

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



Registrar K.R. Mangalam University Sohna Read, 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 worldclass 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 worldclass 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:

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

TWO YEAR M.PHARM COURSE AT A GLANCE

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	4	4	
		Analytical Techniques			
2	MPL102T	Advanced Pharmacology-I	4	4	
3	MPL103T	Pharmacological and	4	4	
		Toxicological Screening Methods-I			
4	MPL104T	Cellular and Molecular	4	4	
		Pharmacology			
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, 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	Т	Р	С								
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 advance	ed analytical instrumental techniques												
2. Identification, characteri	zation and quantification of drugs by various techniq	ues											
3. Instruments dealt are NM	MR, Mass spectrometer, IR, HPLC, GC etc.												
	Course Outcomes (CO)											
On completion of this cour	rse, the students will be able to:												
CO1: Theory and practical	knowledge of UV spectrophotometer												
CO2: The analysis of varie	ous drugs in single and combination dosage forms by	various	spectros	scopic and chror	natographic techniques.								
CO3: Understanding NMF	R and Mass spectroscopy.												
CO4: Theoretical and prac	tical skills of the instruments.												
CO5: Immunological assag	ys												

							Pro	gramm	e and C	Course	Mapping	g					
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO 1	PSO 2	PSO3	PSO4	PSO5	PSO6
C O 1	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=ligh	tly map	ped	2	= mode	rately m	apped		3=stro	ngly ma	pped			
U nit							le	ri ,				e					
	ce to the	tional, and	mental				ce To tł	yability. eneursł	Skill opment			ice to th ssional	Gender Values	nment ð <u>nabilitv</u>	5	EP	

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gandar	Human Values	Emission & Custoinshility			
Unit I	-	_	-	identific ation, characte rization and quantific ation of drugs using UV- Visible spectros copy, IR, Spectrof lourimet	-	-	Theoretical and practical skills of the instruments			Right Conduct , Truth – Contains values like accuracy , fairness, honesty, justice, quest for knowled ge, determin ation.	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Develo pment

			ry and Flame emission spectros copy and Atomic absorpti on spectros copy										
Unit II	-	-	Identific ation, characte rization and quantific ation of drug using NMR Spectros copy.		-	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 Develo pment
Unit III	-	-	Identific ation, characte rization 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 Develo pment

				quantific ation of drug using Mass Spectros copy.										
Unit IV		-	-	Quantita tive and Qualitati ve analysis of Drugs using Chromat ographic techniqu es.	-	-	The analysis of various drugs in single and combination dosage form using Chromatographi c techniques.	-	-	Right Conduct , accuracy , fairness, honesty, justice	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Employ ability
Unit v	-	-	-	Use of Electrop horesis in separati on and Quantita tive 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 Develo pment, Employ ability

Unit-	Immuno	Develop skills		Skills	for	Professional	Skill
VI	logical	for diagnosis of		Decent		Education	Develo
	assays in	diseases,		Work		(17.1-17.5)	pment
	diagnosi	therapeutic drug		(SDG 4.4)		
	s of	monitoring,					
	diseases,	clinical					
	therapeu	pharmacokineti					
	tic drug	c and					
	monitori	bioequivalence					
	ng,	studies in drug					
	clinical	discovery and					
	pharmac	pharmaceutical					
	okinetic	industries					
	and						
	bioequiv						
	alence						
	studies						
	in drug						
	discover						
	y and						
	pharmac						
	eutical						
	industrie						
	S.						

MPH	102T			Drug	Delive	ery syst	em (Tl	heory)			L	Т]	P		С	
Versie	on 2.0										4	0	0		4		
Total	Conta	ct Hou	rs	60 Hr	s.												
Pre-re	equisit	es/Exp	osure	Pharn	naceuti	CS											
Co-re	quisite	S		Nove	l Drug	Deliver	y Syste	ems									
								Co	urse O	bjectives	3						
Upon	comple	etion of	this co	ourse th	e stude	ent shou	ıld be a	ble to:									
1. The	variou	is appro	baches	for dev	elopme	ent of n	ovel dr	ug deli	very sy	stems.							
2. The	e criter	ia for s	election	n of dru	igs and	polym	ers for	the dev	velopm	ent of del	livering	system.					
3. The	formu	lation a	and eva	luation	of No	vel drug	g delive	ery syst	ems.								
								Cours	se Outo	comes (C	(O)						
On co	On completion of this course, the students will be able to:																
CO1:	CO1: The various approaches for development of novel drug delivery systems.																
CO2:	CO2: The criteria for selection of drugs and polymers for the development of delivering system																
CO3:	CO3: The formulation and evaluation of Novel drug delivery systems.																
CO4 :	Know	ledge of	f peptio	de base	d deliv	ery sys	tem.										
CO5:	Know	ledge of	f vacci	ne deliv	very sy	stem.											
							D			d Cours	o Monn	ina					
						1	r	rogran	ime an		e mapp		DCO				
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PS0	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=ligh	tly ma	pped		2= mo	deratel	y mappe	d	3=str	ongly ma	pped		•	

Unit	Relevance to the local, national, regional and global	developmental needs			Relevance To the	Entrepreneurship/ Skill Develomment		Relevance to the Professional Ethics, Gender,	Human Values,	Environment & Sustainability		SDG	NEP	POE/4 th IR
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability		Professional Education (17.1-17.5)	Practic al Course s from Industr y/Alum ni
Unit I				Global Heathc are Needs. It will bring revolut ion in the novel			It will increase the skill among the students for formulatio n of different sustained and	-	-	-	-	Skil ls for Dec ent Wor k (SD G 4.4)	Prof essi onal Edu cati on (17. 1- 17.5)	Practic al Course s from Industr y/Alum ni

			drug deliver y system s by formul ation of differe d dosage forms		controlled release dosage forms					
Unit II		-	Global Health care Needs. It will bring revolut ion in the novel drug deliver y system s by		It will increase the skill among the students for formulatio n of different sustained and controlled release dosage forms		-	Skil ls for Dec ent Wor k (SD G 4.4)	Prof essi onal Edu cati on (17. 1- 17.5)	Practic al Course s from Industr y/Alum ni

Unit III	-	-	formul ation of differe d dosage forms Global Health care Needs.		Assignme nts and webinars	No	No	No	No	Skil ls for Dec ent Wor k (SD G 4.4)	Prof essi onal Edu cati on (17. 1- 17.5)	Practic al Course s from Industr y/Alum ni
Unit IV			Global Health care Needs. It will remove the proble ms associa ted		It will generate the skill of making the novel gastrorete ntive oral dosage forms for better patient complaian ce.		-	-		Skil ls for Dec ent Wor k (SD G 4.4)	Prof essi onal Edu cati on (17. 1- 17.5)	Practic al Course s from Industr y/Alum ni

		with conven tional dosage forms by formul ation into newly gastror etentiv e drug dosage forms by									
		method									
Unit v		Global Health care Needs. It will lead to formul ation of		It will create the skill among the students to develop in the various industries which actually	-	-	-	-	Skil ls for Dec ent Wor k (SD G 4.4)	Prof essi onal Edu cati on (17. 1- 17.5	Practic al Course s from Industr y/Alum ni

		transde rmal drug produc ts with lower side effects		are actively involved in making transderm al patches of those drugs which are)	
		effects and toxicit y and also eradica te the stabilit y proble ms associa ted		which are highly bitter or unstable in the acidic media.				
		with many drugs.						

MPH 103T	Modern Pharmaceutics (Theory)	L	Т	Р	С
Version 2.0		4	0	0	4
Total Contact Hours	60 Hrs.				
Pre-requisites/Exposure	Industrial Pharmaceutics				
The requisites, Emposition					

Co-re	quisite	s		Drug	Delive	ry Syste	ems										
								Co	urse Ol	bjectives	5						
Upon	comple	etion of	this co	ourse th	e stude	ent shou	ıld be a	ble to:									
		. –															
The el	lements	s of Pre	formul	ation st	udies.	10		1 D	1 /	1 1							
1. The	e Active	e Pharn	naceuti	cal Ing	redients	s and G	eneric	drug Pi	roduct o	developn	nent						
2. Inc 3. Opt	iusiriai imizati	in Tec	hnique	and Gr	of Plan	isiderat	1011S. Un Tei	chnique	20								
3. Opt 4. Stal	hility T	esting.	steriliz	ation n	rocess	& nack	aging (of dosa	zs ge form	IS.							
	onity 1	esting,	50011112	unon p	1000000	ee puen	~88 ·	01 u 00 u	50 10111								
								Cours	se Outc	omes (C	CO)						
On co	On completion of this course, the students will be able to: The various approaches for development of novel drug delivery systems																
The va	The various approaches for development of novel drug delivery systems.																
CO1.	CO1. The elements of Preformulation studies.																
CO 2.	CO1. The elements of Preformulation studies. CO 2. The Active Pharmaceutical Ingredients and Generic drug Product development																
CO3.	About	Indust	rial Ma	inagem	ent and	I GMP	Consid	leration	s.								
CO4	Optim	1zation	Techn	iques &	z Pilot	Plant S	cale Uj	p Techi	nques	f							
0.05	Stabil	ity resi	ing, su	ermzau	on pro	cess &	раскад	ing of o	uosage	IOTIIIS							
							P	rogran	ıme an	d Cours	e Mappi	ing					
00	DO1	DOC	DOI	DOA	DOT	DOC	DOF		DOC	РО	DO11	PSO	PSO	DCO2	DCO 4	DCO7	DEOC
CO	POI	PO2	PO3	PO4	P05	PO6	PO7	P08	PO9	10	POII	1	2	PS03	PS04	PS05	PS06
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=ligh	tly ma	pped		2= mo	deratel	y mappe	d	3=stro	ongly ma	pped			

