

Study & Evaluation Scheme

of

M.Sc. (Medical Pharmacology)
[Applicable for the Batch 2013-14 till revised]



TEERTHANKER MAHAVEER UNIVERSITY

Delhi Road, Moradabad, Uttar Pradesh-244001

Website: www.tmu.ac.in



TEERTHANKER MAHA VEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)

Delhi Road, Moradabad (U.P)

Study & Evaluation Scheme of M. Sc. (Medical Pharmacology)

SUMMARY

Programme	:	M. Sc. (Medical Pharmacology)
Duration	:	Three year full time (Annual System)
Medium	:	English
Minimum Required Attendance	:	75 percent
Maximum Credits	:	90
Minimum credits required for the degree	:	90

Assessment	:	Internal		External		Total	
		25		75		100	
Internal Evaluation (Theory Papers)	:	Class Test-I	Class Test-II	Assignment(s)	Other Activity (including attendance)	Total	
		7.5 Marks	7.5 Marks	5 Marks	5 Marks	25 Marks	
Evaluation of Practical/Dissertations & Project Reports	:	Internal		External		Total	
		50		50		100	
Duration of Examination	:	External			Internal		
		3 hrs.			1 ½ hr.		

To qualify the course a student is required to secure a minimum of 50% marks in aggregate including the year-end examination and teachers continuous evaluation.(i.e. both internal and external).A candidate who secures less than 50% of marks in a course shall be deemed to have failed in that course.

A Candidate who has been placed under re-appear category in any of the subject shall be allowed to continue his/her studies in the next year but will have to appear in the supplementary examination to be conducted within three months after declaration of the result.

Students clearing all papers or having failure in not more than two subjects will be allowed to move to the next higher class. Students with failure in more than two subjects will have to re-appear in the said papers in the year end examination of the program in the subsequent year(s).

Note: For internal assessment purpose, there will be three Class Tests in a year and best two tests will be computed for the final result.

STUDY & EVALUATION SCHEME
Programme: M. Sc. (Medical Pharmacology)

Year-I

S. No.	Course Code	Subject	Periods				Credit	Evaluation Scheme		
			L	T	S	P		Internal	External	Total
1	MSC101	Basics of Anatomy	6	-	1	-	7	25	75	100
2	MSC102	Basics of Physiology	5	-	1	-	6	25	75	100
3	MSC103	Basics of Biochemistry	4	-	1	-	5	25	75	100
4	MSC104	Research Methodology	1	-	-	-	1	25	75	100
5	MSC151	Basics of Anatomy (Lab)				6	3	50	50	100
6	MSC152	Basics of Physiology (Lab)				6	3	50	50	100
7	MSC153	Basics of Biochemistry (Lab)				4	2	50	50	100
Total			16		3	16	27	250	450	700

Year-II

S. No.	Course Code	Subject	Periods				Credit	Evaluation Scheme		
			L	T	S	P		Internal	External	Total
1	MSP201	General Pharmacological Principles And Applied Sciences	3	2	1	-	5	25	75	100
2	MSP202	Systemic Pharmacology	3	2	1	-	5	25	75	100
3	MSC201	Teaching Methodology	2	1	1	-	3	25	75	100
4	MSP251	Pharmacology Practical I	-	-		24	12	50	50	100
5	MSC251	Fundamental of Computer (Lab)				2	1	50	50	100
Total			8	5	3	26	26	175	325	500

Year-III

S. No.	Course Code	Subject	Periods				Credits	Evaluation Scheme		
			L	T	S	P		Internal	External	Total
1	MSP301	Experimental Pharmacology, Bioassay and Recent Advancements	3	2	1	-	5	25	75	100
2	MSP302	Clinical Pharmacokinetics & Recent Advances	3	2	1	-	5	25	75	100
3	MSC351	Teaching Practice	-	-	-	6	3	50	50	100
4	MSP351	Pharmacology Practical II	-	-	-	24	12	50	50	100
5	MSP352	Thesis	-	-	-	-	12	50	50	100
Total			6	4	2	30	37	200	300	500

L – Lecture **T- Tutorial** **P- Practical** **S= Seminar** **C-Credits**
1L = 1Hr **1T= 1 Hr** **1P= 1 Hr** **1S=1Hr** **1C =1Hr of Lecture/Seminar**
2 Hrs of Practical/Tutorial

Note: Presenting paper/poster at conferences/ preparing manuscripts for documentation and presenting seminar shall be given weight age in the internal assessment.

