



Department of Pharmacology

Manipal Academy of Higher Education, Manipal

Outcomes Based Education (OBE) Framework

Two Year full time Postgraduate Program

M.Sc. Pharmacology (Medical)

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1. NATURE AND EXTENT OF THE PROGRAM

MSc (medical) Pharmacology is a 2-year postgraduate course divided into four semesters. The goal of this course is to prepare a competent pharmacology postgraduate student to meet the requirements of academics, research and industry.

In this program, students will acquire pedagogy skills, will understand the concept of drug development. They will be skilled enough to pursue a career in research and industry.

2. PROGRAM EDUCATION OBJECTIVE (PEO)

The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF) for **M.Sc. Pharmacology (Medical) program** are as follows.

PEO No	Education Objective
PEO 1	Students will be able to apply and integrate the basic knowledge into the various principles of pharmacology and widen their perspective.
PEO 2	Students will be able to understand the fundamentals of basic research and apply it in pursuing research further
PEO 3	Students will develop an ability to critically analyse scientific data, draw objective conclusions and apply this knowledge for human welfare.
PEO 4	Students will be able to promote lifelong learning to meet the advances in professional field by developing ethical, interpersonal and team skills.

3. **GRADUATE ATTRIBUTES:**

S No.	Attribute	Description
1	Disciplinary Knowledge	Acquiring the theoretical knowledge and practical skills to formulate the research question and find solutions
2	Understanding different areas of pharmacology	Experimental pharmacology, basics of general and systemic pharmacology, pharmacovigilance, drug development
3	Measurable Skills and Industry-ready Professionals	Basic and applicable knowledge of laboratory skills, preclinical studies and basics of clinical research
4	Effective and Influencing communication	Effective and influencing written and speech communications to share ideas, build relationships and to handle challenges
5	Leadership readiness/ Qualities	To maximize efficiency and to achieve organizational goals.
6	Critical/ Reflective thinking & language efficiency	For self-evaluation, corrective actions and efficient communication
7	Technologically Efficient Professional	To build up and enhance the ability to apply latest techniques and procedures by updating with modern availability and requirements at workplace
8	Ethical Awareness	It is important to know the professional ethics and responsibilities in the field of work
9	Lifelong Learning	Updating with current knowledge of research and theoretical knowledge is of prime importance in the competitive & rapidly growing world and is a lifelong process.
10	Research-related Skills	Urge of exploration/ ability to gather information in the relevant, interested field, to review, analyse and interpret the information to get a solution.
11	Cooperation/ Teamwork	A good <i>team</i> can yield a wide range of possible solutions for each specific problem to meet workplace challenges

4. QUALIFICATIONS DESCRIPTORS

1. Ability to plan and do basic animal and clinical research
2. Data analysis related to pharmacology
3. Good presentation, oral and written communication skills.
4. Ability to work independently and as a team

PROGRAM OUTCOMES: After successful completion of M.Sc. in Pharmacology (Medical), Students will be able to:

PO No	Attribute	Competency
PO 1	Domain knowledge	Apply the theoretical & practical knowledge of Pharmacology in academics, industry and research
PO 2	Problem analysis	Identification of needs and carrying out research using theoretical/practical knowledge in industry, academic and research institutions
PO 3	Design/develop solutions	Design a research protocol
PO 4	Conduct investigations of complex problems	To identify gaps and formulate a research question. Conduct research as per the regulatory guidelines
PO 5	Modern tool usage	Usage of software for literature review, conduct of research and data analysis
PO 6	Business and society	Maintain and manage the professional responsibilities such as ethical, legal and societal issues by applying the contextual knowledge
PO 7	Environment and sustainability	Recognize the significance and effect of new developments on society and environment and explain the impact effectively
PO 8	Ethics	Understanding and obeying the professional ethics and research ethics
PO 9	Individual / Teamwork	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication	Communicate effectively according to the situations comprehensively by written or oral communications to meet the expectations
PO 11	Project management and finance	Demonstrate knowledge and understanding of the financial management principles and apply these to evaluate new and existing projects for effective decision making
PO 12	Life-long learning	Life-long learning capacity to update with current knowledge of skills, techniques and theoretical knowledge is of prime importance in the competitive & rapidly growing world.



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ACADEMY of HIGHER EDUCATION

(Deemed to be University under Section 3 of the UGC Act, 1956)

FIRST YEAR:

Semester: 1

Semester: 2

Subject Code	Subject Title	L	T	P	C	Subject Code	Subject Title	L	T	P	C
MCC601	Common Core: Basic Sciences	3	1	0	4	MCC602	Common Core: Introduction to	2	2	0	4
MPH603	General Pharmacology	1	3	0	4	MPH604	ANS, CVS & Renal System	2	2	0	4
MPH605	Endocrines+Blood	1	3	0	4	MPH606	Chemotherapy	2	2	0	4
MPH607	Lab 1	0	0	8	4	MPH608	Lab 3	0	0	8	4
MPH609	Lab 2	0	0	8	4	MEL610	Elective - 1	1	1	4	4
	Total	5	7	16	20		Total	7	7	12	20



Name of the Program:		M.Sc. in Pharmacology (Medical)									
Course Title:		Common Core 1 – Basic Sciences									
Course Code: MCC 601		Course Instructor: Faculty Department of Anatomy, Physiology and Biochemistry									
Academic Year: 2021-2022		Semester: First Year, Semester 1									
No of Credits: 4		Prerequisites: Nil									
Synopsis:		This course deals with imparting knowledge of basic science subjects namely, Anatomy, physiology and biochemistry, so that the students acquire sound knowledge of basic subjects that form foundation to all other medical subjects. This course will run during the first 8 weeks in the first semester.									
Course (COs):		Outcomes On successful completion of this course, students will be able to									
CO 1:		Apply the knowledge of basic science subjects and develop understanding of human body structure and functioning.									
Mapping of COs to POs											
<i>COs</i>	<i>PO 1</i>	<i>PO 2</i>	<i>PO 3</i>	<i>PO 4</i>	<i>PO 5</i>	<i>PO 6</i>	<i>PO 7</i>	<i>PO 8</i>	<i>PO 9</i>		
CO 1	X										
Course content and outcomes:											
<i>Content</i>		<i>Competencies</i>								<i>No of Hours</i>	
Unit 1: Anatomy											
<ul style="list-style-type: none"> • General anatomy • Introduction to systems of the body 		<ul style="list-style-type: none"> • Explain the history of anatomy and Subdivision/branches of the anatomy and their functions in brief (1 hr) • Describe the nomenclature, subdivisions, terms and arrangements of anatomical structures (1 hr) • Describe different types of skin, fascia and connective tissue, epithelium and cartilage (1 hr) • Describe the nomenclature, types, parts, attachments and mechanics of muscles (1hr) • Describe the types, growth, blood supply, functions and ossification of bones (1 hr) • Classify the joints with structure & examples (1hr) • Identify major muscles and bones in the body along with their location (4 hrs) • Describe the different types of blood vessels, capillaries and sinusoids, components and functions of lymphatic system and structure of lymph node (1 hr) • Enumerate the components of cardiovascular system and briefly describe the external features of heart, its blood supply and interior of the chambers (2 hrs) 								32	



