepreneurship: Research consultancy	Skilled person in Computer aided drug delivery molecular modeling softwares work in drug design, pharmaceuticals research and academic sectors.	-	-	-	-	Sustainable Development and Global Citizenship (SDG 4.7) Youth and Adult Literacy (SDG 4.6) Scholarships for Higher Education (SDG 4.b) Revita	Quality Universities and Colleges: A New and Forward-looking Vision for India's Higher Education System (9.1- 9.3) Professional Education (17.1-17.5) Promoting Highj-quality research (18.1-18.9) Technology Use & Integration (23.1-23.13)	Global Education Knowledge Practical Courses from Industry/Alumni Technical Skills that match Industry Needs Focus on Employability Skills (Local/ Regional and

												lize the global partnership for sustainable development (SDG 17)		Global) Internship Programs Consulting Field Projects Simulations Entrepreneurship Program through Innovation System
Unit III		-	-	Computer-aided formulation development has made a significant global impact on the pharmaceutical industry by accelerating formulation development, enhancing formulation performance,	Employability: Drug design and drug discovery research institutes	Entrepreneurship: Research consultancy	Skilled person in Computer aided drug delivery molecular modeling softwares	-	-	-	-	Sustainable Development and Global	Quality Universities and Colleges: A New and Forward-looking	Global Education Knowledge Practical

				reducing costs and waste, tailoring formulations for specific delivery systems, improving quality control, integrating formulation and drug design, and facilitating global knowledge sharing and collaboration.	Pharmaceutical sectors Academics		work in drug design, pharmaceuticals research and academic sectors.					Citizenship (SDG 4.7) Youth and Adult Literacy (SDG 4.6) Scholarships for Higher Education (SDG 4.b) Revitalize the global partnership for sustai	Vision for India's Higher Education System (9.1- 9.3) Professional Education (17.1-17.5) Promoting Highj-quality research (18.1-18.9) Technology Use & Integration (23.1-23.13)	Courses from Industry/Alumni Technical Skills that match Industry Needs Focus on Employability Skills (Local/ Regional and Global) Internship Programs Consulting

												nable development (SDG 17)		Field Projects Simulations Entrepreneurship Program through Innovation System
Unit IV		-	-	Computer-aided biopharmaceutical characterization has had a significant global impact on the development, optimization, and characterization of biopharmaceutical products.	Employability: Drug design and drug discovery research institutes Pharmaceutical sectors Academics	Entrepreneurship: Research consultancy	Skilled person in Computer aided drug delivery molecular modeling softwares work in drug design, pharmaceuticals research and academic	-	-	-	-	Sustainable Development and Global Citizenship (SDG 4.7) Youth and Adult Literacy	Quality Universities and Colleges: A New and Forward-looking Vision for India's Higher Education System (9.1- 9.3) Professional Education (17.1-17.5)	Global Education Knowledge Practical Courses from Industry/Alumni Technical Skills that

							sectors.					(SDG 4.6) Scholarships for Higher Education (SDG 4.b) Revitalize the global partnership for sustainable development (SDG 17)	Promoting Highj-quality research (18.1-18.9) Technology Use & Integration (23.1-23.13)	match Industry Needs Focus on Employability Skills (Local/ Regional and Global) Internship Programs Consulting Field Projects Simulations Entrepreneurship Program through Innovation

														System
Unit v				AI, robotics and CFD technologies have the potential to revolutionize various sectors, improve efficiency, drive innovation, and address complex challenges across industries.	Employability: Drug design and drug discovery research institutes Pharmaceutical sectors Academics	Entrepreneurship: Research consultancy	Skilled person in Computer aided drug delivery molecular modeling softwares work in drug design, pharmaceuticals research and academic sectors.	-	-	-	-	Sustainable Development and Global Citizenship (SDG 4.7) Youth and Adult Literacy (SDG 4.6) Scholarships for Higher Education (SDG 4.b) Revitalize	Quality Universities and Colleges: A New and Forward-looking Vision for India's Higher Education System (9.1- 9.3) Professional Education (17.1-17.5) Promoting Highj-quality research (18.1-18.9) Technology Use & Integration (23.1-23.13)	Global Education Knowledge Practical Courses from Industry/Alumni Technical Skills that match Industry Needs Focus on Employability Skills (Local/ Regional and Global)

												the global partnership for sustainable development (SDG 17)		Internship Programs Consulting Field Projects Simulations Entrepreneurship Program through Innovation System

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: 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 students 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