Question Paper Structure

- The question paper shall consist of EIGHT questions, out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question No. 1 shall contain 8 parts representing the entire syllabus and students shall have to answer any five (weightage 3 marks each)*
- Out of the rest SEVEN questions, students shall be required to attempt any five questions. The weight age of questions no. 2 to 8 shall be 12 marks each.*

M.Sc. (Medical Pharmacology) Year-I
BASICS OF ANATOMY

Course Code: MSC101

L-6, T-0, P-0, S-1 C-7

Course Contents

General Anatomy

1. Anatomical terminology, Anatomical plane, Anatomical positions, Clinical positions, Terms related to movements
2. Basics of cytology: Structure of cell wall, Cell organelles,
3. Musculoskeletal system:
 - (a) Bones & classification, Morphology, ossification functions, blood supply
 - (b) Muscles, Morphology, classification blood supply, innervations, functions
4. Integumentary system: Thick Skin, Thin skin layers of dermis epidermis, Skin appendages, blood supply, innervations, functions
5. Cardiovascular system: Morphology of blood vessel, classification of blood vessels, blood capillaries, blood circulation, functions
6. Nervous system: Central Nervous system & Peripheral Nervous system, Gross basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, Autonomic nervous system
7. Endocrine system: Classification, Hormone produces, Control of hormone secretion, basic functions
8. Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Lymph circulation, functions
9. Digestive system: Parts of digestive system, gross anatomy and functions
10. Excretory system: Parts of excretory system, gross anatomy of kidney, ureter, urinary bladder penis and their functions
11. Reproductive system: Male reproduction system- gross anatomy of testis, epididymis, vas-deferens, seminal vesicles and prostate. Female reproductive system- gross anatomy of ovaries, uterine tube, uterus, vagina, menstruation cycle
12. Basics of genetics: Cell division ,mitosis, meiosis, Cell cycle, Chromosomes

Gross Anatomy (Elementary Anatomy)

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck & Fact Region

Anatomy of each part including functional, sectional and radiological anatomy

Recommended Books

1. Williams et al, *Gray's Anatomy*, Livingstone Churchill.
2. B. Young and J. Heath, *Wheaters' Functional Histology*, Livingstone Churchill
3. Ross M.H., *Histology: A Text & Atlas*, Williams & Wilkins.
4. Langman Jan, *Medical Embryology*, William and Wilkins.
5. Thompson J.S. & Thompson M.W., *Genetic in Medicine*, W.B. Saunders & Co. Philadelphia,
6. Stuin J & Carpenter MB, *Human Neuroanatomy*,
7. Richard S. Snell, *Clinical Neuroanatomy for Medical Students*, Willian and Wilkins

M.Sc. (Medical Pharmacology) Year-I
BASICS OF PHYSIOLOGY

Course Code: MSC102

L-5, T-0, P-0, S-1 C-6

Course Contents

1. Cell Physiology

Cell Structure and membrane transport, Resting Membrane Potential, Composition of ECF and ICF, Nernst Equation, Equilibrium Potential, Goldman Equation

2. Nerve-Muscle and Biopotential

Neuron (structure, function and classification), Neuroglia, Action Potential, Neuromuscular junction, Skeletal Muscle (structure, mechanism of contraction and relaxation), Smooth Muscle (structure, mechanism of contraction and relaxation)

3. Blood

Function and Composition, Erythrocytes, Haemoglobin, Blood groups, Leucocytes, Thrombocytes, Immunity

4. Cardiovascular System

Cardiac Muscle, Physiological anatomy of heart and conduction system, Cardiac Action Potential, Normal ECG, Cardiac cycle, Heart sounds, Cardiac output and blood pressure, Coronary circulation

5. Respiration

Functional anatomy of the respiratory system, Mechanism of breathing, Dead space, Surfactants