Cardiovascular system	<ul style="list-style-type: none"> • Describe the design of systemic and pulmonary circulation, anatomy of heart and blood vessels, innervation to heart and blood vessels (1 hr) • Describe the Cardiac cycle, ECG and heart sounds, Cardiac output: determinants, variations, regulation (2 hr) • Describe the Arterial blood pressure and regulation, shock Coronary circulation (1 hr) 	
Endocrines	<ul style="list-style-type: none"> • Describe the actions and disorders of Anterior pituitary hormones, Posterior pituitary hormones, Thyroid hormones, Adrenal cortical hormones, Adrenal medullary hormones, Hormones of endocrine pancreas (1 hr) • Describe Calcium homeostasis – Functions of calcium, hormones regulating plasma calcium level, parathormone, calcitonin and vitamin D₃ (1 hr) 	
Reproductive system	<ul style="list-style-type: none"> • Overview of Male reproductive system- Female reproductive system – Menstrual cycle and regulation (1 hr) • Describe the Concept of Pregnancy and parturition, Lactation and family planning (1 hr) 	
Digestion	<ul style="list-style-type: none"> • Describe the Composition, function of saliva, gastric juice, pancreatic juice, Bile. (1 hr) • Describe the Deglutition, Gastric emptying, movements of small intestine (1 hr) • Explain the functions of large intestine: movements of colon and defecation (1hr) 	
Central nervous system	<ul style="list-style-type: none"> • Describe Receptors, synapse, reflexes (1 hr) • Explain the Ascending and descending pathways (1 hr) 	



Special senses	<ul style="list-style-type: none"> Describe the Functions and effect of lesions of cerebellum, basal ganglia, Functions of hypothalamus (1 hr) Describe the Cerebral cortex, functional area, cerebrospinal fluid, EEG, sleep (1 hr) Describe the Physiology of taste and smell, Structure and function of external, middle and internal ears (1 hr) Describe the Structure of eye, functions of different components, accommodation of eye, common errors of refraction, Visual pathway, colour vision (1 hr) 	
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Unit 3: Biochemistry

<ul style="list-style-type: none"> Amino acids and proteins Enzymes Blood glucose regulation & diabetes mellitus Vitamins & Minerals Nutrition 	<ul style="list-style-type: none"> Brief outline of Classification, properties and structural organization and biomedical significance of Proteins, carbohydrates, lipids and nucleic acids. Brief account of general characteristics, kinetics and Inhibition of enzymes Enumerate the hypoglycemic and hyper glycemc hormones with their action in regulation of blood glucose and note on diabetes mellitus Discuss the classification, functions and associated disorders of Vitamins & Minerals Discuss the general aspects of nutrition by defining SDA, BMR, nutritional significance of macromolecules and PEM 	24
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Learning strategies, contact hours and student learning time

<i>Learning strategy</i>	<i>Contact hours</i>	<i>Student learning time (Hrs)</i>
Lecture	60	180
Tutorial	10	30
Small Group Discussion (SGD)	10	30
Revision	10	10



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Assessment	10	10				
TOTAL	100	260				
Assessment Methods:						
Formative:	Summative:					
Class tests /Quiz	Sessional examination					
Assignments	End semester examination					
Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6
Sessional Examination 1	X					
Sessional Examination 2	X					
Quiz/ class test	X					
Assignment	X					
End Semester Examination	X					
Feedback Process	<ul style="list-style-type: none"> • Mid-Semester feedback • End-Semester Feedback 					
Reference Material	<ol style="list-style-type: none"> 1. Text book of general anatomy by Vishram Singh 2. Manipal manual of physiology 3. Essentials of biochemistry by Sathyanarayana 					

Name of the Institution / Department: DEPARTMENT OF PHARMACOLOGY

Name of the Program:	M.Sc. in Pharmacology (Medical)											
Course Title:	General Pharmacology Endocrines and Blood, Lab1 , Lab 2											
Course Code: MCC 601 MPH 603 MPH 605 MPH 607 MPH 609	Course Instructor: Faculty of the Department of Pharmacology											
Academic Year: 2020-2021	Semester: First Year, Semester 1											
No of Credits: 20	Prerequisites: Nil											
Synopsis:	Students will be exposed to basic aspects of general pharmacology, drugs affecting endocrine, blood and blood forming organs, basic requirements of experimental pharmacology and bioassay											
Course Outcomes (COs):	On successful completion of this course, students will be able to											
CO 1:	Understand the basic principles of general pharmacology											
CO 2:	Understand the basic principles of drugs acting endocrine, blood and blood forming organs											
CO 3:	Understand the basic requirements of experimental pharmacology and CPCSEA guidelines											
CO 4:	Perform bioassay											
Mapping of COs to POs												
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12



CO 1	x			x			x					
CO 2	x			x			x					
CO 3		x	x	x	x			x	x			
CO 4	x	x										

Course content and outcomes:

<i>Content</i>	<i>Competencies</i>	<i>No of Hours</i>
Unit 1: MPH603 General Pharmacology		
<ul style="list-style-type: none"> • Introduction, definitions, nature and sources of drugs, Drug nomenclature • Principles of Pharmacokinetics and Pharmacodynamics. • Adverse drug effects 	<ul style="list-style-type: none"> • Explain principles of pharmacology • Describe routes of drug administration • Explain briefly absorption, metabolism, distribution and elimination of drugs • Explain briefly mechanism of drug action • Explain factors modifying drug action • Explain various types of adverse effects of drugs 	80 hours
Unit 2: MPH 605 Endocrines and Blood		
<ul style="list-style-type: none"> • Hypothalamic and pituitary hormones • Thyroid hormones and antithyroid drugs • Sex hormones and their antagonists • Adrenocorticosteroids and their antagonists • Pancreatic hormones and antidiabetic drugs • Drugs affecting calcium metabolism • Drugs affecting uterine motility - Oxytocics and tocolytics • Drugs affecting hemopoietic system including growth factors • Drugs affecting coagulation, bleeding and thrombosis 	<ul style="list-style-type: none"> • List hypothalamic and pituitary hormones and their uses • Mention uses of thyroid hormones • Explain briefly mechanism of action, uses and adverse effects of antithyroid drugs • Explain briefly mechanism of action, uses and adverse effects of corticosteroids • Explain briefly mechanism of action, uses and adverse effects of sex hormones • Explain briefly mechanism of action, uses and adverse effects of antidiabetic drugs • Explain briefly mechanism of action, uses and adverse effects of drugs affecting calcium metabolism • Mention mechanism of action, uses and adverse effects of oxytocics and tocolytics • List the preparations, uses and adverse effects of iron, folic acid and vit B12 • List growth factors, their uses and adverse effects 	80 hours