Unit	Relevance to the local, national, regional and global developmental needs	Relevance To the Employability/ Entrepreneurship/ Skill Development	Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability	SDG	NEP	POE/4th IR

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I	.-	-	-	Individual know Regulation/ provisions for import, manufacture and sale of different cosmetics product			Individual know well about nation & international Regulations for import , export, manufacture & sales of cosmoceuticals					Revitalize the global partnership for sustainable development (Role of all Schools, KRMU)	**Professional Education (17.1-17.5) Promoting Highj-qua**	Technical Skills that match Industry Needs, Entrepreneurship, Employability

												(SDG 17)	**lity res ear ch (18. 1- 18. 9)**	
Unit II		-	-	know different health related issues, their preventive requiremen t & their improveme nt.			scientific knowledge , of different body conditions and their preventive requireme nt ts.							**Global Educat ion Knowl edge** ,
Unit III		-	-	Individual may know different ingredients used in cosmetic formulation and their properties cosmetics			Scientific Knowledg e about ingredient s, their properties and use in cosmeceut icals.					**1.a Ensu re signif icant mobil izatio n of resou rces from**		

				and their requirements								**a variety of sources...**		
Unit IV		-	-	Proper & best utilization of natural resources in formulating different cosmeceutical products			Increase in skill of an individual and personals.					Ensure healthy lives and promote well-being for all at all ages (SDG 3) **Ensure sustainable consumption and production**	**Technology Use & Integration (23.1-23.13)**	**Focus on Employability Skills (Local/ Regional and Global)**

												patterns (SDG 12)		
Unit v				Proper & best utilization of natural resources in cosmeceutical.			Better utilization of different Natural resources in health and beauty care.					**Ensure sustainable consumption and production patterns (SDG 12)**	Technology Use & Integration (23.1-23.13)	**Corporate Alliances to provide Big Sister/ Big Brother Connections**

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	Pharmaceutics

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 students 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	PO11	PSO	PSO	PSO3	PSO4	PSO5	PSO6

										10		**1**	**2**				
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																	

Unit	Relevance to the local, national, regional and global developmental needs				Relevance To the Employability/ Entrepreneurship/ Skill Development			Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability				SDG	NEP	POE/4th IR
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability		Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

Unit I				Global Health care Needs. It will create revolution in the global heathcare services by targeting some drugs like anti cancer drugs etc for better therapeutic and target	It will generate different modules for emplomentsin the pharmaceutical industry dealing with	-	-	-	-	-	-	Ensure healthy lives and promote well-being for all at all ages (SDG 3)	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				oriented delivery	anti cancer drug products									
Unit II				Global Heathcare Services. It will improve the drugs delivery through respiratory systems, to improve quality	It will generate different modules for emplooments in the pharmaceut	-	-	-	-	-	-	Ensure healthy lives and promote well-being for all at all ages (SDG 3)	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				and delivery with respect to aerosols, propellants and containers.	ical industry dealing with anti cancer drug products									
Unit III				Global Heathcare Services. It will improve the drugs delivery throug	It will create employability drive among	-	-	-	-	-	-	Ensure healthy lives and promote well-being	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				h respiratory systems, to improve quality and delivery with respect to aerosols, propellants and containers.	the candidates in the industries dealing with the drug products for interventional respiratory diso							for all at all ages (SDG 3)		

					rders and diseaaes.									
Unit IV				Global Heathcare Services. It will improve the drugs delivery through respiratory systems, to improve quality and deliver	It will create employability drive among the candidates in the industries deal	-	-	-	-	-	-	Ensure healthy lives and promote well-being for all at all ages (SDG 3)	Professional Education (17.1-17.5)	Technical Skills that match Industry Needs

				y with respect to aerosols, propellants and containers.	ing with the drug products for interventional respiratory disorders and diseaaes.									
Unit v				Global Heathcare Service	It will create	-	-	-	-	-	-	Ensure healthy	Professional Edu	Technical Skills that

				s. It will improve the drugs delivery through respiratory systems, to improve quality and delivery with respect to aerosols, propellants and containers.	employability drive among the candidates in the industries dealing with the drug products for						lives and promote well-being for all at all ages (SDG 3)	cation (17.1-17.5)	match Industry Needs

					interventional respiratory disorders and diseaaes.									