Dynamic and static lung volumes and capacities, Transport of oxygen and carbon dioxide, Regulation of Respiration, Cyanosis, Hypoxia, Oxygen toxicity

6. Gastrointestinal Tract

Functional anatomy, Salivary glands (secretion and function of saliva, deglutition), Stomach (composition, regulation of secretion and function of the gastric juice), Liver (secretion and function of bile), Pancreas (secretion and function), Intestines, Intestinal secretion (composition and function), Movements of Intestines, Hormones of GIT

7. Excretory System

Function of kidney, Structure of nephron, Juxta glomerular apparatus, Formation of urine

Counter current mechanism, Acidification of urine & role of kidney in maintenance of acid base balance, Renal function tests, Micturition

8. Autonomic Nervous System

Organization of the ANS, Chemo-transmitters, Effect of sympathetic and parasympathetic stimuli on different organ systems

9. Central Nervous System

General organization of CNS & PNS, Sensory system :(General sensations, receptors, sensory pathways, sensory areas of brain)

Motor system: (muscle spindle, Golgi tendon organ, reflex arc, corticospinal and extra-pyramidal tracts)

Brain: Functions of: Cerebellum, thalamus, hypothalamus, basal ganglia, limbic system, reticular activating system; Higher Function: Sleep

10. Special Senses

Eye (functional anatomy, refractory indices of media, rods and cones, role of vitamin A, visual pathway), Ear (structure of internal ear, mechanism of hearing), Taste (distribution and structure of taste buds and taste papillae, primary taste modalities, taste pathway), Smell (olfactory epithelium and pathway)

11. Endocrine System

Mechanism of action of hormones, Functions of the following glands: Pituitary, thyroid, parathyroid, adrenal (cortex and medulla), pancreas

12. Reproductive System

General organization of male and female reproductive systems, Male: Spermatogenesis and actions of male sex hormones, Female: Sexual cycles and actions of female sex hormones, pregnancy, parturition and lactation, Family planning

Reference Books (Latest Edition)

1. Guyton, A., *Text Book of Medical Physiology*, Elsevier Publication,
2. Ganong, W.F., *Reviews of Medical Physiology*, Lange Publication
3. Khurana, I., *Text Book of Physiology*, Elsevier Publication
4. Berne V, *Principles of Physiology*, Elsevier Mosby Publication.
5. Lippincott W &Wilkins, *Medical Physiology (Clinical Medicine)*, Rhodes &Bell.

M.Sc. (Medical Pharmacology) Year-I
BASICS OF BIOCHEMISTRY

Course Code: MSC103

L-4, T-0, P-0, S-1, C-5

Course Contents

Basic concepts of Biochemistry to be studied under the following headings:

1. Cell structure and function and transport through the biological membrane.
2. Chemistry of Bio molecules – carbohydrate, lipids, amino acids, proteins and nucleic acids.
3. Chemistry of Blood & haemoglobin.
4. Enzymes.
5. Bioenergetics and Biologic oxidation.
6. Metabolism of carbohydrates, Proteins, lipids and nucleotides.
7. Integration of metabolism.
8. Nutrition, Vitamins & minerals.
9. Molecular Biology.
10. Detoxification & Xenobiotics.
11. Oxygen derived free radicals.
12. Immunology.
13. Organ function tests.

Reference Books

1. Lubert Stryer (Ed.), *Biochemistry*, W.H. Freeman & Company, New York.
2. Lehninger , Nelson & Cox (Ed.), *Principles of Biochemistry*, CBS Publishers & Distributers.
3. Murray R.K. & P.A. Mayes (Ed.), *Harpers Biochemistry*, D.K. Granner,
4. Thomas M. Devlin (Ed.), *Textbook of Biochemistry with Clinical Correlations*, Wiley Liss Publishers.
5. Benjamin Lewin (Ed), *Genes VI*, Oxford University Press

M.Sc. (Medical Pharmacology) Year-I RESEARCH METHODOLOGY

Course Code: MSC104

L-1, T-0, P-0, S-0, C-1

Course Contents

Unit – 1

Methods of collection of data, classifications and graphical representation of data. Binomial and normal probability distribution. Polygon, histogram, measure of central tendency. Significance of statistical methods, probability, degree of freedom, measures of variation - Standard deviation, Standard error.