MPH	104T			Regu	latory	Affairs	(Theo	ry)			L	Т		Р		С	
Versio	on 1.0										4	0	0		4		
Total	Contac	ct Hour	S	60 Hr	s.												
Pre-re	equisite	es/Expo	sure	Pharm	naceutic	s											
Co-re	quisite	S		Regul	atory A	ffairs											
								Cour	se Obje	ectives							
Upon	comple	tion of	this cou	arse the	studen	t should	l be abl	e to:									
The el	ements	of Pref	ormula	tion stu	dies.												
1. Cou	irse des	igned to	o impar	t advan	ced kno	owledge	e and sl	cills rec	quired to	o learn	the conc	ept of g	eneric d	rug and	their dev	elopmen	t
2. Var	ious reg	gulatory	/ filings	in diff	erent co	ountries	, differ	ent pha	ses of c	linical	trials an	d submi	tting reg	gulatory of	documen	ts : filing	5
proces	s of IN	D, NDA	A and A	NDA													
3. To l	. To know the chemistry, manufacturing controls and their regulatory importance																
	Course Outcomes (CO)																
On co	On completion of this course, the students will be able to:																
CO1:	The Co	oncepts	of inno	vator a	nd gene	ric dru	gs, drug	g develo	opment	Proces	S						
CO2:	The Re	gulator	y guida	ince's a	nd guic	lelines	for film	g and a	ipprova	l Proce	SS						
CO3:	Prepara	ation of	Dossie	rs and t	heir su	bm1ss1c	on to reg	gulator	y agenc	ies ind	ifferent c	countries	5				
CO4:	Post ap	proval	regulat	ory requ	uiremer	its for a	CTD f	and dru	g produ	icts							
005:	Submi	ssion o	r globa	aocum	ients in	CID/ (ormats									
							Pro	gramm	e and (Course	Manni	ng					
	DCI	DCC	D C -	D C :	D C -	D.C. (D C=			PO	Dest	PSO	PSO	Dass		DG C F	
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	10	PO11	1	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

	<u>CO5</u>		3							2	1			2	1	2				1				
						1=lightly	y mapp	ed	2	= mode	rately	mapp	ed		3=str	ongly	y m	app	bed					
l r i t	J		Relevance to the local.	national, regional	and global developme	ntal needs	Relevance	To the Employabil	ity/ Entreprene urshin/	Skill Developme	nt	Relevance	ro the Professiona	l Eunics, Gender,	Human Values, Fuvironme	nt &	Sustainabil				SDG		NEP	POE/4 th IR
ι	Local Regional	National	the g I top ensu	global pics rev uring a	needs volve ccess	s for Unit- around to safe,	Regueres expension of the phealt	latory rtise is ploya harma hcare i	Affairs affairs bility w ceutical industric	valued ithin and es.	Entrepreneurship Skill Development	Regu profe prom credi	llatory ession tote et tain tr bility,	Left Lines A strong the strong th	rs n conduc nd contrib		Uender Himan Values	Environment & Sustainability	SDG cover Pharr align	3: The red in U maceuti	topics Jnit-I of t ical indus DG 3 by	he try	Γra 1sf Dr min	Sk ill E m be
r i t - I		_	effe med regu and colla publ wor	ctive, a licines, llatory fosteri aborati lic hea ldwide	and af , pron harm ng gle ion to lth ch	noting onization, obal address allenges	Profe contr comp deve mark asses surve comp strate	essiona ibute f bliance lopme et acco sment eillance nunica egic de	als in thi to regula e, produce nt, globa ess, risk c, post-m e, effect ation, an ecision-	s field atory ct al arket ive d		to the effect pharm healt Upho ethic ensure effica regul	e respective re maceu hcare olding s is es ring th acy, an lated p	onsible egulat tical a produ profe sentia sentia ne safe nd qu produce	le and ion of and acts. essiona al for ety, ality of cts and	1		_	addre acces and h medi healt prom world	essing t ssible, a nigh-qu cines to h outco note we dwide.	he need f affordable ality improve mes and ll-being	or I 2, § 2 2 5 2 5 2 5 2 5 2 5 2 5 2 5 2 5 2 5 2	he Re gul itor / Sys cem (20. 1-	dd ed Co urs es De vel op me

			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
U n i t I I I	 	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.	Tra nsf or min g the Re gul ator y Sys tem (20. 1- 20. 15)	Sk ill E m be dd ed Co urs es De vel op me nt

	glot effe mec	bal access to safe and active medicines and dical devices.	employability of organizations and contribute to the safe and successful commercialization of healthcare products.						
U n i t I I I I	 Glo revo glob proo eval data prep subr inve doss - safe new Har regu data inte coll role neeo devv effe	bal needs of Unit III olve around efficient oal submission cesses, comprehensive luation of non-clinical a, standardized paration and mission of estigational product siers, and ensuring the ety and efficacy of v drugs. monization of alatory requirements, a transparency, and mational aboration play crucial es in meeting these ds and facilitating the elopment of safe and ective 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.	Tra nsf or min g the Re gul ator y Sys tem (20. 1- 20. 15)	Sk ill E m be dd ed Co urs es De vel op me nt

		healthcare products.						
U n i t I V	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.	I	_	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.	Tra nsf or min g the Re gul ator y Sys tem (20. 1- 20. 15)	Sk ill E m be dd ed Co urs es De vel op me nt

MPH	105P			Phar	maceut	ics Pra	actical				L	Т]	P		С	
Versio	on 1.0										0	0	12		6		
Total	Conta	ct Hou	rs	180 H	lrs.												
Pre-re	equisit	es/Exp	osure	Pharn	naceuti	cs											
Co-re	quisite	S		Nove	Drug	Delive	ry Syste	ems									
								Co	urse O	bjectives	5						
Upon	comple	etion of	this co	ourse th	e stude	nt shou	uld be a	ble to:									
To im	part pra	actical	knowle	dge ab	out var	ious an	alytical	l techni	iques ai	nd formu	lation an	d evalua	tion of va	arious do	sage for	mulation	ıs.
								Cours	se Outo	comes (C	CO)						
On co	mpletio	on of th	is cour	se, the	student	s will b	be able	to:									
CO1:	Worki	ng of U	V, HP	LC and	chrom	atogra	phic tec	hnique	es								
CO2:	O2: Estimations of formulations by UV and HPLC methods																
CO3:	CO3: Estimations of drugs by fluorimetry and other spectrophotometric drugs.																
CO4:	Pre foi	mulati	on stud	ies and	dissolu	ition st	udies o	f vario	us form	nulations	•						
CO5:	Formu	lations	and ev	aluatio	n of va	rious d	osage f	orms									
							Pı	rooran	ıme an	d Cours	e Manni	inσ					
										PO		PSO	PSO				
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	10	PO11	1	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=ligh	tly ma	oped		2= mo	deratel	y mappe	d	3=str	ongly ma	pped	•		

Unit	Relevance to the local, national, regional and	global developmental needs			Relevance To the Employability/ Entrepreneurshi	p/ Skill Development			Relevance to the	Professional	Ethics, Gender, Human Values, Environment &	Sustainability	SDG	NEP	POE/4 th IR
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development		Professional Ethics	Gandar	Human Values	Environment & Custeinability			
Analys is of pharm acopoe ial compo unds and their formul ations	-	-	-	Helps in Quality Control Globally	-	-	Hands training various instruments	on on	-	-	Right Conduct , Truth – Contains values like accuracy , fairness, honesty,	-	Skills for Decent Work (SDG 4.4) (To develop qualitative/q uantitave instrumental anlytical skill for	Professional Education (17.1-17.5)	Skill Develo pment
by UV Vis spectro photo meter Simult aneous	-	-	-	-	-	Hands on training on		-	-	justice, quest for knowled ge, determin ation. Right Conduct	-	future job) Skills for Decent	Professional Education	Skill Develo	
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estimat ion of multi compo nent contai ning formul ations by UV spectro photo metry						various instruments				and Truth		Work (SDG 4.4) (To develop qualitative/q uantitave instrumental anlytical skill for future job	(17.1-17.5)	pment	
Experi ments based on HPLC					-	Hands training various instruments	on on	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4) (To develop qualitative/q uantitave instrumental anlytical	Professional Education (17.1-17.5)	Skill Develo pment	

4. Experi ments based on Gas Chrom atogra phy	-	-	-	_	-	Hands training various instruments	on on	-	_	Right Conduct , accuracy , fairness, honesty, justice	_	skill for future job Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Employ ability
5. Estima tion of ribofla vin/qui nine sulphat e by fluori metry	-	-	-		-	Hands training various instruments	on on	-	-	Right Conduct and Truth	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Develo pment, Employ ability
Estima tion of sodiu m/pota ssium by flame	-	-	-			Hands training various instruments	on on			Right Conduct , accuracy , fairness,		Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Develo pment

photo metry							honesty, justice			
							Jastice			
	-	-	-					Skills for	Professional	"Skill
								Decent	Education	Develo
								Work	(17.1-17.5)	pment:
								(SDG 4.4)	(The topic	student
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										Employ

									bility
Formu lation	-	-	-					Professional Education (17.1-17.5) (The topic	Skill Embed ded Course s Develo pment" Skill Develo pment, Employ
evaluat ion of sustain ed release matrix tablets								covered theoretical/ practical aspects of instrumen that helps in future job in pharmaceutical Anaysis)	bility
Formu lation and evaluat ion osmoti									

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DDS								Ensura	Professional	"Skill
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and								healthy lives	Education	Develo
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Sem –II

MPH 201T	Molecular Pharmaceutics (Nanotechnology & Targeted Drug Delivery Systems; NTDS) (Theory)	L	Т	Р	С								
Version 1.0		4	0	0	4								
Total Contact Hours	60 Hrs.												
Pre-requisites/Exposure Pharmaceutics Conconsister Novel Drug Delivery Systems													
Co-requisites Novel Drug Delivery Systems													
	Course Objectives												
Upon completion of this co	purse the student should be able to:												
1. The various approaches	for development of novel drug delivery systems.												
2. The criteria for selection	n of drugs and polymers for the development of NTDS	S											
3. The formulation and eva	luation of novel drug delivery systems.												
	Course Outcomes (CO)	1											
On completion of this cour	rse, 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.