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, 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 students 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	1	1
Total Contact Hours	--				
Pre-requisites/Exposure	Pharmaceutics				

Co-requisites	Pharmaceutics

MPH 303S	**Discussion/ Presentation**	**L**	**T**	**P**	**C**
Version 1.0		0	0	2	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	1	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	3	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 behavior 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 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 on-going 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 students will be able to:

1. Theory and practical knowledge of UV spectrophotometer
2. The analysis of various drugs in single and combination dosage forms by various spectroscopic and chromatographic techniques.
3. Understanding NMR and Mass spectroscopy.
4. Theoretical and practical skills of the instruments.
5. 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	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

Unit	**Relevance to the local, national, regional and global developmental needs**	**Relevance To the Employability/ Entrepreneurship/ Skill Development**	**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**	**SDG**	**NEP**	**POE/4th IR**

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I	-	-	-	identification, characterization and quantification of drugs using UV-Visible spectroscopy, IR, Spectrofluorimet	-	-	Theoretical and practical skills of the instruments	-	-	Right Conduct, Truth – Contains values like accuracy, fairness, honesty, justice, quest for knowledge, determination.	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development

				ry and Flame emission spectroscopy and Atomic absorption spectroscopy										
Unit II		-	-	Identification, characterization and quantification of drug using NMR Spectroscopy.	-	-	The analysis of various drugs in single and combination dosage form, Theoretical and practical skills of the instruments	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development
Unit III		-	-	Identification, characterization and	-	-	Theoretical and practical skills of the instruments	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development

				quantification of drug using Mass Spectroscopy.										
Unit IV		-	-	Quantitative and Qualitative analysis of Drugs using Chromatographic techniques.	-	-	The analysis of various drugs in single and combination dosage form using Chromatographic techniques.	-	-	Right Conduct, accuracy, fairness, honesty, justice	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Employability
Unit v	-	-	-	Use of Electrophoresis in separation and Quantitative analysis of Drugs		-	Quantitative analysis of Drugs	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development, Employability

Unit-VI				Immunological assays in diagnosis of diseases, therapeutic drug monitoring, clinical pharmacokinetic and bioequivalence studies in drug discovery and pharmaceutical industries.			Develop skills for diagnosis of diseases, therapeutic drug monitoring, clinical pharmacokinetic and bioequivalence studies in drug discovery and pharmaceutical industries					Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Development

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 students will be able to:

1. 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.
2. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved
3. Explain the various types of neurotransmitters and their receptors
4. It gives information about the CNS disorders and drugs used for their treatment
5. Explain the role of autacoid's and their pharmacology.

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	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																		

Unit	**Relevance to the local, national, regional and global developmental needs**				**Relevance To the Employability/ Entrepreneurship/ Skill Development**			**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**				**SDG**	**NEP**	**POE/4th IR**
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development							
Unit I				Student will able to know general pharmacology is crucial for ensuring the safe, effective, and rational use of drugs globally. It informs drug regulation,			Pharmacology as a discipline has significantly contribute					(SDG 4.4)	(9.1 - 9.3)	Global Education Knowledge, Skill Develo

				promotes rational drug use, contributes to pharmacovigilance efforts, supports global health initiatives, informs pharmacoeconomic evaluations, and fosters international collaborations and research in pharmacology.			d to skill development in various aspects of drug therapy. It has provided the knowledge,						pment, Employability
Unit II				The global impact of drugs targeting the peripheral nervous system is vast, with applications in treating autonomic disorders, anesthesia, neuromuscular disorders and research, allowing healthcare professionals to optimize patient outcomes by leveraging their pharmacological properties.			education, and training necessary for healthcare professionals to understand drug actions, make informed therapeuti					(SDG 4.4)	(9.1 - 9.3)	Global Education Knowledge, Skill Development, Employability

Unit III				The pharmacology of drugs acting on the central nervous system has profound various global applications such as neurological and psychiatric disorders, pain management sleep disorders, substance abuse, neuro-protection			c decisions, ensure drug safety, and contribute to patient care. Skill development in pharmacology continues through lifelong learning and interdisciplinary collaboration, enabling professionals to adapt to new developments and					(SDG 4.4)	(9.1 - 9.3)	Global Education Knowledge, Skill Development, Employability
Unit IV				Cardiovascular drugs have extensive global applications and are utilized in the management of hypertension, ischemic heart disease, heart failure, arrhythmias, thromboembolic diseases, dyslipidemia, pulmonary hypertension, valvular heart disease, and secondary prevention strategies. They play a critical role in improving cardiovascular health, reducing morbidity and									(SDG 4.4)	(9.1 - 9.3)	Global Education Knowledge, Skill Development, Employability

				mortality rates associated with cardiovascular conditions			improve patient outcomes.							
Unit v				Autacoids used to address inflammatory disorders, manage pain, treat cardiovascular disorders, alleviate gastrointestinal and respiratory conditions, control allergic and immune responses, address reproductive health issues, and manage renal disorders								(SDG 4.4)	(9.1 - 9.3)	Global Education Knowledge, Skill Development, Employability