Unit – 2

Sampling, sample size and power. Statistical inference and hypothesis. Tests for statistical significance: t-test, Chi-square test, confidence level, Null hypothesis.

Unit – 3

Analysis of Variance (one way and two way ANOVA). Factorial designs (including fraction factorial design). Theory of probability, Permutation and Combination, Ratios, Percentage and Proportion and Multiple comparison procedures.

Unit – 4

Non-parametric tests, Experimental design in clinical trials, Statistical quality control, Validation, Optimization techniques and Screening design. Linear regression and Correlation, least square method, significance of coefficient of correlation, nonlinear regression.

Unit – 5

Report Preparation: Types and Layout of Research Report, Precautions in Preparing the Research Report. Bibliography and Annexure in the Report: Their Significance, Drawing Conclusions, Suggestions and Recommendations to the Concerned Persons. Use of SPSS in Data Analysis.

Recommended Books

1. Cooper & Schindler, *Business Research Methods*, Tata McGraw Hill.
2. *Saunders Research Methods for Business Students*, Pearson Education, 2007.
3. Malhotra Naresh K., *Marketing Research*, Pearson Education.
4. Fisher, R.A., *Statistical Methods for Research Works*, Oliver & Boyd, Edinburgh.
5. Chow, *Statistical Design and Analysis of Stability Studies*, Marcel Dekker, New York.
6. Finney, D.J., *Statistical Methods in Biological Assays*, Hafner, New York.
7. Montgomery, D.C., *Introduction to Statistical Quality Control*, Willy.
8. Lipschutz, *Introduction to Probability and Statistics*, McGraw-Hill.

Note:

* Latest editions of all the suggested books are recommended.

M.Sc. (Medical Pharmacology) Year-I
BASICS OF ANATOMY (LAB)

Course Code: MSC151

L-0, T-0, P-6, S-0, C-3

Course Contents

Practical: Demonstration of the following on dissected parts

1. Anatomical terminology (anatomical plane, anatomical positions, other positions required in clinical practice, terms related to movements and sections etc.)
2. Basics of cytology
3. Musculoskeletal system
4. Integumentary system
5. Cardiovascular system
6. Nervous system
7. Endocrine system
8. Lymphatic system
9. Digestive system
10. Excretory system
11. Reproductive system
12. Basics of genetics (cell division, cell cycle)

Gross Anatomy Dissections

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck and Face

M.Sc. (Medical Pharmacology) Year-I
BASICS OF PHYSIOLOGY (LAB)

Course Code: MSC152

L-0, T-0, P-6, S-0, C-3

Course Contents

- Study of microscope
- Preparation and staining of blood film and identification of different blood cells
- Differential leukocyte count
- Determination of blood group
- Estimation of haemoglobin
- Haemin crystal
- Determination of bleeding and clotting time
- Total leukocyte count

Recommended Books

1. Ghai, C.L., *Textbook of Practical Physiology*, Jaypee Bros.
2. Jain, A.K., *Manual of Practical Physiology*, Arya Publications

**M.Sc. (Medical Pharmacology) Year-I
BASICS OF BIOCHEMISTRY (LAB)**

Course Code: MSC153

L-0, T-0, P-4, S-0, C-2

Course Contents

Basic awareness of laboratory with respect to equipments and glassware, units of measurement and calibration of volumetric apparatus, preparation and storage of reagents, standard solutions, buffer solutions and pH determination.