							Prog	ramme	and Co	urse N	lapping						
СО	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=light	tly mapp	bed	2=	modera	ately ma	pped		3=stror	igly ma	pped			

nit focal, 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/4 th IR	
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	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability		Professional Education (17.1-17.5)	Techni cal Skills that match Industr y Needs
Unit				Global Health care Needs. It will create revolut ion in the global heathc are service s by targeti ng	It will gen erat e diff eren t mo dule s for emp lom ents in						-	Ens ure heal thy live s and pro mot e well - bein g for all at all ages	Prof essi onal Edu cati on (17. 1- 17.5)	Techni cal Skills that match Industr y Needs

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	propell	g									

		ants and contain ers.	pro duct s for inte rve ntio nal resp irat ory diso rder s and dise aaes									
Unit IV		Global Heathc are Service s. It will improv e the drugs deliver	It will crea te emp loya bilit y driv e	-	-	-	-	-	-	Ens ure heal thy live s and pro mot e well	Prof essi onal Edu cati on (17. 1- 17.5)	Techni cal Skills that match Industr y Needs

		V	amo				-	
		throug	ng				bein	
		h	the				g	
		respirat	can				for	
		ory	dida				all at	
		system	tes				all	
		s, to	in				ages	
		improv	the				(ŠD	
		e	ind				G 3)	
		quality	ustr					
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		deliver	deal					
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			ory diso rder s and dise aaes						
Unit		Global Heathc are Service s. It will improv e the drugs deliver y throug h respirat ory system s, to improv e quality	It will crea te emp loya bilit y driv e amo ng the can dida tes in the ind ustr				Ens ure heal thy live s and pro mot e well - bein g for all at all ages (SD G 3)	Prof essi onal Edu cati on (17. 1- 17.5)	Techni cal Skills that match Industr y Needs

		and	ies					
		deliver	deal					
		y with	ing					
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MPH 202T	ADVANCED BIOPHARMACEUTICS &	L	Т	Р	С

				PHAR	RMACO)KINE'	TICS (7	Fheory)								
Versio	on 1.0										4	0	0		4		
Total	Conta	ct Hou	rs	60 Hrs	5.												
Pre-re	equisite	es/Exp	osure	Bioph	armaceu	itics and	l Pharm	acokine	etics								
Co-re	quisite	S		Clinic	al Pharn	nacokin	etics										
								Course	e Objec	tives							
Upon	comple	etion of	this co	urse the	studen	t should	be able	e to:									
1. The	basic o	concept	ts in bio	opharma	aceutics	and pha	armacok	cinetics.									
2. The	use ra	w data	and de	rive the	pharma	cokineti	c mode	ls and p	aramete	ers that	best des	cribe th	e proce	ss of dru	g absorp	tion,	
distrib	ution, 1	metabo	lism ar	d elimi	nation.												
3. The	critica	l evalua	ation of	f biopha	rmaceu	tic studi	es invo	lving dr	ug prod	uct equ	ivalency	<i>y</i> .					
4. The	design	and ev	valuatio	on of do	sage reg	gimens o	of the dr	ugs usii	ng phari	macoki	netic and	l bioph	armaceu	utic parai	neters.		
5. The	potent	ial clin	ical ph	armacol	cinetic p	oroblem	s and ap	plicatio	on of bas	sics of p	pharmac	okineti	С				
							C		toom		`						
0	1	6.1	•	.1	. 1 .	.11.1		burse O	utcome	es (CO))						
On co	mpletic	on of th	1s cour	se, the s	tudents	will be	able to:			•			c1 · 1				
CO 1.	The co	ourse gi	ves fui	ndament	tal learn	ing of b	asic the	oretical	discuss	sions of	the prin	ciples of	of bioph	armaceu	tics and		
pharm	acokin	etics.	desia			1 . d .	ام ام مع	-:11.0		fordoa	1 1 .	4:	.d.d.a.a	a dina tan		40.0mm]	4 1 • •
CO 2.	i fills c	bormoo	oution	had to II	in proof	ionl pro	blom co	kills net		for dose	e calcula	mons a	la dose	aujustine	ents and	to apply	the
	The su	bject o	ime at	applying	ni praci	rmaceu	tical co	nvilig. nsiderat	ions in	drug pr	oduct de	signing	tharak	w predic	ting its i	n vitro	
behavi	ior	ibjeet a	mis at	appiying	golopin	umaccu		lisiucia	.10115 111	urug pi	ouuciu	Jorginne	z, meret	by predic	ting its i	II-vitt0	
CO 4	The sr	ibiect o	ffers to	develo	n an iind	lerstand	ling of d	lrug_nra	oduct ne	erforma	nce in vi	ivo and	l in-vitr	o and in-	vivo cor	relation	
CO 5.	The co	ourse of	ffers to	provide	e knowle	edge on	the pha	rmacok	inetics a	and pha	rmacod	vnamics	s of biot	technolog	ev drugs		
				I · · · ·		0	· · I · ·			I I	• • • • • •				5,		
							Prog	ramme	and Co	ourse N	Aapping	5					
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO11	PS	PSO	PSO3	PSO4	PSO5	PSO6
	101	102	105	104	105	100	10/	100	107	10		01	2	1505	1004	1505	1000
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	2	1			
CO5	3	2	1		1		2	1					2	1						
				1=light	ly mappe	ed	2=	moderate	ly map	ped		3=stroi	ngly m	apped						
Unit	nce to the national,	al and	pmental						ance To the	loyability/ reneurship/	Skill elopment	4		ance to une fessional s, Gender,	an Values,	onment & ainability		SDG	NEP	ıE/4 th IR
	Releva local, 1	region: global	develo needs						Releva	Entrep	Dev			Pro Ethic	Hum	Envii Sust				PO
	Local		Regional			National		Global	Employability	Entrepreneurship		Skill Development			Gender	Human Values	Environment & Sustainability			
Unit I								Global Health care Needs. It will	It will brin g emp		-	-	-		-	_	-	Ens ure heal thy live	Prof essi onal Edu cati	Techni cal Skills that match

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v		Health	will							ure	essi	cal
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		pharma	urtu							e)	
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		forms,	Os							all		
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		ts.					

MPH 203T	Computer Aided Drug Development (Theory)	L	Т	Р	С
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	5			
Upon completion of this con	urse the student should be able to:				
 History of Computers in 2. Computational Modelling Computers in Preclinical Optimization Techniques Computers in Market An Computers in Clinical De Artificial Intelligence (A) Computational fluid dyna 	Pharmaceutical Research and Development g of Drug Disposition Development in Pharmaceutical Formulation alysis evelopment I) and Robotics amics (CFD)				
	Course Outcomes (C	CO)			
On completion of this cours	e, 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.

							Pro	gramn	ne and	Course	e Mappi	ng					
СО	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=light	ly map	ped	2	= mode	erately 1	napped	l	3=str	ongly m	apped			

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

Unit		CADD has revolutionized the	Employabili	Entrepr	Skilled	-	-	-	-	Sustai	Quality	Global
Ι		field of pharmacy by leveraging	ty: Drug	eneursh	person in					nable	Universitie	Educati
		computational power to enhance	design and	ip:	Computer					Devel	s and	on
		drug discovery and	drug	Researc	aided drug					opme	Colleges: A	Knowle
		development. Its global impact	discovery	h	delivery					nt and	New and	dge
		includes accelerated timelines,	research	consult	molecular					Globa	Forward-	Practic
		increased success rates, cost	institutes	ancy	modeling					1	looking	al
		reduction, personalized	Pharmaceuti		softwares					Citize	Vision for	Course
		medicine, and improved	cal sectors		work in					nship	India's	s from
		knowledge in pharmaceutical	Academics		drug					(SDG	Higher	Industr
		sciences.			design,					4.7)	Education	y/Alum
					pharmaceu					Youth	System	ni
					ticals					and	(9.1-9.3)	Techni
					research					Adult	Professiona	cal
					and					Litera	1 Education	Skills
					academic					cy	(17.1-17.5)	that
					sectors.					(SDG	Promoting	match
										4.6)	Highj-	Industr
										Schol	quality	У
										arship	research	Needs
										s for	(18.1-18.9)	Focus
										Highe	Technology	on
										r	Use &	Employ
										Educa	Integration	ability
										tion	(23.1-	Skills
										(SDG	23.13)	(Local/
										4.b)		Region
										Revita		al and

						lize	Global)
						the	Interns
						global	hip
						partne	Progra
						rship	ms
						for	Consult
						sustai	ing
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						(SDG	ions
						17)	Entrepr
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							Innovat
							ion
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Unit	-	-	Computational modeling of drug	Employabili	Entrepr	Skilled	-	-	-	-	Sustai	Quality	Global
II			disposition has had a profound	ty: Drug	eneursh	person in					nable	Universitie	Educati
			impact on pharmacy by	design and	ip:	Computer					Devel	s and	on
			improving drug dosing	drug	Researc	aided drug					opme	Colleges: A	Knowle
			strategies, predicting drug	discovery	h	molecular					nt and	New and	dge
			interactions, optimizing therapy	research	consult	modeling					Globa	Forward-	Practic
			in special populations, reducing	institutes	ancy	softwares					1	looking	al
			the need for animal testing, and	Pharmaceuti		work in					Citize	Vision for	Course
			accelerating the drug	cal sectors		drug					nship	India's	s from
			development process.	Academics		design,					(SDG	Higher	Industr
						pharmaceu					4.7)	Education	y/Alum
						research					Youth	System	ni
						and					and	(9.1-9.3)	Techni
						academic					Adult	Professiona	cal
						sectors.					Litera	1 Education	Skills
											cy	(17.1-17.5)	that
											(SDG	Promoting	match
											4.6)	Highj-	Industr
											Schol	quality	у
											arship	research	Needs
											s for	(18.1-18.9)	Focus
											Highe	Technology	on
											r	Use &	Employ
											Educa	Integration	ability
											tion	(23.1-	Skills
											(SDG	23.13)	(Local/
											4.b)		Region
											Revita		al and

											lize the global partne rship for sustai nable devel opme nt (SDG 17)		Global) Interns hip Progra ms Consult ing Field Project s Simulat ions Entrepr eneursh ip Progra m through Innovat
													Innovat ion
Unit			Computer aided formulation	Employabili	Entropy	Claillad					Sustai	Quality	System
	-	-	development has made		Entrepr	person in	-	-	-	-	Sustal	Universitie	Global
111			development mas made a	ty. Diug	in	Computer					Daval	Universitie	
			significant global impact on the	drug	Ip. Dogooro	aided drug					opma	S and	VII
			pharmaceutical mustry by	diagonamy	kesearc h	delivery						Now and	daa
			accelerating formulation	uiscovery	11 	molecular					nt and	new and	uge Dragtic
			development, enhancing	research	consult	modeling						Forward-	Practic
			tormulation performance,	institutes	ancy	softwares					1	looking	al