	<ul style="list-style-type: none"> List coagulants, anticoagulants, antiplatelets, fibrinolytics and antifibrinolytics Mention the mechanism of action, uses and adverse effects of coagulants, anticoagulants, antiplatelets, fibrinolytics and antifibrinolytics 	
Unit 3 : MPH607 Lab 1		
<ul style="list-style-type: none"> Physiological salt solutions Instruments Routes of drug administration Anesthetics in lab animals Dosage formulations Animal House Posting 	<ul style="list-style-type: none"> Mention ingredients of various physiological salt solutions and their role List basic features of various instruments used in experimental pharmacology Demonstrate administration of drugs in animals Define various dosage forms of drugs Explain basic aspects of CPCSEA guidelines 	160
Unit 4: MPH 609 Lab 2		
<ul style="list-style-type: none"> Dose Response Curve Potentialiation and antagonism Bioassay of Ach- matching method Bioassay of Ach- Interpolation method Bioassay of Ach- 2+1 method 	<ul style="list-style-type: none"> Demonstrate different methods of bioassay using appropriate tissue/CAL Interpret and analyse data of bioassay 	160

Learning strategies, contact hours and student learning time		
<i>Learning strategy</i>	<i>Contact hours</i>	<i>Student learning time (Hrs)</i>
Lecture	70	140
Seminar	06	12
Journal Club	04	08
Small Group Discussion (SGD)	40	80
Case Based Learning (CBL)	-	-
Practical	320	320
Clinical Laboratory posting	-	-
Elective Posting	-	-
Self-directed learning (SDL)	20	20
Revision	20	20
Assessment	16	16
TOTAL	496	616



Assessment Methods:						
Formative:				Summative:		
Assignments				Sessional examination		
				End semester examination		
Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4		
Sessional Examination 1	X					
Sessional Examination 2		X				
Assignment	X	X				
End Semester Examination	X	X	X	X		
Laboratory examination			X	X		
Feedback Process	<ul style="list-style-type: none"> • Mid-Semester feedback • End-Semester Feedback 					
Reference Material	<ul style="list-style-type: none"> • Essentials of Medical Pharmacology – by K D Tripathi 8th Edition • Pharmacology and Pharmacotherapeutics - by Satoskar & Bhandarkar 25th Edition • Basic & Clinical Pharmacology – by Bertram C Katzung 13th Edition • Goodman & Gilman – The Pharmacological Basis of Therapeutics 12th Edition • Fundamentals of Experimental Pharmacology – MN Ghosh, 3rd edition 					

PROGAM OUTCOMES (POS) AND COURSE OUTCMES (COS) MAPPING

S.No.	Course Code	Course Name	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	MPH603	General Pharmacology	4	X			X			X					
2	MPH605	Endocrines+Blood	4	X			X			X					
3	MPH607	Lab 1	4		X	X	X	X			X	X	X		
4	MPH609	Lab 2	4	X	X										



Name of the Institution / Department: DEPARTMENT OF PHARMACOLOGY

Name of the Program:		M.Sc. in Pharmacology (Medical)										
Course Title:		Autonomic Nervous system (ANS) Cardiovascular system (CVS) (including renal pharmacology) Chemotherapy Lab 3 Elective										
Course Code: MPH604 MPH606 MPH608 MEL610		Course Instructor: Faculty of the Department of Pharmacology										
Academic Year: 2020-2021		Semester: First Year, Semester 2										
No of Credits: 20		Prerequisites: -										
Synopsis:		Students will be exposed to drugs affecting autonomic nervous system, cardiovascular system, renal pharmacology, chemotherapy and pharmacovigilance										
Course (COs):		Outcomes										
CO 1:		On successful completion of this course, students will be able to										
CO 1:		Understand the basic principles of various drugs acting in ANS, CVS and renal system										
CO 2:		Understand basic aspects of drugs used to treat infections										
CO 3:		Understand basic aspects of reporting of adverse drug reactions										
CO 4:		Interpret and analyse data of drugs affecting ANS and CVS										
Mapping of COs to POs												
<i>COs</i>	<i>PO 1</i>	<i>PO 2</i>	<i>PO 3</i>	<i>PO 4</i>	<i>PO 5</i>	<i>PO 6</i>	<i>PO 7</i>	<i>PO 8</i>	<i>PO 9</i>	<i>PO 10</i>	<i>PO 11</i>	<i>PO 12</i>
CO 1	x			x			x					
CO 2	x			x			x					
CO 3	x			x								
CO 4	x				x							
Course content and outcomes:												
<i>Content</i>					<i>Competencies</i>					<i>No of Hours</i>		
Unit 2: MPH 604 Autonomic nervous system, Cardiovascular system, renal pharmacology												
Autonomic nervous system (ANS)					<ul style="list-style-type: none"> Enumerate steps in neurohumoral transmission Enumerate agonists and antagonists of cholinergic and adrenergic systems, their actions, uses and adverse effects Explain skeletal muscle contraction and drugs affecting it 					80 hours		
<ul style="list-style-type: none"> Neurohumoral transmission Agonists and antagonists of cholinergic and adrenergic systems. Skeletal muscle relaxants: Physiology of skeletal muscle contraction and drugs affecting it. 												



<p>Cardiovascular system (CVS) (including renal pharmacology)</p> <ul style="list-style-type: none"> • Cardiac electrophysiology • Drugs used in ischemic heart disease, hypertension, congestive heart failure, cardiac arrhythmias, hyperlipoproteinemias and shock • Physiology of urine formation; Diuretics and antidiuretics 	<ul style="list-style-type: none"> • Enumerate various phases of cardiac action potential and underlying mechanisms • Enumerate drugs used in ischemic heart disease, hypertension, congestive heart failure, cardiac arrhythmias, hyperlipoproteinemias and shock their mechanism, uses and adverse effects • Enumerate diuretics and antidiuretics • Explain mechanism of action, uses adverse effects of diuretics and antidiuretics 	
<p>Unit 3: MPH 606 Chemotherapy</p>		
<ul style="list-style-type: none"> • General principles of chemotherapy • Sulfonamides including cotrimoxazole • Quinolones and fluoroquinolones • β-lactam antibiotics • Aminoglycoside antibiotics • Tetracyclines and chloramphenicol • Macrolides • Miscellaneous antibiotics • Antimycobacterial agents • Antifungal agents • Antiviral agents • Chemotherapy of protozoal infections • Drugs for helminthiasis • Anticancer drugs 	<ul style="list-style-type: none"> • Explain general principles of chemotherapy • Explain mechanism of action, uses and adverse effects of sulphonamides and cotrimoxazole • Enumerate various drugs acting on gram positive and gram-negative bacteria • Explain their mechanism of action, uses and adverse effects • Enumerate antitubercular and antileprotic drugs, their mechanism of action, uses and adverse effects • Enumerate antifungal drugs, their mechanism of action, uses and adverse effects • Enumerate antiviral drugs, their mechanism of action, uses and adverse effects • Enumerate antiprotozoals and anthelmintics, their mechanism of action, uses and adverse effects • Enumerate anticancer drugs, their mechanism of action, uses and adverse effects 	<p>80 hours</p>
<p>Unit 4: MPH 608 Lab 3</p>		