S. No.	Topic
1.	Introduction : Handling of chemicals, preparation of reagents Pipetting etc.
2	Colour reactions of carbohydrates
3	Colour reactions of Lipids
3.	Colour reactions of proteins
4.	Precipitation reactions of protein.
5.	Individual proteins -Albumin, Globulin , Casein & Gelatin.
6.	Unknown protein identification
7.	Milk Analysis
8.	Starch digestion by salivary amylase and products.
9.	Normal constituents of urine.
10.	Abnormal constituents of urine and Reporting of abnormal urine.
11.	pH determination and buffer preparation
12.	Demonstration : Spectroscopic examination of Blood
13.	Verification of Beer's Lambert Law: Colorimetry, Spectro photometry.
14	Estimation of serum glucose level and glucose tolerance test.
15	Estimation of total protein and albumin level and calculation of A/G Ratio.
16	Estimation of Serum Urea level and calculation of Urea clearance.
17	Estimation of Serum Uric Acid level.
18	Estimation of Serum Creatinine level and Calculation of Creatinine clearance.
19	Diagnostic Enzymology :- * Liver Enzymes * Cardiac Enzymes * Misc.
20	Estimation of Serum ALP Activity
21	Clinical problems involving organ function tests.
22	Demonstration : Electrophoresis.(Paper, agarose & PAGE)
23	Demonstration : Chromatography (Paper & HPLC)
24	Demonstration: Flame photometry.
25	Special Technique: - Bioluminescence, fluorometry, Chemiluminescence.
26	Quality Control.
27	Molecular Biology Practicals.

Reference Books

1. Burtis & Ashwood W.B (Ed), *Tietz Textbook of Clinical Chemistry*, Saunders Company.
2. Keith Wilson & John Walker (Ed), *Principles & Techniques of Practical Biochemistry*, Cambridge University Press.

M.Sc. (Medical Pharmacology) Year-II
GENERAL PHARMACOLOGICAL PRINCIPLES AND APPLIED SCIENCES

Course Code: MSP201

L-3, T-2, P-0, S-1, C-5

Course Contents

General Pharmacology

Introduction		: Definition nature & sources of drugs dosage forms, drug Nomenclature etc Complimentary Alternative Medicine.
Pharmacokinetics I	(a) Absorption	: General Principles passage of drugs across biological membranes, factors affecting absorption, transport, bioavailability.
Routes of administration		: Advantages & disadvantages of important routes used.
Pharmacokinetics II	(b) Distribution	: Plasma protein binding, biological barriers (BBB& Placental), volume of distribution, tissue storage.
Pharmacokinetics III	(c) Biotransformation	: Principle phases (I & II), sites, types with examples. Factors affecting (Induction, Inhibition, First pass effect).
Pharmacokinetics IV	(d) Elimination	: Routes, Kinetics Half-Life, Loading dose, Maintenance dose. Methods of prolongation of drug effect, Posology & Factors modifying dose of a drug.
Pharmacodynamics I		: Principles of drug action, mechanism of drug action, Receptors, Agonist, partial agonist, inverse agonist etc. Transducer mechanism.
Pharmacodynamics II		: Dose-response relationship, Drug efficacy & potency, Therapeutic index, LD 50 & ED 50, synergism, Drug antagonism. Factors modifying drug action. Adverse drug reactions. Drug Interactions, Phases of drug development, Generic name , trade name. Fixed dose combinations.
Rational Drug concept		: P Drugs, Essential drugs, Evidence based Medicine. Pharmacovigilance, Pharmacoeconomics and Drug Information
Toxicology		: General principles of treatment of poisoning including snake bite and animal stings. Heavy metal poisoning and heavy metal antagonists. Management of over dosage with commonly used therapeutic agents.
Pharmacogenetics		: Pharmacogenomics and Personalized Medicine
Wonder Discoveries in Pharmacology		: Nobel laureates in Pharmacology and their revolutionary discoveries

Practical Skills:

- Dosage forms
 - Oral
 - Parenteral
 - Topical & Others
- Routes of drug administration, setting up of an intravenous drip
- Calculation of drug dosage
- Sources of drug information – how to retrieve information
- ADR monitoring
- Therapeutic Drug Monitoring
- Critical appraisal of drug promotional literature
- Essentials of Clinical trials
- Communicating of patients on the proper use of medication
- Selection of P drug
- Prescription writing, prescription auditing and standard treatment protocols
- General Principles of Pharmacy
- Preparation and dispensing of powders, emulsion ointments, mixtures, liniments, suppositories and syrups
- Spotting exercise – Identify the commonly used items in Pharmacology
- Exercise on drug interactions
- Essential drug list
- Use of drugs in pregnancy, lactation children and elderly
- Use of drugs in liver disease and renal disease
- Ethics in clinical trials, therapy