reducing costs and maste	Dhammaaarti	workin	Citize	Vision for	Course
reducing costs and waste,	Pharmaceuu	work III		VISION IOF	Course
tailoring formulations for	cal sectors	design	nship	India's	s from
specific delivery systems,	Academics	nharmaceu	(SDG	Higher	Industr
improving quality control,		ticals	4.7)	Education	y/Alum
integrating formulation and drug		research	Youth	System	ni
design, and facilitating global		and	and	(9.1-9.3)	Techni
knowledge sharing and		academic	Adult	Professiona	cal
collaboration.		sectors.	Litera	1 Education	Skills
			су	(17.1-17.5)	that
			(SDG	Promoting	match
			4.6)	Highj-	Industr
			Schol	quality	у
			arship	research	Needs
			s for	(18.1-18.9)	Focus
			Highe	Technology	on
			r	Use &	Employ
			Educa	Integration	ability
			tion	(23.1-	Skills
			(SDG	23.13)	(Local/
			4.b)		Region
			Revita		al and
			lize		Global)
			the		Interns
			global		hip
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Unit	-	-	Computer-aided	Employabili	Entrepr	Skilled	-	-	-	-	Sustai	Quality	Global
IV			biopharmaceutical	ty: Drug	eneursh	person in					nable	Universitie	Educati
			characterization has had a	design and	ip:	Computer					Devel	s and	on
			significant global impact on the	drug	Researc	aided drug					opme	Colleges: A	Knowle
			development, optimization, and	discovery	h	delivery					nt and	New and	dge Dractic
			characterization of	research	consult	molecular					Globa	Forward-	Practic
			biopharmaceutical products	institutes	ancy	softwares					I Citize	Vision for	al Course
			products.	Pharmaceuti	uney	work in					nshin	India's	s from
				cal sectors		drug					(SDG	Higher	Industr
				A andomica		design,					4.7)	Education	y/Alum
				Academics		pharmaceu					Youth	System	ni
						ticals					and	(9.1-9.3)	Techni
						research					Adult	Professiona	cal
						and					Litera	1 Education	Skills
						academic				1	cv	(17.1-17.5)	that

			sectors.			(SDG	Promoting	match
						4.6)	Highj-	Industr
						Schol	quality	у
						arship	research	Needs
						s for	(18.1-18.9)	Focus
						Highe	Technology	on
						r	Use &	Employ
						Educa	Integration	ability
						tion	(23.1-	Skills
						(SDG	23.13)	(Local/
						4.b)	,	Region
						Revita		al and
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						the		Interns
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										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.	Employabili ty: Drug design and drug discovery research institutes Pharmaceuti cal sectors Academics	Entrepr eneursh ip: Researc h consult ancy	Skilled person in Computer aided drug delivery molecular modeling softwares work in drug design, pharmaceu ticals research and academic sectors.			Sustai nable Devel opme nt and Globa 1 Citize nship (SDG 4.7) Youth and Adult Litera cy (SDG 4.6) Schol arship s for Highe r Educa tion (SDG 4.b) Revita	Quality Universitie s and Colleges: A New and Forward- looking Vision for India's Higher Education System (9.1- 9.3) Professiona I Education (17.1-17.5) Promoting Highj- quality research (18.1-18.9) Technology Use & Integration (23.1- 23.13)	Global Educati on Knowle dge Practic al Course s from Industr y/Alum ni Techni cal Skills that match Industr y Needs Focus on Employ ability Skills (Local/ Region al and
								r Educa tion (SDG 4.b) Revita lize	Use & Integration (23.1- 23.13)	Emj abil Skil (Loo Reg al an Glo

						the	Interns
						global	hip
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						rship	ms
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MPH 204T	Cosmetics And Cosmoceuticals- (Theory)	L	Т	Р	С								
Version 1.0		4	0	0	4								
Total Contact Hours60 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 v	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= moder									deratel	y mapped		3=strongly mapped						

1 2

Unit	Relevance to the local, national, regional and global	Relevance To the	Relevance to the			
	developmental needs	Employability/	Professional Ethics,			R
		Entrepreneurship/ Skill	Gender, Human Values,	J	NEP	th I
		Development	Environment &	Ŝ		E/4
			Sustainability			DO

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit	•-			Individual know Regulation/ provisions for import, manufactur e and sale of different cosmetics product			Individual know well about nation & internation al Regulation s for import , export, manufactu re & sales of cosmoceut icals					Revit alize the globa l partn ership for sustai nable devel opme nt (Role of all Scho ols, KRM U)	Pro fess ion al Ed uca tio n (17. 1- 17. 5) Pro mo tin g Hig hj- qua	Techni cal Skills that match Industr y Needs, Entrepr eneursh ip, Employ ability
							(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 requiremen ts			a varie ty of sourc es		
Unit IV	- Proper & best utilization of natural resources in formulating different cosmeceuti cal products	z In sk in an pe	ncrease in kill of an adividual ad ersonals.	Ensur e l health l y y lives l and d prom l ote e well- a d being l for all (at all l ages 2 (SDG l 3) Ensu re sustai nable consu mpti on and prod uctio n	Tec H hno co log H y y Use y & ((Int H egr a atio (C n) (23. 1- 23. 13)	Focus on Emplo /abilit / Skills Local/ Region al and Global

			pa rn (Sl 12	tte 3 DG)	
Unit v	Proper & best utilization of natural resources in cosmeceuti cal.	Better utilization of different Natural resources in health and beauty care.	En re su: na co: mj on an pr uc n pa rn (Si 12	su Tec hno stai log ble y nsu Use & d Inte od grat tio ion (23. 1- s DG 13)	Corpor ate Allianc es to provid e Big Sister/ Big Brothe r Conne ctions

MPH 205P	Pharmaceutical Practical-II	L	Т	Р	С
Version 1.0		0	0	12	6
Total Contact Hours	180 Hrs.				
Pre-requisites/Exposure	Pharmaceutics Practical - II				

Co-requisites	Pharm	naceuti	cs											
					Co	urse Ot	jectives	5						
Upon completion of this	course th	e stude	nt shou	ıld be a	ble to:									
1. To understand the basi	c compoi	nents o	f cosm	etics' fo	ormulat	ion and	their ev	aluation	paramete	ers.				
2. To get basic understan	ling of re	elated f	formula	tion op	timizat	tion soft	wares.							
3. To formulate controlle	l drug de	elivery	system	s.										
4. To get well versed with	a calculat	tions re	elated to	o drug j	pharma	cokinet	ics							
					Cours	e Outc	omes (C	(O)						
On completion of this co	rse, the	student	s will b	be able	to:	c oute		.0)						
I I I I I I I I I I I I I I I I I I I														
CO 1. The course offers	o provid	e hand	s on ex	perienc	e on fo	rmulati	on and e	valuatio	n of cosn	netics.				
CO_2 The course provid	es to imn	art nec	essary	hasic s	zills for	r 11590e	of comp	uter ann	lications	in nharm	acentical	researc	h	
	is to mp	urt nee	essur y			usuge	or comp	ater upp	lications	in phain	uccuricu	researe		
CO 3. The subject provid	es learni	ng of f	ormula	tion da	ta analy	ysis Usi	ng Desig	gn Exper	t®					
CO 4. The subject intend	s to prov	ide ski	lls need	led to f	ormula	te the n	ovel dru	g deliver	y system	IS.				
5	I							e	5 5					
CO 5. The course offers	o provid	e skills	requir	ed to de	etermin	e pharn	nacokine	etic parar	neters an	d IVIVC	•			
				P	rogran	nme and	d Cours	e Mappi	ing					
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=ligh	tly map	oped		2= mo	oderatel	y mapp	ed	3=str	ongly	mapped						
Unit										<u> </u>									<u> </u>	<u> </u>
Om	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/4 th IR
	Local		Regional			National			Global	Employability	Entrepreneurship	Skill Development		Professional Ethics	Gender	Human Values	Environment & Sustainability		Professional Education (17.1-17.5)	Techni cal Skills that match Industr y Needs

Unit		Global	It	-	-	-	-	-	-	Ens	Prof	Techni
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Sem-III

MRM101T	Research Methodology and Biostatistics	L	Т	Р	С				
Version 2.0		4	0	0	4				
Total Contact Hours	Fotal 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																
СО	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	Т	Р	С
Version 1.0		0	0	1	1
Total Contact					
Hours					
Pre-	Pharmaceutics				
requisites/Exposure					

Co-requisites	Pharmaceutics
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MPH 303S	Discussion/ Presentation	L	Т	Р	С
Version 1.0		0	0	2	2
Total Contact Hours					
Pre-	Pharmaceutics				
requisites/Exposure					
Co-requisites	Pharmaceutics				

MPH 304P	Research Work	L	Т	Р	С
Version 1.0		0	0	28	14
Total Contact Hours					
Pre-	Pharmaceut	ics			
requisites/Exposure					
Co-requisites	Pharmaceut	ics			

Sem-IV

MPH 401S	Journal club (Presentation	L	Т	Р	С	
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)				
Version 1.0		0	0	1	1
Total Contact Hours					
Pre-	Pharmaceutics				
requisites/Exposure					
Co-requisites	Pharmaceutics				

MPH 402P	Research Work (Practical)	L	Т	Р	С
Version 1.0		0	0	31	16
Total Contact Hours					
Pre-	Pharmaceutic	S			
requisites/Exposure					
Co-requisites	Pharmaceutic	S			

MPH 403S	Discussion/ Presentation	L	Т	Р	С
Version 1.0		0	0	3	3
Total Contact Hours					
Pre-	Pharmaceutics				
requisites/Exposure					
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, 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	Т	Р	С									
Version 2.0		4	0	0	4									
Total Contact Hours		60 Hrs	5											
Pre-requisites/Exposure	Organi	ic Chem	istry-III											
Co-requisites	Co-requisites Analytical Chemistry													
Course Objectives														
 Upon completion of this control Study of various advance Identification, character Instruments dealt are N 	ourse the student should be able to: ced analytical instrumental techniques rization, and quantification of drugs by various techni MR, Mass spectrometer, IR, HPLC, GC etc.	iques												
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= mode							oderate	ly mappe	d		3=strong	gly mapp	ed					

Unit	ance to the national, nal and pmental	ance To the loyability/ preneurshi o/ Skill elopment	'ance to the ofessional cs, Gender, ian Values, ronment & tainability	SDG	NEP)E/4 th IR
	Relevan local, n regiona global develor needs	Releval Emple Entrep p/ Deve	Releva Prof Ethics Huma Envirc Susta	S	4	IOI