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 students will be able to:

1. This subject is designed to impart the knowledge on preclinical evaluation of drugs.
2. It focuses on recent experimental techniques in the drug discovery and development.
3. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines,
4. 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

Unit	Relevance to the local, national, regional and global developmental needs	Relevance To the Employability/ Entrepreneurship/ Skill Development	Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability	SDG	NEP	POE/4th IR

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability	SDG	NEP	POE/4th IR
Unit I				Trained the students with the Globally recognized work force, as toxicology is the fundamental science			Toxicology and their guidelines will enable Skill development			Environment and Sustainability		Quality primary/ Secondary Education for all (SDG4.1)	Professional Education (17.1-17.5)	Skill Development
Unit II		-	-	Trained the students to work as per the			OECD guidelines helps to perform the animal experimentation					Skills for Decent Work	Promoting Highj-quality	Organization for economic cooperation

				global standards and make them available for ready to work			thus engaged in Skill development					(SDG 4.4)	research (18.1-18.9)	and development trained the students and thus help in Skill Development
Unit III		-	-	Over population is the Challeng of the all the countries. It became a global problem. In this, students learn the and			Reproductive animal screening trained the students for pre clinical research and development Skill development			Environment and Sustainability		Skills for Decent Work (SDG 4.4)	Effective Governance & Leadership (19.1-19.5)	Employability

				discover the novel anti ferlitily agents and population control methods										
Unit IV		-	-	Skilled the students to fill and apply for the IND across the varius approval agencies (FDA, DCGI etc)			In this, students will able to file the Investigation drug application after the pre clinical reports.					Skills for Decent Work (SDG 4.4)	Promoting Highj-quality research (18.1-18.9)	Employability

Unit v				Using the principle of 3 R, that globally harmonized ,Skilled the students to perform the experiment based on 3 R principle and inventing new method as per the alternative to animals experimentati			Based on alternatives methods of animal experimentation this promotes the In silico studies and helps in Skill development					Quality primary/ Secondary Education for all (SDG4.1)	Professional Education (17.1-17.5)	Secondary research and trails studies trained the students to get the training on live projects and thus helps in Employability

				on										

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 students will be able to:

1. 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.
2. The subject also designed to impart knowledge about the various cell death pathways.
3. It helps in detail understanding of molecular biology techniques like western blotting and PCR
4. The students will be able to understand about the cell culture techniques.
5. This information will further help the student to apply the knowledge in drug discovery process.

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																		

Unit	**Relevance to the local, national, regional and global developmental needs**				**Relevance To the Employability/ Entrepreneurship/ Skill Development**			**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**				**SDG**	**NEP**	**POE/4th IR**
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I	-	-	-	Cell biology,Structure	-	-	Understanding basics of cell	-	-	-	-	SDG 4.4 and	Professional edu	Technical Skills that

				and functions of cell, signaling								SDG 3	cation	match Industry Needs (by giving recent updates in pharma industry which will help in creating job oppurtinity), Hands-on Experience Employability Skill Development

Unit II	-	-	Cell signaling, Intercellular and Extracellular signaling pathways	Understanding signaling pathway	-	-	Understanding cell signalling pathways in various disease	-	-	-	-	SDG 3	Promoting high quality research	-
Unit III	-	-	Principles and applications of genomic and proteomic tools DNA electrophoresis	Treatment of cancer other disease using gene transfer	-	-	To understand genetic basis of various diseases	-	-	-	-	SDG 3	Professional education	-
Unit IV	-	Pharmacogenomics Gene mapping and cloning of disease gene	Pharmacogenomics Gene mapping and cloning of disease gene	Importance of gene mapping in diagnosis of various disease.	-	-	Understanding basics of genomics in various diseases	-	-	-	-	SDG 4.4	Professional education	Technical Skills that match Industry Needs, Skill Development

Unit v		Cell culture techniques ,Basic equipments used in cell culture lab	-	To effectivly understand basic techniques in cell culture and its applications.	-	-	-					SDG 4.4	Professional education	Technical Skills that match Industry Needs, Hands on experience