M.Sc. (Medical Pharmacology) Year-II
SYSTEMIC PHARMACOLOGY

Course Code: MSP202

L-3, T-2, P-0, S-1, C-5

Course Contents

- Autonomic nervous system
- Central nervous system
- Autacoids
- Drugs affecting kidney function and Cardiovascular system
- Drugs affecting gastrointestinal and respiratory system
- Drugs affecting uterine motility
- Chemotherapy of parasite infections
- Chemotherapy of microbial diseases
- Antineoplastic agents
- Immunomodulators
- Drugs acting on blood and blood forming organs
- Hormones
- Miscellaneous
- Vitamins (water soluble and fat soluble vitamins).
- Heavy metals and heavy metal antagonists.
- Ocular and dermato-pharmacology .
- Recent developments in Pharmacology time to time.
- Gene therapy. Therapeutic gases.
- Free radical biology and antioxidants,
- Pharmacology of bisphosphonates, melatonin-therapeutic potential.
- Pharmacotherapy of migraine,
- Drug therapy in Alzheimer's disease and male sexual dysfunction.
- Hormone replacement therapy.

M.Sc. (Medical Pharmacology) Year-II
TEACHING METHODOLOGY

Course Code: MSC201

L-2, T-1, P-0, S-1 C-3

Course Contents

- Challenges for teachers in Medical Education
- Teaching strategies
 - Lecture method
 - Small group teaching
 - Inquiry and problem solving methods
 - Case study
 - Team projects
 - Presentation
 - Seminar
 - Field visit
 - Simulation
 - Computer based instructions
 - Bed side learning
 - One to one teaching
 - Self directed teaching
- Preparation of lesson
- Selection of teaching methods
- Identification and review of literature
- Identification of teaching resources
- Developing teaching aids for instructional activities that link research and theory to practice
- Contact development; key element of curriculum design and evaluation
- Implementation and monitoring of curriculum transaction and student's evaluation
- Student feedback : designing and implementation
- Research paper writing

M.Sc. (Medical Pharmacology) Year-II
PHARMACOLOGY PRACTICAL I

Course Code MSP251

L-0, T-0, P-24, S-0, C-12

Course Contents

- Effect of anti-inflammatory agents on carrageenin induced rat paw edema. Evaluation of analgesic activity of morphine using tail flick latency test. Demonstration of Dale's vasomotor reversal and nicotinic effect of acetylcholine on dog blood pressure.(through e-lab). Effect of autonomic drugs on rabbit intestine. Effect of sedatives & skeletal muscle relaxants on rodents (rotarod test).
- Prescription writing for common diseases in the proper format.
- Audit a given prescription.
- Criticize & evaluate pharmaceutical company's literature.
- Recognise signs and symptoms of common drug over dosage and poisons and how to treat them.
- Calculate the cost- effectiveness of various drug regimens for common illness.
- Interpret graphs & charts of Experimental and Clinical Pharmacology.

M.Sc. (Medical Pharmacology) Year-II
FUNDAMENTALS OF COMPUTER (LAB)

Course Code: MSC251

L-0, T-0, P-2, S-0 C-1

Course Contents

Unit – I

Basic computer organization functionality computer codes computer classification Boolean algebra, primary storage, secondary storage devices, input-output devices, computer software, computer languages, operating system, business data processing concepts, data communication and networks and advances

Unit – II

Planning the computer program, algorithm, flowcharts, and decision tables.

Unit – III

Writing simple programs in 'C', Numeric constants and variables. Arithmetic Expressions, Input & Output in 'C' Programs, conditional statements, implementing loops in programs, arrays, logical expressions, and control statements such as switch, break and continue functions, processing character strings, files in 'C'.

Unit – IV

MS Office (Word, Excel, PowerPoint), Basic Database concept and classification, operations performed on database, using MS-Access. Internet Features.

Unit – V

Computer applications in Pharmacology and clinical studies.