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Candar	Human Values	Environment & Sustainability			
Unit I	-		-	identific ation, characte rization and quantific ation of drugs using UV- Visible spectros copy, IR, Spectrof lourimet	-	-	Theoretical and practical skills of the instruments	-	-	Right Conduct , Truth – Contains values like accuracy , fairness, honesty, justice, quest for knowled ge, determin ation.	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Skill Develo pment

			ry and Flame emission spectros copy and Atomic absorpti on spectros copy										
Unit II	-	-	Identific ation, characte rization and quantific ation of drug using NMR Spectros copy.	-	-	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 Develo pment
Unit III	-	-	Identific ation, characte rization 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 Develo pment

				quantific ation of drug using Mass Spectros copy.										
Unit IV		-	-	Quantita tive and Qualitati ve analysis of Drugs using Chromat ographic techniqu es.	-	-	The analysis of various drugs in single and combination dosage form using Chromatographi c techniques.	-	-	Right Conduct , accuracy , fairness, honesty, justice	-	Skills for Decent Work (SDG 4.4)	Professional Education (17.1-17.5)	Employ ability
Unit v	-	-	-	Use of Electrop horesis in separati on and Quantita tive 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 Develo pment, Employ ability

Unit-	Immuno	Develop skills			Skills for	Professional	Skill
VI	logical	for diagnosis of			Decent	Education	Develo
	assays in	diseases,			Work	(17.1-17.5)	pment
	diagnosi	therapeutic drug			(SDG 4.4)		
	s of	monitoring,					
	diseases,	clinical					
	therapeu	pharmacokineti					
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	monitori	bioequivalence					
	ng,	studies in drug					
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MPL 102T	Advanced Pharmacology-I (Theory)	L	Т	Р	С
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Versio	n 2.0										4	0	(0		4	
Total	Contact	t Hours	5								60 Hrs						
Pre-re	quisites	s/Expos	sure							Ph	armacolo	gy-I					
Co-rec	quisites								Hum	an Ana	tomy and	Physiolog	gy -I				
								Cou	rse Ob	jectives	5						
Upon o	complet	ion of t	his cou	se the s	tudent s	should t	e able t	0:									
1.	Discus	s the pa	thophy	siology	and pha	irmacot	herapy (of certa	in disea	ses							
2.	Explai	n the m	echanis	m of dr	ug actio	ns at ce	llular aı	nd mole	ecular le	vel							
3.	3. Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases																
	Course Outcomes (CO)																
On cor	On completion of this course, the students will be able to:																
1. 7 2. 1 3. 1 4. 1 5. 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. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved Explain the various types of neurotransmitters and their receptors It gives information about the CNS disorders and drugs used for their treatment Explain the role of autacoid's and their pharmacology. 																
			[r		[Pr	ogram	me and	Cours	e Mappir	ng	1	1			1
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		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													
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	1 2 1 2 2 3 2 1 3 1											
				1=lig	htly ma	apped		2 = mode	erately	mappe	ed		3=stro	ongly map	ped					
Unit	Releva develo	ance to opmen) the lo tal neo	ocal, natio eds	onal, re	gional :	and glo	bal	Rele Emp Enti Deve	evance ployat reprer elopm	e To t bility/ neurs nent	he ′ hip/ S	kill	Relevan Professi Gender, Environ Sustaina	ce to the onal Etl Human ment & ability	e hics, n Valu	les,	SD G	NE P	POE/4 ^t ^h IR
	Local		Regi onal	National		Jlobal			Em plo yabi lity	Entr ener ip	repr ursh	Skill Deve ent	lopm							
Unit I					S k f e u ii	Student now harmac or ensu ffective ase of d nforms	will ology i uring t , and rugs gl drug re	able to general is crucial the safe, rational obally. It egulation,) 			Pharn ogy discij has signi ly contr	macol as a pline ficant ibute					(SD G 4.4)	(9.1 - 9.3)	Global Educati on Knowle dge, Skill Develo

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

Unit	The pharmacology of	c		(SD	(9.1	Global
III	drugs acting on the	decisions,		G	-	Educati
	central nervous system	ensure		4.4)	9.3)	on
	has profound various	drug				Knowle
	global applications such	safety, and				dge,
	as neurological and	contribute				Skill
	psychiatric disorders,	to patient				Develo
	pain management sleep	care. Skill				pment,
	disorders, substance	developme				Employ
	abuse, neuro-protection	nt in				ability
Unit	Cardiovascular drugs	pharmacol		(SD	(9.1	Global
IV	have extensive global	ogy		G	-	Educati
	applications and are	continues		4.4)	9.3)	on
	utilized in the	through				Knowle
	management of	lifelong				dge,
	hypertension, ischemic	learning				Skill
	heart disease, heart	and				Develo
	failure, arrhythmias,	interdiscip				pment,
	thromboembolic	linary				Employ
	diseases, dyslipidemia,	collaborati				ability
	pulmonary hypertension,	on,				
	valvular heart disease,	enabling				
	and secondary	profession				
	prevention strategies.	als to				
	They play a critical role	adapt to				
	in improving	new				
	cardiovascular health,	developme				
	reducing morbidity and	nts and				

	mortality rates	improve				
	associated with	patient				
	cardiovascular	outcomes.				
	conditions					
Unit	Autacoids used to			(SD	(9.1	Global
v	address inflammatory			G	-	Educati
	disorders, manage pain,			4.4)	9.3)	on
	treat cardiovascular					Knowle
	disorders, alleviate					dge,
	gastrointestinal and					Skill
	respiratory conditions,					Develo
	control allergic and					pment,
	immune responses,					Employ
	address reproductive					ability
	health issues, and					
	manage renal disorders					

MPL 103T	Pharmacological and Toxicological Screening Methods -I	L	Т	Р	С
Version 2.0		4	0	0	4
Total Contact Hours	6	60 Hrs			
Pre-requisites/Exposure	Pharmacological and Toxi	cologica	l Screening	g Methods -I	
Co-requisites	Fundamentals of Phar	macolog	y, Drug Di	scovery	
	Course Objectives				

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

Upon completion of the course the student shall be able to, Appraise the regulations and ethical requirement for the usage of experimental animals. 1. 2.

- 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

							Pr	ogramn	ne and (Course I	Mapping						
СО	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	O2 3 2 2 2 1 1 2 3 1 1											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=li	ightly m	apped		2 = mode	erately n	napped		3=strongl	y mappe	d			

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

	Local	Regional	National	Global	Employability	Entrepreneurshi p	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability	SDG	NEP	POE/4 th IR
Unit				Traine d the student s with the Globall y recogni zed work force, as toxicol ogy is the funda mental science			Toxicolog y and their guidelines will enable Skill developme nt			E n vi ro n m en t an d S us ta in ab ili ty		Qua lity pri mar y/ Sec ond ary Edu cati on for all (SD G4. 1)	Prof essi onal Edu cati on (17. 1- 17.5)	Skill Develo pment
Unit II		-	-	Traine d the student s to work as per the			OECD guidelines helps to perform the animal experimen tation					Skil ls for Dec ent Wor k	Pro mot ing Hig hj- qual ity	Organi zation for econom ic coopera tion

				global standar ds and make them availab le for ready to work		thus engaged in Skill developme nt			(SD G 4.4)	rese arch (18. 1- 18.9)	and develop ment trained the student s and thus help in Skill
											pment
Unit	-	-	-	Over		Reproduct	E		Skil	Effe	Employ
III				populat		ive animal	n		ls fau	ct1v	ability
				1011 1S		screening	V		10r	e Gov	
				Challa		students	n)	Dec	GOV	
				chane ng of		for pre	11		Wor	nce	
				the all		clinical	11	n	k vv 01	1100 &	
				the an		research	t	•	(SD	Lea	
				countri		and	a	n	G	ders	
				es. It		developme	d		4.4)	hip	
				becam		nt Skill	S		,	(19.	
				e a		developme	u	5		1-	
				global		nt	ta			19.5	
				proble			ir	l)	
				m. In			al)			
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				student			ty	,			
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			ferlitily					
			agents					
			and					
			populat					
			ion					
			control					
			method					
			S					
Unit	-	-	Skilled	In this,		Skil	Pro	Employ
IV			the	students		ls	mot	ability
			student	will able		for	ing	
			s to fill	to file the		Dec	Hig	
			and	Investigati		ent	hj-	
			apply	on drug		Wor	qual	
			for the	applicatio		k	ity	
			IND	n after the		(SD	rese	
			across	pre		G	arch	
			the	clinical		4.4)	(18.	
			varius	reports.			1-	
			approv				18.9	
			al)	
			agenci					
			es					
			(FDA,					
			DCGI					
			etc)					

Unit		Using		Based on			Qua	Prof	Second
v		the		alternative			lity	essi	ary
		princip		s methods			pri	onal	researc
		le of 3		of animal			mar	Edu	h and
		R, that		experimen			у/	cati	trails
		globall		tation this			Sec	on	studies
		у		promotes			ond	(17.	trained
		harmo		the In			ary	1-	the
		nized		silico			Edu	17.5	student
		,Skille		studies			cati)	s to get
		d the		and helps			on		the
		student		in Skill			for		training
		s to		developme			all		on live
		perfor		nt			(SD		projects
		m the					G4.		and
		experi					1)		thus
		ment							helps in
		based							Employ
		on 3 R							ability
		princip							
		le and							
		inventi							
		ng new							
		method							
		as per							
		the							
		alternat							
		ive to							
		animal							
		S							
		experi							
		mentati							

		on					

MPL 104T	Cellular and Molecular Pharmacology	L	Т	Р	С							
Version 2.0		ar and Molecular Pharmacology L T P C 4 0 0 4 60 Hrs 60 Hrs Pharmacology-I, II, III Human anatomy and Physiology -I Course Objectives tudent should be able to: ansduction processes. tys affected by drugs. f molecular pharmacology and • • process. gy techniques as applicable for pharmacology Course Outcomes (CO) data knowledge on the structure and functions of cellular components and help to understand the interaction										
Total Contact Hours	OdT Cellular and Molecular Pharmacology L T P C n 2.0 4 0 0 4 Contact Hours 60 Hrs 9000000000000000000000000000000000000											
Pre-requisites/Exposure	Pharm	nacology	-I, II, III									
Co-requisites	Human ana	tomy and	l Physiolog	gy -I								
	Course Objectives	5										
Upon completion of this cour	rse the student should be able to:											
 Explain the receptor s Explain the molecula Appreciate the applic Biomarkers in drug d Demonstrate molecul 	signal transduction processes. r pathways affected by drugs. ability of molecular pharmacology and iscovery process. ar biology techniques as applicable for pharmacolog	у										
	Course Outcomes (C	:O)										
On completion of this course	e, the students will be able to:											
 The subject imparts a fu of these components with The subject also designed It helps in detail underst The students will be abl This information will fu 	indamental knowledge on the structure and functions th drugs. ed to impart knowledge about the various cell death p canding of molecular biology techniques like western e to understand about the cell culture techniques. wither help the student to apply the knowledge in drug	of cellul pathways blotting g discove	ar compor and PCR ry process.	ents and help to	understand the interaction							