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 students will be able to:

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

Programme and Course Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO11		PSO	PSO	PSO3	PSO4	PSO5	PSO6

										10			**1**	**2**				
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																		

Unit	**Relevance to the local, national, regional and global developmental needs**				**Relevance To the Employability/ Entrepreneurship/ Skill Development**			**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**				**SDG**	**NEP**	**POE/4th IR**
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I				This unit covers the practical approaches of animal experi			Hands on training of different techniques, s that students can learn the in					Skills for Decent Work (SDG 4.4)	Promoting High-quality research (18.	Soft Skills

				mentation in labs Skill development			vivo, ex vivo and in vitro techniques						1-18.9)	
Unit II		-	-	Different instruments are used n measurement of BP, Skill development			Hands on training of different techniques					-	-	Soft Skills
Unit III		-	-	Hands on training of different techniques			Hands on training of different techniques					Skills for Decent Work (SDG 4.4)	Effective Governance & Leadership (19.1-19.5	Skill Development

													)	
Unit IV		-	-	Skill develo pment								-	-	Skill Develo pment
Unit v				Design ing of In silico studies helps the student s to get the trainin g on lead optimi zation Skill develo pment			Hands on training of different techniques					Rev itali ze the glob al part ners hip for sust aina ble dev elop men t (Rol e of all Sch ools	Tra nsfo rmi ng the Reg ulat ory Syst em (20. 1- 20.1 5)	Soft Skills

												, KR MU) (SD G 17)		

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 students will be able to:

1. 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.
2. In addition, the subject helps the student to understand the concepts of drug action and mechanism involved.
3. This subject provides the knowledge of endocrine pharmacology, chemotherapy, antibiotics, and immunology.
4. Student can understand the diseases like Parkinsonism, cancer, Alzheimer, diabetes mellitus and its treatment.

5. 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

Unit	**Relevance to the local, national, regional and global developmental needs**				**Relevance To the Employability/ Entrepreneurship/ Skill Development**			**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**				**SDG**	**NEP**	**POE/4th IR**
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I	-	-	-	Molecular and cellular	-	-	Understanding molecular mechanis	-	-	-	-	SDG 4.4 and	Professional edu	Technical Skills that

				mechanism of action of hormones			m of drugs in the process of drug discovery and development					SDG 3	cation	match Industry Needs (by giving recent updates in pharma industry which will help in creating job oppurtinity), Hands-on Experience Employability Skill Development

Unit II	-	-	Cellular and molecular mechanism of actions and resistance of antimicrobial agents.	Mechanism of resistance and improvement in drug action	-	-	Understanding molecular mechanism of drugs resisatnce	-	-	-	-	-	Promoting high quality research	-
Unit III	-	-	Principles of Chemotherapy and study of ADR	Treatment of cancer by using various drugs in improving health	-	-	To understand cancer chemotherapy and various ADR associated with anti-cancer drugs	-	-	-	-	SDG 3	Professional education	-
Unit IV	-	Understanding pharmacology f drugs acting on GIT	-	-	-	-	Understanding basics of drugs acting on GIT like prokinetics, antiulcer	-	-	-	-	SDG 4.4	Professional education	Technical Skills that match Industry Needs, Skill

							etc							Development
Unit v	Free radicals Pharmacology	Understanding Role of free radicals in life style and aging.	-	-	-	-	Role of free radicals in neurodegenerative diseases					SDG 4.4	Professional education	Technical Skills that match Industry Needs, Hands on experience

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 students will be able to:

1. This subject imparts knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity.
2. This knowledge will make the student competent in regulatory toxicological evaluation.
3. It deals with animal models used for pre-clinical studies of various diseases and involves the ethical issues related with the animals.
4. Students will also study about the various guidelines for safety use of animals during experimentation.
5. 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	PO1 1		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

Unit	Relevance to the local, national, regional and global developmental needs	Relevance To the Employability/ Entrepreneurship/ Skill Development	Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability	SDG	NEP	POE/4th IR