<ul style="list-style-type: none"> Rabbit eye experiments (Miotics, Mydriatics, Local anaesthetics) Cardiac stimulants/depressants (Computer assisted learning) Dog blood pressure (Computer assisted learning) Pharmacovigilance & ADR filling Drug interactions 	<ul style="list-style-type: none"> Interpret and analyse data of drugs affecting autonomic and cardiovascular system Explain basic aspects of pharmacovigilance Fill up ADR reporting form Explain drug-drug interactions 	160 hours
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Learning strategies, contact hours and student learning time		
<i>Learning strategy</i>	<i>Contact hours</i>	<i>Student learning time (Hrs)</i>
Lecture	70	140
Seminar	12	24
Journal Club	08	16
Small Group Discussion (SGD)	30	60
Case Based Learning (CBL)	-	-
Practical	160	160
Clinical Laboratory posting	-	-
Elective Posting	-	-
Self-directed learning (SDL)	20	20
Revision	20	20
Assessment	16	16
TOTAL	336	456

Assessment Methods:	
Formative:	Summative:
Assignments	Sessional examination
	End semester examination

Mapping of assessment with COs						
Nature of assessment	CO 1	CO 2	CO 3	CO 4		
Sessional Examination 1	X					
Sessional Examination 2		X				
Assignment	X	X				
End Semester Examination	X	X	X	X		
Laboratory examination			X	X		

Feedback Process	<ul style="list-style-type: none"> Mid-Semester feedback End-Semester Feedback
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Reference Material	<ul style="list-style-type: none"> Essentials of Medical Pharmacology – by K D Tripathi 8th Edition Pharmacology and Pharmacotherapeutics - by Satoskar & Bhandarkar 25th Edition Basic & Clinical Pharmacology – by Bertram C Katzung 13th Edition Goodman & Gilman – The Pharmacological Basis of Therapeutics 12th Edition Fundamentals of Experimental Pharmacology – MN Ghosh, 3rd edition
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Name of the Program:		MSc Pharmacology (Medical)									
Course Title:		Common core: Introduction to research									
Course Code: MCC 602		Course Instructor: Faculty Department of Community Medicine									
Academic Year: 2020-2021		Semester: First Year, Semester 2									
No of Credits: 4		Prerequisites: Nil									
Synopsis:		This course sensitises students towards research and help them to acquire knowledge in the basic aspects of biostatistics and research methodology. Also helps to gain knowledge to use computer application for searching scientific database.									
Course Outcomes (COs):		On successful completion of this course, students will be able to									
CO 1:		Explain the processes involved in basic research									
CO 2:		Explain the importance of ethics in research & misconduct in research									
Mapping of COs to POs											
<i>COs</i>	<i>PO 1</i>	<i>PO 2</i>	<i>PO 3</i>	<i>PO 4</i>	<i>PO 5</i>	<i>PO 6</i>	<i>PO 7</i>	<i>PO 8</i>	<i>PO 9</i>		
CO 1	X	X									
CO 2	X				X						
Course content and outcomes:											
<i>Content</i>		<i>Competencies</i>								<i>No of Hours</i>	
Unit 1: Introduction to research											
		<ul style="list-style-type: none"> Describe Selection of a research topic, framing of hypothesis, research objectives and their outcomes Familiarize with Literature survey and write a research protocol Describe the steps of designing study involving both humans and animal models Understand the Importance of statistics in research and introduction to basic statistics and usage of statistical software Describe the format of Thesis and scientific articles for publication Explain Ethics & responsible conduct in research Describe the Process of publication of scientific papers Familiarize with indexing sources, impact factors and citations of journal articles 								80	



Learning strategies, contact hours and student learning time						
Learning strategy	Contact hours			Student learning time (Hrs)		
Lecture	40			120		
Seminar	-----			-----		
Small Group Discussion (SGD)	30			90		
Self-directed learning (SDL)	10			10		
Case Based Learning (CBL)	10			30		
Revision	10			10		
Assessment	10			10		
TOTAL	110			270		
Assessment Methods:						
Formative:				Summative:		
Class tests				Sessional examination		
Assignments				End semester examination		
Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2				
Sessional Examination 1	X					
Sessional Examination 2	X	X				
class test	X	X				
Assignment	X					
End Semester Examination	X	X				
Feedback Process	<ul style="list-style-type: none"> • Mid-Semester feedback • End-Semester Feedback 					
Reference Material	Parks Text book of Community medicine					

Name of the Program:		MSc Pharmacology (Medical)										
Course Title:		Elective 1*										
Course Code: MEL 610		Course Instructor: course coordinator of elective										
Academic Year: 2020-2021		Semester: First Year, Semester 2										
No of Credits: 4		Prerequisites: Nil										
Synopsis:		This exposure to multidisciplinary courses will help them develop interests and abilities that will help them further their career skills. Students can choose any one of the electives, listed below in the respective campuses. There should be a minimum of 3 students opting for a particular elective for it to be offered. The electives will be assigned depending on the number of slots available based on previous semester CGPA. Each elective runs for a period of 4 weeks. 75% attendance is mandatory and at the end of each elective there is assessment, the scores will help boost CGPA.										
Course Outcomes (COs):		On successful completion of this course, students will be able to										
CO 1:		Explore their interests and develop desirable career skills and abilities that will help professional development										
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9			
CO 1	X	X	X	X					X			
Course content and outcomes:												
Content		Competencies								No of Hours		



MEL 610.1	Tissue Processing	ANATOMY	Both campuses
MEL 610.2	Basic cardiovascular Examination	PHYSIOLOGY	Both campuses
MEL 610.3	Photometric Techniques	BIOCHEMISTRY	Both campuses
MEL 610.4	BA/BE studies	PHARMACOLOGY	Not offered in both campus since May 2017
MEL 610.5	Serological diagnosis of infectious diseases	MICROBIOLOGY	At Mangalore campus only
MEL 610.6	Microbiological analysis of water	MICROBIOLOGY	At Manipal campus only
MEL 610.7	Drug development	PHARMACOLOGY	Both campuses
MEL 610.8	IEM screening	Biochemistry	At Manipal campus only
MEL 610.9	Basics of andrology techniques	Clinical embryology	At Manipal campus only
MEL 610.10	Forensic toxicology	Forensic medicine	At Manipal campus only
<ul style="list-style-type: none"> MEL 610.1-Tissue Processing 	<ul style="list-style-type: none"> Explain the aims and effects of tissue fixation Enumerate the precautions to be taken during tissue fixation Name the commonly used fixatives and to explain their merits and demerits Name the different types of embedding methods available and to give their applications Describe the detailed procedure involved in paraffin embedding method Demonstrate the paraffin embedding method for variety of tissues Name the different types of microtomes and to explain their applications Describe the detailed procedure of section cutting using rotary microtome Demonstrate the experience in using rotary microtome for section cutting Explain the water bath method of flattening and mounting of sections 	120	
<ul style="list-style-type: none"> MEL 610.2-Basic cardiovascular Examination 	<ul style="list-style-type: none"> Demonstrate the basic use of stethoscope Demonstrate how to measure the pulse Demonstrate the recording of blood pressure using sphygmomanometer Describe the basic approach to the Physical examination of cardiovascular system including inspection, palpation, percussion and auscultation Explain the basic heart sounds 	120	