Recommended Books

1. Sinha, R.K., *Computer Fundamentals*, BPB Publications.
2. Raja Raman, V, *Computer Programming in 'C'*, PHI Publication.
3. Hunt N & Shelley J., *Computers and Common Sense*, PHI Publication.

* Latest editions of all the suggested books are recommended.

M.Sc. (Medical Pharmacology) Year-III
EXPERIMENTAL PHARMACOLOGY, BIOASSAY AND RECENT
ADVANCEMENTS

Course Code: MSP301

L-3, T-2, P-0, S-1, C-5

Course Contents

Experimental methodologies involved in the discovery of drugs (in vivo, in vitro, ex vivo). Animal handling and animal care. Methods of anaesthetising animals and methods of euthanasia. Restraining and blood collecting methods. Drug screening methods involved in the evaluation of anti-ulcer, antidepressant, antianginal, antihypertensive, antiarrhythmic, antidiabetic, anticataract, anti-platelet, anticancer, antiinflammatory, antidiarrhoeal, antiepileptic, analgesic, antithyroid, antipyretic, antiglaucoma, antihyperlipidemic antiasthmatics drugs and cough suppressants. Drug screening methods used in screening antifungal, anthelmintic, antibacterial, antiviral agents, drugs for heart failure, posterior pituitary, adrenal steroid (gluco & mineralo corticoids), testicular, parathyroid, ovarian, thyroid hormones, Methods involved in testing teratogenicity, carcinogenicity and organ toxicities in animals.

INSTRUMENTATION IN DRUG ANALYSIS

Qualitative testing, titrimetric analysis. Beer and Lambert's law. Basis and working principle of colorimeter, ultraviolet, atomic absorption spectrometers, Fluorescence spectroscopy, NMR and Mass Spectroscopy. Basics of Chromatography. Partition, adsorption and ionexchange chromatography. Column chromatography, thin layer chromatography, paper chromatography, immunoabsorbant chromatography, high performance thin layer Chromatography, high performance liquid chromatography (HPLC) and gas Chromatography. Radio immunoassay. Processing of biological materials for drug analysis. Calculations in drug analysis. Good laboratory practice. Validation of analytical procedure.

M.Sc. (Medical Pharmacology) Year-III
CLINICAL PHARMACOKINETICS & RECENT ADVANCES

Course Code: MSP302

L-3, T-2, P-0, S-1, C-5

Course Contents

Basics of pharmacokinetics, calculation of pharmacokinetic estimates (C-max, Tmax, T1/2, AUC(0-n), AUC(0- μ), Vd, Ke, Ka etc.) Compartment models used in pharmacokinetics (oral and intravenous). Compartment fitting (one comp & two comp). Pharmacodynamic /pharmacokinetic (PD/PK) correlation.

DRUG REGULATIONS

Drugs and Cosmetics Act, Drug Price Control order, Application for Investigational New Drug (IND), Application for New Drug Discovery (NDD) according to Indian Control Authority & USFDA guidelines. Conducting bio-equivalence studies. Ethical considerations in utilizing human subjects for drug discovery process. Helsinki's declaration. ICH-GCP Guidelines. Ethical guidelines in utilizing animals for experimental purposes.

DRUG DEVELOPMENT PROCESS

Methods involved in the development of new drugs. Preclinical toxicological studies. Calculation of LD50 & ED50. Acute, subacute and chronic toxicity studies. Pre-clinical pharmacokinetic and dynamic studies. High throughput screening (invitro and invivo) for pre-clinical pharmacokinetic and pharmacodynamic studies.

THERAPEUTIC DRUG MONITORING

Basic principles of TDM. Therapeutic index. Trough level monitoring and dosage adjustments.

Drug delivery systems: sustained release, enteric coated formulations and liposome etc.

Four point assay of histamine and acetylcholine on guinea pig ileum. Identification of unknown by evaluating its action on dog haemodynamic parameters(through e-lab)

M.Sc. (Medical Pharmacology) Year-III TEACHING PRACTICE

Course Code: MSC351

L-0, T-0, P-6, S-0 C-3

Objectives:

- Acquire competence to plan for instructions and delivery of curriculum
- Obtain feedback both about teaching as well as student learning
- To develop broad understanding of modern principles and procedures used in medical science education
- Development of essential skills for practicing modern medical science teaching

For teaching practice student shall take classes as decided and allocated by the Department. For evaluation purpose, a board of three examiners comprising of one internal and two external examiners will be appointed by the Vice Chancellor from the panel of examiners recommended by the Principal of the College. All the three examiners will assess the student separately and average of these marks shall be awarded as final marks to the student concerned.