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I				Trained the students with the Globally recognized work force, as toxicology is the fundamental science			Toxicology and their guidelines will enable Skill development			Environment and Sustainability		Quality primary/ Secondary Education for all (SDG4.1)	Professional Education (17.1-17.5)	Skill Development
Unit II		-	-	Trained the students to work as per the			OECD guidelines helps to perform the animal experimentation					Skills for Decent Work	Promoting Highj-quality	Organization for economic cooperation

				global standards and make them available for ready to work			thus engaged in Skill development					(SDG 4.4)	research (18.1-18.9)	and development trained the students and thus help in Skill Development
Unit III		-	-	Over population is the Challeng of the all the countries. It became a global problem. In this, students learn the and			Reproductive animal screening trained the students for pre clinical research and development Skill development			Environment and Sustainability		Skills for Decent Work (SDG 4.4)	Effective Governance & Leadership (19.1-19.5)	Employability

				discover the novel anti ferlitily agents and population control methods										
Unit IV		-	-	Skilled the students to fill and apply for the IND across the varius approval agencies (FDA, DCGI etc)			In this, students will able to file the Investigation drug application after the pre clinical reports.					Skills for Decent Work (SDG 4.4)	Promoting Highj-quality research (18.1-18.9)	Employability

Unit v				Using the principle of 3 R, that globally harmonized ,Skilled the students to perform the experiment based on 3 R principle and inventing new method as per the alternative to animals experimentati			Based on alternatives methods of animal experimentation this promotes the In silico studies and helps in Skill development					Quality primary/ Secondary Education for all (SDG4.1)	Professional Education (17.1-17.5)	Secondary research and trails studies trained the students to get the training on live projects and thus helps in Employability

				on										

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 students will be able to:

1. The subject imparts basic knowledge of drug discovery process. This information will make the student competent in drug discovery process.
2. It enlightens the students about the lead identification, target identification, target validation, molecular docking, QSAR.
3. It also deals with the Role of Genomics, Proteomics and Bioinformatics in drug discovery system.
4. It deals with the combinatorial chemistry and high throughput screening, assay development in detection of various lead components like proteins

5. 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, Prod rug design-Basic concept, Prodrugs 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

Unit	**Relevance to the local, national, regional and global developmental needs**	**Relevance To the Employability/ Entrepreneurship/ Skill Development**	**Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability**	**SDG**	**NEP**	**POE/4th IR**

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I	-	-	Drug discovery boost the economy of country	-	-	-	Activities on online available computational softwares like autodock	-	-	-	-	Skills for Decent Work; Research-related skills (case study, seminars and hands on training) (SDG 4.4)	Professional Education (17.1-17.5); Promoting Highj-quality research (18.1-18.9)	Technical Skills that match Industry Needs/ Hands-on Experience

Unit II	-	-	-	Learning of Techniques help to discover drugs	-	-	Activities on online available computational softwares like schrodinger, discovery studio	-	-	-	-	Skills for Decent Work; Research-related skills (case study, seminars and hands on training) (SDG 4.4)	Professional Education (17.1-17.5); Promoting Highj-quality research (18.1-18.9)	Technical Skills that match Industry Needs/ Hands-on Experience
Unit III	-	-	-	Target identification and validation help in drug discovery	-	-	on online available computational softwares like schrodinger, discovery studio	-	-	-	-	Skills for Decent Work; Research-related skills (case study, seminars and hands on training) (SDG 4.4)	Professional Education (17.1-17.5); Promoting Highj-quality research (18.1-18.9)	Technical Skills that match Industry Needs/ Hands-on Experience

Unit IV	-	-	Molecular docking fastens the drug discovery for the benefit of the country	-	-	-	on online available computational softwares like schrodinger, discovery studio	-	-	-	-	Skills for Decent Work; Research-related skills (case study, seminars and hands on training) (SDG 4.4)	Professional Education (17.1-17.5); Promoting Highj-quality research (18.1-18.9)	Technical Skills that match Industry Needs; Skill Development
Unit v	-	-	-	Help in drug discovery & development by inhibiting enzymes	-	-	on online available computational softwares like QSAR toolbox	-	-	-	-	Skills for Decent Work; Research-related skills (case study, seminars and hands on training) (SDG 4.4)	Professional Education (17.1-17.5); Promoting Highj-quality research (18.1-18.9)	Technical Skills that match Industry Needs/ Hands-on Experience

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 students will be able to:

1. This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance.
2. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials.
3. This subject also focuses on global scenario of Pharmacovigilance in different methods that can be used to generate safety data.
4.It will teach the students in developing drug safety data in Pre-clinical, Clinical phases of Drug development and post market surveillance
5. 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