	<ul style="list-style-type: none"> Record ECG Understand the basic principle and record heart rate variability Perform the basic cardiovascular examination independently 	
<ul style="list-style-type: none"> MEL 610.3- Photometric Techniques 	<ul style="list-style-type: none"> To know the principle, instrumentation and functioning of colorimeter & spectrophotometer Understand the Beer's law, on which the photometric techniques are based for measuring the concentration of a substance in solution. Describe the operation and component parts of the colorimeter/ spectrophotometer Operate the colorimeter /spectrophotometer and measure the concentration of an analyte To know the principle and clinical applications of atomic absorption spectrophotometer, flame photometer, fluorometer, nephelometer To understand the principle of ELISA and its use To know the working of a semiautoanalyzer To select an appropriate technique for measuring an analyte based on the requirements 	120
<ul style="list-style-type: none"> MEL 610.5- Serological diagnosis of infectious diseases 	<ul style="list-style-type: none"> List the different types of serological tests used in diagnosis of infectious diseases and principles of the routine serological procedures performed in the clinical laboratory . Acquire knowledge about the applications of different serological tests . Understand and analyse the various concepts involved in serological diagnosis of infectious diseases 	120
<ul style="list-style-type: none"> MEL 610.6- Microbiological analysis of water 	<ul style="list-style-type: none"> Enumerate different Water borne infectious diseases Describe the source and reservoirs of the water borne pathogens in the community and healthcare facilities Narrate different strategies for Controlling Waterborne Microbial Contamination Describe and demonstrate collection, transportation, and various methods of bacteriological analysis of water with respect to community and hospital settings (dialysis water, RO) and interpretation of results Investigate waterborne outbreak in the community and hospital 	120
<ul style="list-style-type: none"> MEL 610.7- Drug development 	<ul style="list-style-type: none"> To explain pre-clinical phases of drug development To explain the clinical phases of drug development To understand the basic concepts of Ethical Guidelines for Biomedical Research and Ethical Issues in Clinical Research 	120



	<ul style="list-style-type: none"> To learn Roles & responsibilities of the investigator / sponsor / CRO / Site coordinator / Site manager and Auditor To explain the process of Informed consent and submission dossier to IEC To understand the Role of regulatory bodies: FDA/ DCGI and IRB/IEC and Updates in the regulatory requirements in India To be aware and understand the Good Clinical Practice Guidelines To understand and demonstrate Adverse event reporting: ADR reporting Form and Serious adverse events and reporting and Collection of ADRs from hospital 	
<ul style="list-style-type: none"> MEL 610.8- IEM screening 	<ul style="list-style-type: none"> To know the biochemical basis of different disorders of inborn errors of metabolism To be able to prepare chemical solutions required to perform the qualitative tests in IEM lab To be able to perform and interpret the basic screening tests of IEM. To be able to perform and interpret thin layer chromatography (TLC) of organic acids To know the principle and application of HPLC To observe the new born screening tests done in DBS samples 	120
<ul style="list-style-type: none"> MEL 610.9- Basics of andrology techniques 	<ul style="list-style-type: none"> Identify the basic instruments in Andrology laboratory Communicate instructions to the patient about semen collection Analyse semen - macroscopic and microscopic evaluations Demonstrate sperm preparation methods for therapeutic insemination Assess sperm DNA damage 	120
<ul style="list-style-type: none"> MEL 610.10- Forensic toxicology 	<ul style="list-style-type: none"> To be able to identify the poisons To identify the poisons based on their physical forms To classify poisons based on systems on which they act To know various poisons based on classification To know general management of the poisons To know and identify the common household poisons and their management To be aware of medico-legal aspects of poisoning To have knowledge about substances that may affect a person's performance or behaviour and ability to make rational judgement; and To have knowledge about substances that are not compliant with employment regulations or classified as substances of abuse. To have knowledge about evidentiary materials. 	120



Learning strategies, contact hours and student learning time		
<i>Learning strategy</i>	<i>Contact hours</i>	<i>Student learning time (Hrs)</i>
Lecture	20	60
Tutorial- SGT	10	30
SDL	10	10
Practical	80	160
Assessment	10	10
TOTAL	130	270
Assessment Methods:		
Formative:		Summative:
Practical assessment		End of elective examination
Mapping of assessment with Cos		
Nature of assessment	CO 1	
Practical assessment	X	
End of elective examination	X	
Feedback Process	• End elective Feedback	
Reference Material	Based on elective- departments will specify	

PROGAM OUTCOMES (POS) AND COURSE OUTCMES (COS) MAPPING

S.No.	Course Code	Course Name	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	MPH604	ANS, CVS & Renal System	4	X			X			X					
2	MPH606	Chemotherapy	4	X			X			X					
3	MPH608	Lab 3	4	X			X	X							

SECOND YEAR (FINAL YEAR):
Semester: 3

Semester: 4

Subject Code	Subject Title	L	T	P	C	Subject Code	Subject Title	L	T	P	C
MPH701	CNS	2	2	0	4	MPH702	Clinical pharmacology & Miscellaneous Topics	1	2	0	3
MPH703	GIT, RS & Autacoids	1	3	0	4	MPH704	Lab 5	0	0	6	3



MPH705	Experimental pharmacology	1	3	0	4	MPH706	Lab 6	0	0	8	4
MPH707	Lab 4	0	0	8	4	MPH798	Project	0	0	20	10
MEL709	Elective* - 2	1	1	4	4	-----	-----	-	-	-	-
	Total	5	10	20	20	Total		1	2	34	20