							Pı	rogramn	ne and	Cours	se Map	pping								
СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO1	1 PS	0	PSO 2	PSO:	3]	PSO4	PSO5	PSO	6
CO1	2	1	1	3	2	2	1	2	3	2	1	2) /	1	3		3	1	2	
CO2	3	2	2	1	3	1	2	1	2	1	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																			
Init Relevance to the local, national, regional and developmental needs needs						T	Relevance To the	Employability/ Entrepreneurshi	p/ Skill Development			Relevance to the Professional Ethics, Gender,	Human Values, Environment &	Sustainability		SDG	NEP	POE/4 th IR		
	Local	-	Kegional			National		Global	Employability	Entrepreneurshi	d	Skill Development		Professional Ethics	Gender	Human Values	Environment & Sustainability			
Jnit	-	-				-		Cell	-		-	Understar	ı ·	-	-	-	-	SD	Prof	Tec
								biolog				ding						G	essi	cal
								y,Struc				basics of	of					4.4	onal	Ski
								turo	1	1		a a 11					1	a mal	a .d	1
		and				SD	cati	match												
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		functio				G 3	on	Industr												
		ns of						У												
		cell,						Needs												
		signali						(by												
		ng						giving												
								recent												
								updates												
								in												
								pharma												
								industr												
								У												
								which												
								will												
								help in												
								creatin												
								g job												
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								nity),												
								Hands-												
								on												
								Experie												
								nce												
								Employ												
								ability												
								Skill												
								Develo												
								pment												

Unit	-	-	Cell	Unders	-	-	Understan	-	-	-	-	SD	Pro	-
II			signaling,	tanding			ding cell					G 3	mot	
			Intercellular	signali			signalling						ing	
			and	ng			pathways						high	
			Extracellular	pathwa			in various						qual	
			signaling	У			disease						ity	
			pathways										rese	
													arch	
Unit	-	-	Principles	Treatm	-	-	То	-	-	-	-	SD	Prof	-
III			and	ent of			understand					G 3	essi	
			applications	cancer			genetic						onal	
			of genomic	other			basis of						edu	
			and	disease			various						cati	
			proteomic	using			diseases						on	
			tools DNA	gene										
			electrophore	transfe										
			sis	r										
Unit	-	Pharmacogenomics	Pharmacoge	Import	-	-	Understan	-	-	-	-	SD	Prof	Techni
IV		Gene mapping and	nomics	ance of			ding					G	essi	cal
		cloning of disease	Gene	gene			basics of					4.4	onal	Skills
		gene	mapping and	mappin			genomics						edu	that match
			cloning of	g in			in various						cati	Industr
			disease gene	diagno			diseases						on	y
				sis of										Needs,
				various										Skill
				disease										Develo
														pment

Unit v	Cell culture techniques ,Basic equipments used in cell culture lab	To effecti vly underst and basic techniq ues in cell culture and its applica tions.	-	-			SD G 4.4	Prof essi onal edu cati on	Techni cal Skills that match Industr y Needs, Hands on experie nce

MPL 105P Pharmacology Practical -I	L	Т	Р	С
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Versio	on 2.0										0		0	1	12		6	
Total	Contact I	Hours									180 H	[rs						
Pre-re	quisites/l	Exposi	ure							Pharm	acology	Prac	ctical -I					
Co-ree	quisites								Hum	an Ana	atomy an	nd P	hysiolog	gy -I				
								Cou	rse Obj	jective	S							
Upon o	completio	on of th	is cour	se the s	tudent s	should b	e able	to:										
 An. spe Sin Sin spe Exj Exj Exj Exj Exj Exj Hat 	alysis of p actrophoto nultaneou actrophoto periments periments imation o imation o ndling of	pharma ometer s estim ometry based based of ribof of sodiu laborat	ncopeia nation c on HP on Gas lavin/q um/pota tory an	l compo of multi LC s Chron uinine s assium b imals.	ounds a compo natograj sulphate oy flam	nd their nent cor phy e by fluc e photor	formul ntaining primetry netry	lations b g formul y	y UV V ations t	'is oy UV								
								Course		mes (((O							
On cor	npletion of	of this	course.	the stu	dents w	ill be al	ole to:	Course	Juico	mes ((,							
 Thi ani It ii It h The 	is subject mals used mparts the elps the s e subject a	is des l in the e pract tudent also de	igned t experi ical kno s to lea signed	o impar mental owledge rn abou to impa	rt funda pharma e on mc t different nrt knov	umental acology. blecular ent roots vledge a	knowle biology s drug a bout th	edge abo y technic administ ae regula	put the p pues ration a tory bo	$\frac{1}{1}$	hods of	al exp	cperiment	nts, anin Irawal s on anin	nal's han mals like	dlings an CPCSEA	d about o	lifferent
	DO1 1		DOA	DO (DO5	DOC	P	rogram	me and	Cours	se Mapp	oing	DCC	DGG	DCOC	DCO 1	DCO F	DCO
CO	PO1]	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO11		PSO	PSO	PSO3	PSO4	PSO5	PSO6

CO4	1	2	3	2	2	1	2	3	1	2 3	3 3	1	2		3	2	1	
				1=lig	htly ma	apped		2 = mode	erately r	napped	3=stro	ngly mapp	ed					
Unit	Relevance to the local, national, regional and	global develonmental	needs						Relevance To the	Entrepreneurshi p/ Skill Develonment		Relevance to the Professional Ethics, Gender,	Human Values,	Environment & Sustainability		SDG	NEP	POE/4 th IR
	Local	Dartional	Negloliai			National		Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I								This unit covers the practic al approa ches or animal experi	f		Hands on training of different techniques , s that students can learn the in					Skil ls for Dec ent Wor k (SD G 4.4)	Pro mot ing Hig h- qual ity rese arch (18.	Soft Skills

										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=lig	ghtly ma	pped		2 = mod	lerately	mapped	1	3=stron	gly map	ped			

			mentati on in labs Skill develo pment	vivo, ex vivo and in vitro techniques			1- 18.9)	
Unit II	-	-	Differe nt instru ments are used n measur ement of BP, Skill develo pment	Hands on training of different techniques		-	-	Soft Skills
Unit III	-	-	Hands on trainin g of differe nt techniq ues	Hands on training of different techniques		Skil ls for Dec ent Wor k (SD G 4.4)	Effe ctiv e Gov erna nce & Lea ders hip (19. 1- 19.5	Skill Develo pment

Unit	-	-	Skill					-)	Skill
IV			develo pment							Develo pment
Unit			Design		Hands on			Rev	Tra	Soft Strille
V			Ing of In		training of			ze	rmi	SKIIIS
			silico		techniques			the	ng	
			studies		teeninques			glob	the	
			helps					al	Reg	
			the					part	ulat	
			s to get					hip	Svst	
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			trainin					sust	(20.	
			g on					aina	1-	
			lead					ble	20.1	
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			Zation Skill					elop		
			develo					t		
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Semester-II

MPL 201T	Advanced Pharmacology-II (Theory)	L	Т	Р	С
Version 2.0		4	0	0	4
Total Contact Hours		60 Hr	s		
Pre-requisites/Exposure	Advanc	ed Pharr	nacology -I		
Co-requisites	Cellular and	Molecula	ar Pharmaco	ology	
	Course Objective	S			
Upon completion of this cou	rse the student should be able to:				
 Explain the mechanism of Discuss the Pathophysiolo Understand the adverse effective 	drug actions at cellular and molecular level gy and pharmacotherapy of certain diseases fects, contraindications and clinical uses of drugs use	ed in trea	tment of dis	seases	
	Course Outcomes (C	CO)			
On completion of this course	e, the students will be able to:				
 The subject is designed to the treatment of various dises In addition, the subject help 	o strengthen the basic knowledge in the field of phar ases. Ips the student to understand the concepts of drug act	macolog	gy and to in mechanism	npart recent adva involved.	nces in the drugs used for
3. This subject provides the l	knowledge of endocrine pharmacology, chemotherap	y, antibi	otics, and ir	nmunology.	

4. Student can understand the diseases like Parkinsonism, cancer, Alzheimer, diabetes mellitus and its treatment.

							P	rogram	me and	Cour	se Mar	pping	Г 9							
СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO1	1	PSO 1	PSO 2	PSO3	B PSO	4 PS	505	PSO	6
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=lig	ghtly m	apped		2= mod	erately	mappe	ed		3=stron	igly mapp	oed					
Unit	Relevance to the local, national,	regional and global	developmental needs						Relevance To the	Employability/ Entrepreneurshi	p/ Skill Development			Relevance to the Professional Ethics. Gender.	Human Values, Environment &	Sustainability		SDG	NEP	POE/4 th IR
	Local		Regional			National		Global	Employability	Entrepreneurshi	b	Skill Develonment		Professional Ethics	Gender	Human Values Environment &	Sustainability			
Unit	-	-				-		Molec	-		-	Unde	erstan	-	-		S	SD	Prof	Techn
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								and				mole	cular				4	4.4	onal	Skills
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5. It also deals with the free radical pharmacology, its etiology and pathophysiology in various neurodegenerative diseases

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Unit	-	Understanding	-	-	-	-	Understan	-	-	-	-	SD	Prof	Techni
IV		pharmacology f drugs					ding					G	essi	cal Strille
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Unit	Free	Understanding Role	-	-	-	-	Role of		SD	Prof	Techni
v	radicals	of free radicals in life					free		G	essi	cal
	Pharmacol	style and aging.					radicals in		4.4	onal	Skills
	ogy						neurodege			edu	that
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											nce

MPL 202T	PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS- II (Theory)	L	Т	Р	С						
Version 2.0		4	0	0	4						
Total Contact Hours	itact Hours 60 Hrs										
Pre-requisites/Exposure	Pharmacological and To	oxicolog	gical Screening N	Methods -I							
Co-requisites	Co-requisites Fundamentals of Pharmacology, Drug Discovery										
Course Objectives											
Unon commission of this of											