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			

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																		

Unit I	Provide knowledge of documentation, awareness and monitoring of clinical trials conducted in health care sector at local Level	Provide knowledge of documentation, awareness and monitoring of clinical trials conducted in health care sector at Regional Level	Provide knowledge of documentation, awareness and monitoring of clinical trials conducted in health care sector at National Level	Inflates understanding of global ICH for smooth conduction of clinical trials and monitoring	Provide prompt employment in health care sector and CRO	One can start database as well as certified CRO for conduction of Clinical study at small level in collaboration with hospital	Handling and maintaining rhythmic documentation of clinical study.	Provide transparent and fair scrutinization of therapeutic molecule without disclosing patients' credentials	Allow conduction of studies without gender bias ne	Human values are on the priority as human volunteers	During conduction of study this allow preserving environment resources and dispose every biomaterial with proper disposal method to keep enviro	"Skill for Decent Work" SDG 4.4, SDG 7 "Ensure aces to all affordable, reliable, sustainable and mod	Professional Education (17.1-17.5)	Global Education Knowledge, Projects , Hands on Experience

									ss	are required	nment free from hazard	ern energy"		
Unit II	Provide knowledge of documentation, awareness monitoring and conduction of clinical trials in health care sector at local Level	Provide knowledge of documentation, awareness monitoring and conduction of clinical trials health care sector at Regional Level	Grabbing knowledge of documentation, awareness, monitoring and conduction of clinical trials in health care sector at National Level	Enhance the knowledge of executing various research clinical study over a population. Globally this concept has been adapted	Provide prompt employment in health care sector and CRO	One can start database as well as certified CRO for conduction of Clinical study at small level in collaboration with hospital	Handling and maintaining rhythmic documentation of clinical study.	Provide transparent and fair scrutinization of therapeutic molecule without disclosing patients'	No gender biasness during conduction	Human values are on the priority ashum	During conduction of study this allow preserving environment resources and dispose every biomaterial with	"Skill for Decent Work" SDG 4.4, SDG 7 "Ensure aces to all affordable,	Professional Education (17.1-17.5)	Global Education Knowledge, Projects, Hands on Experience

									of study	an volunteers are required	proper disposal method to keep environment free from hazard	reliable, sustainable and modern energy"		
Unit III	Provide knowledge of documentation, awareness monitoring and conduction of clinical trials in health care sector at local Level	Provide knowledge of documentation, awareness monitoring and conduction of clinical trials health care sector at Regional Level	Grabbing knowledge of documentation, awareness, monitoring and conduction of clinical trials in health care sector at National	Enhance the knowledge of executing various research clinical study over a population.	Provide prompt employment in health care sector and	One can start database as well as certified CRO for conduction of Clinical study at small level in	Handling and maintaining rhythmic documentation of clinical study.	Provide transparent and fair scrutinization of therapeutic molecule without disclosing patients'	No gender biasness during	Human values are on the pr	During conduction of study this allow preserving environment resources	"Skill for Decent Work" SDG 4.4, SDG 7 "En	Professional Education (17.1-17.5)	Global Education Knowledge, Projects, Hands on Experience

			Level	Globally this concept has been adapted	CRO	collaboration with hospital			conduction of study	ioritys ashuman volunteers are required	and dispose every biomaterial with proper disposal method to keep environment free from hazard	sure aces to all affordable, reliable, sustainable and modern energy”		
Unit IV	Provide knowledge of documentation, awareness monitoring	Provide knowledge of documentation, awareness monitoring and conduction of clinical trials health care sector at regional area	Grabbing knowledge of documentation, awareness, monitoring	Enhance the knowledge of executing various	Provide prompt employmen	One can start database as well as certified CRO	Handling and maintaining rhythmic documentation of clinical	Provide transparent and fair scrutinization of therapeu	No gender bi	Human values	During conduction of study this	“Skill for Decent Work”	Professional Education (17.	Global Education Knowledge, Projects,

	and conduction of clinical trials in health care sector at local Level		and conduction of clinical trials in health care sector at local Level	research clinical study over a population. Globally this concept has been adapted	t in health care sector and CRO	for conduction of Clinical study at small level in collaboration with hospital	study.	tic molecule without disclosing patients'	aness during conduction of study	are on the priority as human volunteers are required	allow preserving environment resources and dispose every biomaterial with proper disposal method to keep environment free from hazard	SDG 4.4, SDG 7 "Ensure aces to all affordable, reliable, sustainable and modern energy"	1-17.5), Gender Equality and Equal access to all (SDG 4.5)	Hands on Experience