***Students are given Electives during their second and third semesters (one elective in each semester)**

***Electives are allotted based on their GPA**

***Students are not allowed to opt for electives in their parent department.**



Name of the Institution / Department: DEPARTMENT OF PHARMACOLOGY

Name of the Program:		M.Sc. Pharmacology (Medical)										
Course Title:		CNS GIT, RS & Autacoids Experimental pharmacology Lab 4										
Course Code: MPH701 MPH703 MPH705 MPH707		Course Instructor: Faculty of the Department of Pharmacology										
Academic Year: 2020-2021		Semester: Second Year, Semester 3										
No of Credits:		Prerequisites: 24 credits										
Synopsis:		Students will be exposed to basic aspects of drugs affecting central nervous system and respiratory system, autacoids and experimental pharmacology.										
Course Outcomes (COs):		On successful completion of this course, students will be able to										
CO 1:		Understand the basic principles of various drugs acting in CNS										
CO 2:		Understand the basic principles of drugs acting in GIT, respiratory system and autacoids										
CO 3:		Understand the methods used in drug assay, drug screening, experimental methodologies and principles and regulations in animal care										
CO 4:		Perform the screening of various groups of drugs										
Mapping of COs to POs												
<i>COs</i>	<i>PO 1</i>	<i>PO 2</i>	<i>PO 3</i>	<i>PO 4</i>	<i>PO 5</i>	<i>PO 6</i>	<i>PO 7</i>	<i>PO 8</i>	<i>PO 9</i>	<i>PO 10</i>	<i>PO 11</i>	<i>PO 12</i>
CO 1	x			x			x					
CO 2	x			x			x					
CO 3		x	x	x	x			x	x			
CO 4		x	x	x	x	x		x	x	x		
Course content and outcomes:												
<i>Content</i>						<i>Competencies</i>					<i>No of Hours</i>	
Unit 1: MPH 701 Central nervous system (CNS)												
<ul style="list-style-type: none"> Neurotransmission in the central nervous system General anaesthetics Local anaesthetics Sedatives and hypnotics Alcohols Antiepileptics 						<ul style="list-style-type: none"> Brief outline of neurotransmitters and their role Classification, mechanism of action, uses and adverse effects of general anaesthetics, local 					80 hours	



<ul style="list-style-type: none"> • Analgesics: Opioids • Analgesics: NSAIDs including drugs for rheumatoid arthritis and gout • Psychopharmacological agents • Drugs for CNS degenerative disorders 	<p>anaesthetics, Alcohol, Antiepileptics, Opioids NSAIDs, psychopharmacological agents</p> <ul style="list-style-type: none"> • Brief description of drugs used in neurodegenerative disorders 	
<p>Unit 2: MPH 703 Gastrointestinal system (GIT) Respiratory system (RS) Autacoids</p>		
<ul style="list-style-type: none"> • Drugs for peptic ulcer • Drugs for constipation and diarrhoea • Emetics and antiemetics • Drugs used in inflammatory bowel disorders • Drugs for bronchial asthma and cough • Histamine and antihistaminics • 5 – HT and its antagonists including drug therapy of migraine • Eicosanoids, kinins and cytokines 	<ul style="list-style-type: none"> • Classification, mechanism of action, uses and adverse effects of drugs used in peptic ulcer • Brief description of drugs used in constipation, diarrhoea and inflammatory bowel disease • Brief description of emetics and antiemetics • Classification, mechanism of action, uses and adverse effects of drugs used in bronchial asthma • Actions of different autacoids and drugs modulating the action of histamine, 5HT receptors, eicosanoids, kinins and cytokines 	<p>80 hours</p>
<p>Unit 3: MPH 705 Experimental Pharmacology</p>		
<ul style="list-style-type: none"> • Experimental methodologies involved in the discovery of drugs (in vivo, in vitro, ex vivo). • CPCSEA guidelines-Animal handling and animal care. • Methods of anaesthetizing animals and methods of euthanasia. • Blood collecting methods. • Toxicity studies including special toxicity studies • Drug screening methods involved in the evaluation of anti-ulcer drugs, antidepressants, antianxiety drugs, antihypertensive, anti-diabetic, anti-inflammatory, 	<ul style="list-style-type: none"> • Description of guidelines of Animal handling and care, anesthetizing and methods of euthanasia as per CPCSEA • describing the techniques for blood collection from animals • Description of preclinical toxicity studies • Describe the methods of screening of different groups of drugs • Describe the principles and methods to carry various bioassays and immunoassays • Explain principles and applications of colorimeter, spectroscopy, chromatography 	<p>80 hours</p>



<p>antiepileptic and analgesic drugs</p> <ul style="list-style-type: none"> • Basis and working principle of colorimeter and Fluorescence spectroscopy, • Basics of Chromatography: Partition, adsorption and ion exchange chromatography. Column chromatography, thin layer chromatography, paper chromatography, high performance thin layer Chromatography, high performance liquid chromatography (HPLC) and gas Chromatography. • Bioassays and immunoassay 		
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Unit 4: MPH 707 Lab 4

<ul style="list-style-type: none"> • Critical appraisal of drug promotional literature • Acute toxicity studies • Screening of analgesics • Screening of anti-inflammatory • Screening of antiepileptics 	<ul style="list-style-type: none"> • Perform the critical appraisal of drug promotional literature • Perform acute toxicity studies • Perform screening of compounds used as analgesics, antiepileptics and anti-inflammatory agents 	160 hours
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Learning strategies, contact hours and student learning time

<i>Learning strategy</i>	<i>Contact hours</i>	<i>Student learning time (Hrs)</i>
Lecture	140	140
Seminar	12	24
Journal Club	08	16
Small Group Discussion (SGD)	40	80
Case Based Learning (CBL)	-	-
Practical	160	160
Clinical Laboratory posting	-	-
Elective Posting	-	-
Self-directed learning (SDL)	20	20
Revision	20	20
Assessment	16	16
TOTAL	416	476

Assessment Methods:

Formative:	Summative:
	Sessional examination
Assignments	End semester examination



Mapping of assessment with Cos				
Nature of assessment	CO 1	CO 2	CO 3	CO 4
Sessional Examination 1	X			
Sessional Examination 2		X		
Sessional Examination 3			X	
Assignment/Presentation	X	X	X	
End Semester Examination	X	X	X	
Laboratory examination				X
Feedback Process	<ul style="list-style-type: none"> Mid-Semester feedback End-Semester Feedback 			
Reference Material	<ul style="list-style-type: none"> Essentials of Medical Pharmacology – by K D Tripathi 8th Edition Pharmacology and Pharmacotherapeutics - by Satoskar & Bhandarkar 25th Edition Basic & Clinical Pharmacology – by Bertram C Katzung 13th Edition Goodman & Gilman – The Pharmacological Basis of Therapeutics 12th Edition Fundamentals of Experimental Pharmacology – MN Ghosh, 3rd edition 			