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																	
СО	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 r	napped		2= mo	derately	mappe	ed	3=st	rongly	mapped	1			

Unit	Relevance to the local, national, regional and global developmental needs	Relevance To the Employability/ Entrepreneurshi p/ Skill Development	Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability	SDG	NEP	POE/4 th IR
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	Local	Regional	National	Global	Employability	Entrepreneurshi p	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I				Traine d the student s with the Globall y recogni zed work force, as toxicol ogy is the funda mental science			Toxicolog y and their guidelines will enable Skill developme nt			E n vi ro n m en t an d S us ta in ab ili ty		Qua lity pri mar y/ Sec ond ary Edu cati on for all (SD G4. 1)	Prof essi onal Edu cati on (17. 1- 17.5)	Skill Develo pment
Unit II		-	-	Traine d the student s to work as per			OECD guidelines helps to perform the animal experimen					Skil ls for Dec ent Wor	Pro mot ing Hig hj- qual	Organi zation for econom ic coopera

		global standar ds and make them availab le for ready to work		thus engaged in Skill developme nt		(SD G 4.4)	rese arch (18. 1- 18.9)	and develop ment trained the student s and thus help in Skill Develo pment
Unit III	-	Over populat ion is the Challe ng of the all the countri es. It becam e a global proble m. In this, student s learn the and		Reproduct ive animal screening trained the students for pre clinical research and developme nt Skill developme nt	E n vi ro n m en t an d S us ta in ab ili ty	Skil ls for Dec ent Wor k (SD G 4.4)	Effe ctiv e Gov erna nce & Lea ders hip (19. 1- 19.5)	Employ ability

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Unit	-	-	Skilled	In this,		Skil	Pro	Employ
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			student	will able		for	ing	
			s to fill	to file the		Dec	Hig	
			and	Investigati		ent	hj-	
			apply	on drug		Wor	qual	
			for the	applicatio		k	ity	
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			the	clinical		4.4)	(18.	
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			approv				18.9	
			al)	
			agenci					
			es					
			(FDA,					
			DCGI					
			etc)					

Unit		Using		Based on			Qua	Prof	Second
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MPL 203T	Principles of Drug Discovery	L	Т	Р	С						
Version 2.0		4	0	0	4						
Total Contact Hours	60 Hrs										
Pre-requisites/Exposure	Medici	inal Cher	nistry -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																
СО	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
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Re glo de de	E H S				

	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I	-	-	Drug	-	-	-	Activitie	-	-	-	-	Skills for	Profess	Techni
			discove				online					Decem		
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			country				dutodock					and hands	Highi-	Hands-
												on training)	anality	on
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													h	nce
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													18.9)	

Unit II	-	-	-	Learnin	-	-	Activitie	-	-	-	-	Skills	for	Profess	Techni
				g of			s on					Decent		ional	cal
				Techni			online					Work;		Educat	Skills
				ques			available					Research	h-	ion	that
				help to			ional soft					related		(17.1-	match
				discove			wares					skills		17.5);	Industr
				r drugs			like					(case st	udy,	Promot	у
							schrodin					seminars	s	ing	Needs/
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							discover					on train	ning)	quality	on
							y studio					(SDG 4.	.4)	researc	Experie
														h	nce
														(18.1-	
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Unit III	-	-	-	Target	-	-	on online	-	-	-	-	Skills	for	Profess	Techni
Unit III	-	-	-	Target identifi	-	-	on online available	-	-	-	-	Skills Decent	for	Profess ional	Techni cal
Unit III	-	-	-	Target identifi cation	-	-	on online available computat	-	-	-	-	Skills Decent Work;	for	Profess ional Educat	Techni cal Skills that
Unit III	-	-	-	Target identifi cation and	-	-	on online available computat ional soft wares	-	-	-	-	Skills Decent Work; Researcl	for h-	Profess ional Educat ion	Techni cal Skills that match
Unit III	-	-	-	Target identifi cation and validati	-	-	on online available computat ional soft wares like	-	-	-	-	Skills Decent Work; Researcl related	for h-	Profess ional Educat ion (17.1-	Techni cal Skills that match Industr
Unit III	-	-	-	Target identifi cation and validati on help	-	-	on online available computat ional soft wares like schrodin	-	-	-	-	Skills Decent Work; Researcl related skills	for h-	Profess ional Educat ion (17.1- 17.5);	Techni cal Skills that match Industr y
Unit III	-	-	-	Target identifi cation and validati on help in drug	-	-	on online available computat ional soft wares like schrodin ger,	-	-	-	-	Skills Decent Work; Researcl related skills (case st	for h- udy,	Profess ional Educat ion (17.1- 17.5); Promot	Techni cal Skills that match Industr y Needs/
Unit III	-	-	-	Target identifi cation and validati on help in drug discove	-	-	on online available computat ional soft wares like schrodin ger, discover	-	-	-	-	Skills Decent Work; Research related skills (case st seminars	for h- udy, s	Profess ional Educat ion (17.1- 17.5); Promot ing	Techni cal Skills that match Industr y Needs/ Hands-
Unit III	-	-	-	Target identifi cation and validati on help in drug discove ry	-	-	on online available computat ional soft wares like schrodin ger, discover y studio	-	-	-	-	Skills Decent Work; Researcl related skills (case st seminars and ha	for h- udy, s ands	Profess ional Educat ion (17.1- 17.5); Promot ing Highj-	Techni cal Skills that match Industr y Needs/ Hands- on Experie
Unit III	-	-	-	Target identifi cation and validati on help in drug discove ry	-	-	on online available computat ional soft wares like schrodin ger, discover y studio	-	-	-	-	Skills Decent Work; Research related skills (case st seminars and ha on train	for h- udy, s ands iing)	Profess ional Educat ion (17.1- 17.5); Promot ing Highj- quality	Techni cal Skills that match Industr y Needs/ Hands- on Experie nce
Unit III	-	-	-	Target identifi cation and validati on help in drug discove ry	-	-	on online available computat ional soft wares like schrodin ger, discover y studio	-	-	-	-	Skills Decent Work; Researcl related skills (case st seminars and ha on train (SDG 4.	for h- udy, s ands iing) .4)	Profess ional Educat ion (17.1- 17.5); Promot ing Highj- quality researc	Techni cal Skills that match Industr y Needs/ Hands- on Experie nce
Unit III	-	-	-	Target identifi cation and validati on help in drug discove ry	-	-	on online available computat ional soft wares like schrodin ger, discover y studio	-	-	-	-	Skills Decent Work; Research related skills (case st seminars and ha on train (SDG 4.	for h- udy, s ands hing) .4)	Profess ional Educat ion (17.1- 17.5); Promot ing Highj- quality researc h	Techni cal Skills that match Industr y Needs/ Hands- on Experie nce
Unit III	-	-	-	Target identifi cation and validati on help in drug discove ry	-	-	on online available computat ional soft wares like schrodin ger, discover y studio	-	-	-	-	Skills Decent Work; Researcl related skills (case st seminars and ha on train (SDG 4.	for h- udy, s ands iing) .4)	Profess ional Educat ion (17.1- 17.5); Promot ing Highj- quality researc h (18.1-	Techni cal Skills that match Industr y Needs/ Hands- on Experie nce

Unit IV	-	Molecu lar docking fastens the drug discove ry for the benefit of the country			on online available computat ional soft wares like schrodin ger, discover y studio		_	-	-	Skills fo Decent Work; Research- related skills (case study seminars and hand on training (SDG 4.4)	 Profess ional Educat ion (17.1- 17.5); Promot ing Highj- quality researc h (18.1- 18.9) 	Techni cal Skills that match Industr y Needs; Skill Develo pment
Unit v	-		Help in drug discove ry & develop ment by inhibiti ng enzyme s		on online available computat ional soft wares like QSAR toolbox	-	-	-	-	Skills fo Decent Work; Research- related skills (case study seminars and hand on training (SDG 4.4)	 Profess ional Educat ion (17.1- 17.5); Promot ing Highj- quality researc h (18.1- 18.9) 	Techni cal Skills that match Industr y Needs/ Hands- on Experie nce

MPL 204T	Clinical Research and Pharmacovigilance (Theory)	L	Т	Р	С							
Version 2.0		4	0	0	4							
Total Contact Hours		60 Hrs										
Pre-requisites/Exposure	Pharmaco	logy, Dru	g Discover	У								
Co-requisites	Fundamental of Pharmacology	, Drug Re	gulatory At	ffairs, Drug Disco	very							
	Course Objectives	5										
Upon completion of this course the student should be able to:												
 Explain the regulatory requirements for conducting clinical trial Demonstrate the types of clinical trial designs Explain the responsibilities of key players involved in clinical trials Execute safety monitoring, reporting and close-out activities Explain the principles of Pharmacovigilance Detect new adverse drug reactions and their assessment Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance 												
	Course Outcomes (C	CO)			-							
On completion of this course	e, the students will be able to:											
 This subject will provide a It will teach the students of This subject also focuses a It will teach the students in It enlightens the students a with the responsibilities and 	a value addition and current requirement for the stude on conceptualizing, designing, conducting, managing on global scenario of Pharmacovigilance in different a developing drug safety data in Pre-clinical, Clinical about the ethics and the guidelines regarding the safet role of various members of clinical research team.	ents in clin and repor methods t phases of ty of huma	nical researd ting of clin hat can be Drug deve an beings a	ch and pharmacov ical trials. used to generate sa lopment and post nd animals during	igilance. afety data. market surveillance the trials, also deals							
	Programme and Cours	e Mappiı	ng									