Unit v	Provide knowledge of documentation, awareness monitoring and conduction of clinical trials in health care sector at local Level	Provide knowledge of documentation, awareness monitoring and conduction of clinical trials health care sector at regional area	Grabbing knowledge of documentation, awareness, monitoring and conduction of clinical trials in health care sector nationwide.	Enhance the knowledge of executing various research clinical study over a population. Globally this concept has been adapted	Provide prompt employment in health care sector and CRO, able to work in various vigilance database	One can start database as well as certified CRO for conduction of Clinical study at small level in collaboration with hospital	Handling and maintaining rhythmic documentation of clinical study.	Provide transparent and fair scrutinization of therapeutic molecule without disclosing patients'	No gender biasness during conduction of study	Human values are on the priority as human volunteers	During conduction of study this allow preserving environment resources and dispose every biomaterial with proper disposal method to keep enviro	"Skill for Decent Work" SDG 4.4, SDG 7 "Ensure aces to all affordable, reliable, sustainable and mod	Professional Education (17.1-17.5),	Global Education Knowledge, Projects, Hands on Experience

					organization in government and private sector					are required	ment free from hazard	ern energy”		

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 students will be able to:

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

Programme and Course Mapping

CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1		PSO 1	PSO 2	PSO3	PSO 4	PSO 5	PSO 6
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

Unit	Relevance to the local, national, regional and global developmental needs	Relevance To the Employability/ Entrepreneurship/ Skill Development	Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability	SDG	NEP	POE/4th IR

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I				This unit covers the practical approaches of animal experimentation in labs Skill development			Hands on training of different techniques, s that students can learn the in vivo, ex vivo and in vitro techniques					Skills for Decent Work (SDG 4.4)	Promoting High-quality research (18.1-18.9)	Soft Skills
Unit II		-	-	Different instruments are used n measurement of BP, Skill develop			Hands on training of different techniques					-	-	Soft Skills

				ment										
Unit III		-	-	Hands on training of different techniques			Hands on training of different techniques					Skills for Decent Work (SDG 4.4)	Effective Governance & Leadership (19.1-19.5)	Skill Development
Unit IV		-	-	Skill development								-	-	Skill Development
Unit v				Designing of In silico studies helps the students to get the training on lead optimiz			Hands on training of different techniques					Revitalize the global partnership for sustainable	Transforming the Regulatory System (20.1-	Soft Skills

				ation Skill develop ment								deve lop ment (Rol e of all Scho ols, KR MU) (SD G 17)	20.1 5)	

Semester-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 & clinical Regulatory -				
Course Objectives					
Upon completion of this course the student should be able to: i. To impart undergraduate, post graduate and doctoral education in identified areas of higher education. ii. To undertake research programmes with industrial interface. iii. 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. iv. To act as a nodal center for transfer of technology to the industry. v. 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 students 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

Unit	Relevance to the local, national, regional and global developmental needs	Relevance To the Employability/ Entrepreneurship/ Skill Development	Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability	SDG	NEP	POE/4th IR

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I	-	-	-	This subject imparts fundamental knowledge on the research methodology, biostatistics, animal experimentation and clinical research.	-	-	This subject helps in analysis of various results by using various tools and softwares.	-	-	-	-	SDG 4.4	Higher Education System (9.1- 9.3)	Technical Skills that match Industry Needs Focus on Employability Skills (Local/ Regional and Global)

Unit II	-	-	-	Applications of biostat in Medical research			This will helps in understanding the biostatistics in medical industry	-	-	-	-	SDG 4.4	Professional education	Technical Skills that match Industry Needs Focus on Employability Skills (Local/ Regional and Global
Unit III	-	-	-	Overview of medical research involved in industry and regulatory procedures			This will helps in understanding regulatory procedures in medical industry and use of biostat in result analysis.	-	-	-	-	SDG 3	Professional education, Promoting high quality research	Technical Skills that match Industry Needs Focus on Employ

														ability Skills (Local/ Regional and Global
Unit IV		-	-	Understanding CPCSEA guidelines			Will help in establishment of animal house for research as well as for industrial applications.	-	-	-	-	SDG 3	Promoting high quality research	Technical Skills that match Industry Needs Focus on Employability Skills (Local/ Regional and Global
Unit v				This unit basically focus on basic principles for all medical research, and additional principles for medical research combined with medical care.			Understanding basic principles for all medical research, and	-	-	-	-	SDG 3	Promoting high quality research	Technical Skills that match Industr

							additional principles for medical research combined with medical care							y Needs Focus on Employability Skills (Local/ Regional and Global