Name of the Program:	MSc Pharmacology (Medical)											
Course Title:	Elective 2*											
Course Code: MEL 709	Course Instructor: course coordinator of elective											
Academic Year: 2020-2021	Semester: Final Year, Semester 3											
No of Credits: 4	Prerequisites: Nil											
Synopsis:	This exposure to multidisciplinary courses will help them develop interests and abilities that will help them further their career skills. Students can choose any one of the electives, listed below in the respective campuses. There should be a minimum of 3 students opting for a particular elective for it to be offered. The electives will be assigned depending on the number of slots available based on previous semester CGPA. Each elective runs for a period of 4 weeks. 75% attendance is mandatory and at the end of each elective there is assessment, the scores will help boost CGPA.											
Course (COs):	Outcomes	On successful completion of this course, students will be able to										
CO 1:	Explore their interests and develop desirable career skills and abilities that will help professional development											
Mapping of COs to POs												
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9			
CO 1	X	X	X	X	X				X			
Course content and outcomes:												
Content		Competencies								No of Hours		
MEL 709.1		Staining Techniques				ANATOMY				Both campuses		



MEL 709.2	Basic genetic techniques and tissue culture	ANATOMY	At Manipal campus only- Not offered since MAY 2017
MEL 709.3	Neurophysiology tests	PHYSIOLOGY	Both campuses
MEL 709.4	Orientation to Clinical Biochemistry	BIOCHEMISTRY	Both campuses
MEL 709.5	Preclinical Drug Screening	PHARMACOLOGY	Both campuses- not offered since MAY 2017
MEL 709.6	Isolation, identification and antimicrobial sensitivity testing-conventional & automated methods	MICROBIOLOGY	At Mangalore campus only
MEL 709.7	Detection of food borne pathogens	MICROBIOLOGY	At Manipal campus only- not offered since NOV 2019
MEL 709.8	Basics of animal research	PHARMACOLOGY	Both campuses
MEL 709.9	Analytical toxicology	BIOCHEMISTRY	At Manipal campus only
MEL 709.10	SEMEN CRYOPRESERVATION	CLINICAL EMBRYOLOGY	At Manipal campus only
MEL 709.11	Fungi in health and disease	MICROBIOLOGY	At Manipal campus only
MEL 709.12	Clinical Forensic medicine	FORENSIC MEDICINE	At Manipal campus only
MEL 709. 1 - staining techniques	<ul style="list-style-type: none"> To name variety of staining techniques with their applications To explain the principle and procedure of Hematoxylin & Eosin (H&E) staining technique in detail To demonstrate the Hematoxylin & Eosin staining procedure To explain some special staining techniques with their principles and procedures (e.g. Van Giessen's stain, Masson's Trichrome stain & Mallory's stain) 		120
MEL 709. 3- Neurophysiology tests	<ul style="list-style-type: none"> Demonstrate the sensory function test Demonstrate the motor function test Demonstrate the clinical examination of cranial nerves Basic techniques used in neurophysiological research using animal models 		120

	<ul style="list-style-type: none"> Perform the basic clinical examination of the central nervous system and to perform techniques used in neurophysiology studies independently 	
MEL 709. 4 - Orientation to Clinical Biochemistry	<ul style="list-style-type: none"> Understand the basic workflow in a clinical/ medical testing laboratory: Sample collection & transport, Sample acceptance & rejection criteria Understand the use of automation Rationale for selection of test panels/organ specific tests – LFT, RFT, TFT, Diabetes, Lipid profile, MI and tumour markers Know the preanalytical, analytical and post-analytical phases and their significance; A typical lab report format; instrument flags and their corrective actions, the significance of auto verification Understand the total quality management of the lab: Use of IQC, EQAS, ILQC, handling of feedback, complaints, errors in laboratory reports Appreciate the significance of laboratory accreditation as per the regulatory bodies 	120
MEL 709. 6- Isolation, identification and antimicrobial sensitivity testing-conventional & automated methods	<ul style="list-style-type: none"> Acquire knowledge regarding the basic concepts of isolation and identification of Infectious agents from clinical specimen Describe the process to determine antimicrobial susceptibility of pathogenic bacteria Acquire knowledge on the automated methods employed for isolation, identification & antimicrobial susceptibility testing of pathogenic bacteria Understand the basic concepts of Serological techniques used in the diagnosis of Infectious diseases 	120
MEL 709. 8- Basics of animal Research	<ul style="list-style-type: none"> Demonstrate animal handling & drug administration techniques Explain Preclinical toxicity studies Understand and observe the spontaneous behavior in laboratory animals Explain the principles and demonstrate the screening of analgesics using hot plate and tail flick method Explain the principles and demonstrate the screening of antiepileptics in MES and PTZ models Explain the principles and demonstrate the test for screening of anti-inflammatory activity Explain the principles and demonstrate the screening of antidepressants using tail suspension methods and forced swim test 	120



	<ul style="list-style-type: none"> Explain the principles and demonstrate the screening of anxiolytics using elevated plus maze and light & dark box 	
MEL 709. 9- Analytical toxicology	<ul style="list-style-type: none"> Description and demonstration of various tests related to the panels: drug abuse panel; pesticide panel; alcohol panel; narcotic panel and heavy metal panel Identification and quantification of unknown chemical/poisons assessment by using a GC-MS (Gas chromatography- mass spectrometry) Description and demonstration of conducting systematic studies regarding use and hazards of various chemicals, used in agriculture. Developing information leaflets regarding guidelines and hazards of pesticide use to all needy farmers across all districts of our state 	120
MEL 709. 10- SEMEN CRYOPRESERVATION	<ul style="list-style-type: none"> Discussions on basics of semen analysis Demonstration of semen cryopreservation and thawing Assessing the post-thaw competence of spermatozoa - motility and viability assessment Preparation of frozen-thawed spermatozoa for therapeutic insemination 	120
MEL 709. 11- Fungi in health and disease	<ul style="list-style-type: none"> Understand the diverse pathogenic fungi involved in disease. Familiarize the laboratory skills for diagnosis of fungal infections. Comprehend the beneficial role of fungi and their applications. 	120
MEL 709. 12- Clinical Forensic medicine	<ul style="list-style-type: none"> Description on to handle medico-legal cases in the hospital Procedure to make a case medico-legal Documentation in a medico-legal cases Procedure on legal protocol that includes police intimation, collection of evidentiary material, preparation of certificates Examination of sexual assault & drunkenness cases About medico-legal consultation Recording of dying declaration 	120

Learning strategies, contact hours and student learning time

<i>Learning strategy</i>	<i>Contact hours</i>	<i>Student learning time (Hrs)</i>
Lecture	20	60
Tutorial- SGT	10	30



SDL	10	10
Practical	80	160
Assessment	10	10
TOTAL	130	270
Assessment Methods:		
Formative:		Summative:
Practical assessments		End elective examination
Mapping of assessment with Cos		
Nature of assessment	CO 1	
Practical Assessment	X	
End Elective Examination	X	
Feedback Process	• End-Elective Feedback	
Reference Material	Depending on the elective, departments will specify the reference books	

PROGAM OUTCOMES (POS) AND COURSE OUTCMES (COS) MAPPING

S.No.	Course Code	Course Name	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	MPH701	CNS	4	X			X			X					
2	MPH703	GIT, RS & Autacoids	4	X			X			X					
3	MPH705	Experimental pharmacology	4		X	X	X	X			X	X			
4	MPH707	Lab 4	4		X	X	X	X	X		X	X	X		