СО	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
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Unit	Provide	Provide knowledge of	Provide	Inflates	Pro	One can	Handling	Provide	Α	Η	Durin	"Ski	Prof	Global
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	of	awareness and	of	anding	pro	databas	maintainin	ent and	0	m	condu	for	onal	on
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	ion,	trials conducted in	on,	global	emp	well as	documenta	scrutiniz	co	va	of	ent	cati	dge,
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	and	Regional Level	and	for	men	d CRO	clinical	therapeu	d	es	this	k"	(17.	s,
	monitoring		monitoring	smooth	t in	for	study.	tic	uc	ar	allow	SD	1-	Hands
	of clinical		of clinical	conduc	heal	conduct		molecul	ti	e	preser	G	17.5	on
	trials		trials	tion of	th	ion of		e	0	0	ving	4.4,)	Experie
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	ion,	clinical trials health	on,	executi	emp	well as	documenta	scrutiniz	de	va	of	ent	cati	dge,
	awareness	care sector at	awareness,	ng	loy	certifie	tion of	ation of	r	lu	study	Wor	on	Project
	monitoring	Regional Level	monitoring	various	men	d CRO	clinical	therapeu	bi	es	this	k"	(17.	s,
	and		and	researc	t in	for	study.	tic	as	ar	allow	SD	1-	Hands
	conduction		conduction	h	heal	conduct		molecul	ne	e	preser	G	17.5	on
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	sector at		sector at	populat	or	small		g	in	e	resour	G 7		
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Unit	Provide	Provide knowledge of	Grabbing	Enhanc	Pro	One can	Handling	Provide	Ν	Η	Durin	"Ski	Prof	Global
III	knowledge	documentation,	knowledge	e the	vide	start	and	transpar	0	u	g	11	essi	Educati
	of	awareness monitoring	of	knowle	pro	databas	maintainin	ent and	ge	m	condu	for	onal	on
	documentat	and conduction of	documentati	dge of	mpt	e as	g rhythmic	fair	n	an	ction	Dec	Edu	Knowle
	ion,	clinical trials health	on,	executi	emp	well as	documenta	scrutiniz	de	va	of	ent	cati	dge,
	awareness	care sector at	awareness,	ng	loy	certifie	tion of	ation of	r	lu	study	Wor	on	Project
	monitoring	Regional Level	monitoring	various	men	d CRO	clinical	therapeu	bi	es	this	k"	(17.	s,
	and		and	researc	t in	for	study.	tic	as	ar	allow	SD	1-	Hands
	conduction		conduction	h	heal	conduct		molecul	ne	e	preser	G	17.5	on
	of clinical		of clinical	clinical	th	ion of		e	SS	0	ving	4.4,)	Experie
	trials in		trials in	study	care	Clinical		without	d	n	enviro			nce
	health care		health care	over a	sect	study at		disclosin	ur	th	nment	SD		
	sector at		sector at	populat	or	small		g	in	e	resour	G 7		
	local Level		National	ion.	and	level in		patients'	g	pr	ces	"En		

			Level	Globall	CR	collabor			co	io	and	sure		
				y this	0	ation			n	rit	dispos	aces		
				concep		with			d	у	e	to		
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				d					n	m	with	le,		
									of	an	proper	relia		
									st	v	dispos	ble,		
									u	ol	al	sust		
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									у	nt	d to	ble		
										ee	keep	and		
										rs	enviro	mod		
										ar	nment	ern		
										e	free	ener		
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										q	hazard			
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Unit	Provide	Provide knowledge of	Grabbing	Enhanc	Pro	One can	Handling	Provide	Ν	Η	Durin	"Ski	Prof	Global
IV	knowledge	documentation,	knowledge	e the	vide	start	and	transpar	0	u	g	11	essi	Educati
	of	awareness monitoring	of	knowle	pro	databas	maintainin	ent and	ge	m	condu	for	onal	on
	documentat	and conduction of	documentati	dge of	mpt	e as	g rhythmic	fair	n	an	ction	Dec	Edu	Knowle
	ion,	clinical trials health	on,	executi	emp	well as	documenta	scrutiniz	de	va	of	ent	cati	dge,
	awareness	care sector at regional	awareness,	ng	loy	certifie	tion of	ation of	r	lu	study	Wor	on	Project
	monitoring	area	monitoring	various	men	d CRO	clinical	therapeu	bi	es	this	k"	(17.	s,

and	and	researc	t in	for	study.	tic	as	ar	allow	SD	1-	Hands
conduction	conduction	h	heal	conduct		molecul	ne	e	preser	G	17.5	on
of clinical	of clinical	clinical	th	ion of		e	SS	0	ving	4.4,),	Experie
trials in	trials in	study	care	Clinical		without	d	n	enviro		Gen	nce
health care	health care	over a	sect	study at		disclosin	ur	th	nment	SD	der	
sector at	sector at	populat	or	small		g	in	e	resour	G 7	Equ	
local Level	local Level	ion.	and	level in		patients'	g	pr	ces	"En	ality	
		Globall	CR	collabor			co	io	and	sure	and	
		y this	0	ation			n	rit	dispos	aces	Equ	
		concep		with			d	у	e	to	al	
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							u	ol	al	sust	4.5)	
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Unit	Provide	Provide knowledge of	Grabbing	Enhanc	Pro	One can	Handling	Provide	Ν	Η	Durin	"Ski	Prof	Global
v	knowledge	documentation,	knowledge	e the	vide	start	and	transpar	0	u	g	11	essi	Educati
	of	awareness monitoring	of	knowle	pro	databas	maintainin	ent and	ge	m	condu	for	onal	on
	documentat	and conduction of	documentati	dge of	mpt	e as	g rhythmic	fair	n	an	ction	Dec	Edu	Knowle
	ion,	clinical trials health	on,	executi	emp	well as	documenta	scrutiniz	de	va	of	ent	cati	dge,
	awareness	care sector at regional	awareness,	ng	loy	certifie	tion of	ation of	r	lu	study	Wor	on	Project
	monitoring	area	monitoring	various	men	d CRO	clinical	therapeu	bi	es	this	k"	(17.	s,
	and		and	researc	t in	for	study.	tic	as	ar	allow	SD	1-	Hands
	conduction		conduction	h	heal	conduct		molecul	ne	e	preser	G	17.5	on
	of clinical		of clinical	clinical	th	ion of		e	SS	0	ving	4.4,),	Experie
	trials in		trials in	study	care	Clinical		without	d	n	enviro			nce
	health care		health care	over a	sect	study at		disclosin	ur	th	nment	SD		
	sector at		sector	populat	or	small		g	in	e	resour	G 7		
	local Level		nationwide.	ion.	and	level in		patients'	g	pr	ces	"En		
				Globall	CR	collabor			co	io	and	sure		
				y this	О,	ation			n	rit	dispos	aces		
				concep	able	with			d	У	e	to		
				t has	to	hospital			uc	as	every	all		
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				adapte	k in				0	u	erial	rdab		
				d	vari				n	m	with	le,		
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		sect					
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MPL 205P	Pharmacology Practical -II (Practical)	L	Т	Р	С						
Version 2.0		0	0	12	6						
Total Contact Hours	180 H	rs									
Pre-requisites/Exposure	Pharmacology	Pract	ical-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 PA₂ value, and various toxicological studies.
- 5. It also deals with the ADR reporting, drug mutagenicity studies, protocol design, QSAR studies.

	Programme and Course Mapping																_	
СО	PO1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	P 0 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 2 2 2 2 1 2 3 1 3 1																		
		1	=lightl	y mapp	ed	2	= mod	erately	mappe	d	3=	=str	ongly ma	apped				

	Local	Regional	National	Global	Employability	Entrepreneursh ip	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability			
Unit I				This unit covers the practica l approac hes of animal experim entation in labs Skill develop ment			Hands on training of different techniques, s that students can learn the in vivo, ex vivo and in vitro techniques					Skill s for Dec ent Wor k (SD G 4.4)	Pro moti ng Hig h- qual ity rese arch (18. 1- 18.9)	Soft Skills
Unit II		-	-	Differe nt instrum ents are used n measur ement of BP, Skill develop			Hands on training of different techniques					-	-	Soft Skills

			ment							
Unit III	-		Hands on training of differen t techniq ues		Hands on training of different techniques			Skill s for Dec ent Wor k (SD G 4.4)	Effe ctive Gov erna nce & Lea ders hip (19. 1- 19.5)	Skill Develop ment
Unit IV	-	-	Skill develop ment					-	-	Skill Develop ment
Unit v			Designi ng of In silico studies helps the students to get the training on lead optimiz		Hands on training of different techniques			Revi taliz e the glob al part ners hip for susta inabl e	Tran sfor min g the Reg ulat ory Syst em (20. 1-	Soft Skills

		ation				deve	20.1	
		Skill				lop	5)	
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Semester-III

MRM101T	Research Methodology and Biostatistics	L	Т	Р	С							
Version 2.0		4	0	0	4							
Total Contact Hours	60											
Pre-requisites/Exposure	Biostatist	ics & cliı	nical Reg	gulatory								
Co-requisites Biostatistics & clinical Regulatory -												
Course Objectives												
Upon completion of this course the student should be able to:												
i. To impart undergraduate, po	st graduate and doctoral education in identified	areas of	higher e	ducation.								
ii. To undertake research progr	ammes with industrial interface.											
iii. To integrate its growth with	the global needs and expectations of the major	stake hol	ders thro	ough teaching, res	search,							
Exchange & collaborative pr	ogrammes with foreign, Indian Universities/Ins	stitutions	and MN	Cs.								
iv. To act as a nodal center for t	ransfer 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																
СО	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=lig	htly ma	pped	/	2 = mode	erately r	napped		3=stron	ngly map	ped			
	Local	Regional	National	Global	Employability	Entrepreneurship	Skill Development	Professional Ethics	Gender	Human Values	Environment & Sustainability						
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Unit			-	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)	Techni cal Skills that match Industr y Needs Focus on Employ ability Skills (Local/ Region al and Global)			

Unit	-	-	-	Applications of biostat in	This will	-	-	-	-	SDG	Professiona	Techni
II				Medical research	helps in					4.4	1 education	cal
					understand							Skills
					ing the							that
					biostatistic							match
					S 1N							Industr
					industry							W
					maasay							y Needs
												Focus
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Unit	-	-	-	Overview of medical research	This will	-	-	-	-	SDG	Professiona	Techni
III				involved in industry and	neips in					3	l education,	cal
				regulatory procedures	ing						Promoting	Skills
					regulatory						high	that
					procedures						quality	match
					in medical						research	Industr
					industry							У
					and use of							Needs
					biostat in							Focus
					result							on
					anarysis.							Employ

												ability Skills (Local/ Region al and Global
Unit IV	-	-	Understanding CPCSEA guidelines		Will help in establishm ent of animal house for research as well as for industrial applicatio ns.		-	-	-	SDG 3	Promoting high quality research	Techni cal Skills that match Industr y Needs Focus on Employ ability Skills (Local/ Region al 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.		Understan ding basic principles for all medical research, and	-	-	-	-	SDG 3	Promoting high quality research	Techni cal Skills that match Industr

				additional principles for medical research combined		y Needs Focus on Employ
			]	medical care		Skills (Local/ Region al and Global