**M.Sc. (Medical Pharmacology) Year-III
PHARMACOLOGY PRACTICAL II**

Course Code: MSP351

L-0, T-0, P-24, S-0, C-12

Course Contents

- Spectrophotometric & fluorimetric estimations of drugs in biological fluids
- Calculation for statistical significance in the given data for Student paired and unpaired t test.
- Applying ANOVA to the given set of concentration vs time data of two drug formulations to comment about their bio-equivalence.
- Draft an IND and NDD application for the approval of a numbered compound

**Practical exercise using animal experiments is subject to institutional animal ethical committee approval

M.Sc. (Medical Pharmacology) Year-III THESIS

Course Code: MSP352

L-0, T-0, P-0, S-0, C-12

Guidelines

Each M.Sc. Medical student will carry out research work under the supervision of a faculty member (Guide) with post-M.D./ Ph.D. teaching experience of three years or more in the subject. However, a teacher with M.D./ Ph.D. degree in the subject or related subjects shall be qualified for being taken in as Co-guide.

The Guide will be allotted to each student at the commencement of second year. The student will prepare a Plan of Thesis under the supervision of the Guide, and submit it to the university within two months of commencement of second year. The university will convey approval/disapproval of the Plan within one month.

In case the Plan is disapproved, a fresh Plan must be submitted within one month. After approval of the Plan, the student will begin work on the thesis.

The progress of work will be monitored regularly by the Guide. The thesis not exceeding 100 pages typed on A4 paper on one side only in double spacing is to be submitted to the university through the Guide six months before the date of III year University examination.

It will be evaluated by a panel of examiners (2 external & 1 internal at least) approved by the Vice Chancellor. The approval of the thesis by the panel will be a pre-requisite for the candidate to appear in the written/practical examination of III year. If the thesis is returned for revision, the suggested revision must be done and the revised thesis submitted for evaluation to the examiner(s) who has/have suggested for the revision.

After approval of revised thesis, the candidate can appear in the next 3rd year examination provided the approval is received one month before the examination. If the thesis is disapproved, the entire process from submission of a new Plan to submission of Thesis is to be repeated. On approval of new thesis, the candidate can appear in the next 3rd year examination provided there is a one month gap between the receipt of approval and commencement of examination.

Note: A student is required to submit four hard copies of the thesis alongwith the soft copy in the prescribed format given by the college.

Recommended Books

1. Hardman JG, Limbird LE, (Ed.) *Goodman Gillman's The Pharmacological basis of Therapeutics. (2006)* (Eleventh Edition) McGraw Hill Press New York.
2. Katzung (Ed), *Basic & Clinical Pharmacology*, (2009).
3. Gupta. S. K. *Drugs Screening Method*
4. Sharma KK & Sharma, *Principles of Pharmacology*, H.L.
5. Ed. Ghosh MN. *Fundamentals of Experimental Pharmacology*, (1984) Scientific Book
6. Agency, Calcutta.
7. Vogel HG & Vogel WH(Ed). *Drug Discovery and Evaluation–Pharmacological Assays*, (1997) Springer-New York.
8. Indrayana, *Biostatistics for Undergraduates*
9. Mahajan BK, *Methods in Biostatistics: (2010) 7th Ed.*
10. Jagdeesh, G (Ed), *Biomedical Research (2009).*

Journals to be referred

- Trends in Pharmacological Sciences,
- Annual Review of Pharmacology,
- Pharmacological Reviews,
- Indian Journal of pharmacology,
- Indian Journal of Physiology and Pharmacology,
- Drugs,
- Pharmacology and Experimental Therapeutics,
- Journal of Ethno pharmacology,
- Nature,
- Science,
- European Journal of Clinical Pharmacology,
- BJCP