Name of the Institution / Department: DEPARTMENT OF PHARMACOLOGY

Name of the Program:		M.Sc. in Pharmacology (Medical)										
Course Title:		Clinical pharmacology & Miscellaneous Topics Lab 5 Lab 6										
Course code MPH702 MPH704 MPH706		Course Instructor: Faculty of the Department of Pharmacology										
Academic year_2020-21		Semester: First Year, Semester 4										
No.of credits:		Prerequisites:										
Synopsis:		This course would provide basic knowledge required to build up on further in their specific subjects. Under this common core, students will be exposed to the foundation on fundamentals of clinical pharmacology, pharmacokinetics and screening of drugs										
Course Outcomes (COs):		On successful completion of this course, students will be able to										
CO 1:		Understand the principles of clinical pharmacology and about the miscellaneous drugs										
CO 2:		Perform pharmacokinetic, pharmacoeconomic exercises										
CO 3:		Perform the screening of various groups of drugs										
CO4:		Conduct research										
Mapping of COs to POs												
<i>COs</i>	<i>PO 1</i>	<i>PO 2</i>	<i>PO 3</i>	<i>PO 4</i>	<i>PO 5</i>	<i>PO 6</i>	<i>PO 7</i>	<i>PO 8</i>	<i>PO 9</i>	<i>PO 10</i>	<i>PO 11</i>	<i>PO 12</i>
CO 1	x	x		x			x					
CO 2						x					x	
CO 3		x	x	x	x	x			x	x		
CO4	x	x	x	x	x	x		x	x	x	x	
Course content and outcomes:												
<i>Content</i>						<i>Competencies</i>					<i>No of Hours</i>	
Unit 1: Clinical Pharmacology and Miscellaneous topics												
Clinical Pharmacology						<ul style="list-style-type: none"> Description of components and scope of various terms used in Pharmacology Explain the phases of clinical trials Describe the use of drugs in special situations like pregnancy, children Explain pharmacoepidemiology, pharmacoeconomics, therapeutic drug monitoring, essential 					60 hours	
<ul style="list-style-type: none"> Introduction to clinical pharmacology: Terminology, basic components and scope New drug discovery process Types of clinical trials: Ethical considerations, controlled trials, randomization, blinding, inclusion/exclusion criteria, sample size, multicentric trials, 												



<p>Sequential trial, meta-analysis, cohort study, case control study and phases of clinical trials.</p> <ul style="list-style-type: none"> • Prescribing in pregnancy, elderly, infants and children • Pharmacoepidemiology • Pharmacoeconomics • Therapeutic drug monitoring • Essential medicines • Rational use of medicines • Regulatory guidelines: ICMR and Schedule Y guidelines, CDSCO, Ethics committees <p>Miscellaneous topics</p> <ul style="list-style-type: none"> • Chelating agents, heavy metals and their antagonists • Immunomodulators – immunostimulants and immunosuppressants • Drugs acting on skin and mucous membrane • Antiseptics and disinfectants • Vaccines and sera • Vitamins and antioxidants 	<p>medicines, rational use of medicines with examples.</p> <ul style="list-style-type: none"> • Explain the Regulatory guidelines of ICMR and Schedule Y guidelines, CDSCO, Ethics committees • Enumerate chelating agents and explain their mechanism of action and uses • Describe briefly immunomodulators, drugs acting on skin and mucus membrane, antiseptics and disinfectants, vaccines, vitamins 	
<p>Unit 2: Lab 5 (MPH 705)</p>		
<ul style="list-style-type: none"> • Dosage calculation exercises • Pharmacoeconomic exercise • Pharmacokinetic exercises • Protocol writing (DM, HTN) • Preparation of informed consent form 	<ul style="list-style-type: none"> • Calculate drug dosage in various settings • Calculate the basic pharmacoeconomic and pharmacokinetic parameters • Write protocol for the new drugs being developed for diabetes mellitus, hypertension • Prepare an informed consent form 	<p>120 hours</p>
<p>Unit 3: Lab 6 (MPH 706)</p>		
<ul style="list-style-type: none"> • Screening methods – Skeletal muscle relaxants • Screening methods – Psychopharmacology • Rota rod, Inclined plane, Actophotometer, Tail suspension • T Maze, Open Field Test, Passive avoidance – Discussion, 	<ul style="list-style-type: none"> • Perform experiments for screening drugs to be used as skeletal muscle relaxants, antipsychotics • Explain principles, working and use of instruments like Rota rod, inclined plane, actophotometer, T maze, open field 	<p>160 hours</p>



Principles, Identification of instrument	of					
Unit 4: MPH 798 Project work						
Conduct of research		<ul style="list-style-type: none"> • Write a protocol • Conduct literature search • Conduct the study • Statistical analysis of data • Preparation of report • Submission of manuscript 	400 h			
Learning strategies, contact hours and student learning time						
<i>Learning strategy</i>		<i>Contact hours</i>	<i>Student learning time (Hrs)</i>			
Lecture		25	50			
Seminar		12	24			
Journal Club		08	16			
Small Group Discussion (SGD)		05	10			
Case Based Learning (CBL)		-	-			
Practical		280	280			
Clinical Laboratory posting		-	-			
Elective Posting		-	-			
Self-directed learning (SDL)		10	20			
Revision		10	20			
Assessment		12	12			
Project		400	400			
TOTAL		762	832			
Assessment Methods:						
Formative:		Summative:				
		Sessional examination				
Assignments		End semester examination				
Mapping of assessment with Cos						
Nature of assessment	CO 1	CO 2	CO 3	CO 4		
Sessional Examination 1	X					
Sessional Examination 2		X				
Sessional Examination 3			X			
Assignment	X					
End Semester Examination	X			X		
Laboratory examination		X	X			
Feedback Process	<ul style="list-style-type: none"> • Mid-Semester feedback • End-Semester Feedback 					
Reference Material	<ul style="list-style-type: none"> • Essentials of Medical Pharmacology – by K D Tripathi 8th Edition 					



	<ul style="list-style-type: none"> • Pharmacology and Pharmacotherapeutics - by Satoskar & Bhandarkar 25th Edition • Basic & Clinical Pharmacology – by Bertram C Katzung 13th Edition • Goodman & Gilman – The Pharmacological Basis of Therapeutics 12th Edition <p>Fundamentals of Experimental Pharmacology – MN Ghosh, 3rd edition</p>
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PROGRAM OUTCOMES (POS) AND COURSE OUTCOMES (COS) MAPPING

S.No.	Course Code	Course Name	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	MPH702	Clinical pharmacology & Miscellaneous Topics	3	x	x		x			x					
2	MPH704	Lab 5	3						x					x	
3	MPH706	Lab 6	4		x	x	x	x	x			x	x		
4	MPH798	Project	10	x	x	x	x	x	x		x	x	x	x	x