



BLDE

(DEEMED TO BE UNIVERSITY)

Choice Based Credit System (CBCS)

Revised Curriculum

**M.Sc. Medical Programme
in Pharmacology**

2025-26

Published by

BLDE

(DEEMED TO BE UNIVERSITY)

Declared as Deemed to be University u/s 3 of UGC Act, 1956, vide notification No. F.9-37/2007-U.3 (A)

The Constituent College

SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

Smt. Bangaramma sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.

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BLDE

(DEEMED TO BE UNIVERSITY)

Declared as Deemed to be University u/s 3 of UGC Act, 1956

Accredited A Grade by NAAC (Cycle-2)

BLDE(DU)/REG/M.Sc. Med. Curri./2025-26/ **5322**

December 24, 2025

NOTIFICATION

Sub: Revision of Curriculum of M.Sc. Medical Programme in Anatomy, Physiology, Biochemistry, Microbiology & Pharmacology.

Ref: Approval of Hon'ble Vice-Chancellor vide no. 2245 dtd. 24.12.2025

On approval of the Hon'ble Vice-Chancellor, the revised curriculum for M.Sc. Medical Programme in Anatomy, Physiology, Biochemistry, Microbiology & Pharmacology by following the Choice Based Credit System (CBCS) offered under the Faculty of Medicine has been approved and is hereby notified.

The Curriculum shall be effective from the Academic Session 2025-26 onwards, for the M.Sc. Medical Programmes offered under the Shri. B. M. Patil Medical College Hospital & Research Centre.

REGISTRAR
REGISTRAR

BLDE(Deemed to be University)
Vijayapura-586103. Karnataka

Copy to:

- The Secretary, NMC, New Delhi
- The Secretary, UGC, New Delhi
- The Controller of Examinations
- The Principal, SBMPMCH&RC
- The Dean, Faculty of Medicine
- The HoD of Pre & Para Clinical Departments
- The Coordinator, M.Sc. Medical Programmes
- The Co-ordinator/ Director, IQAC
- The Assistant Registrar

Copy respectfully submitted to:

- The Hon'ble Pro-Chancellor
- The Hon'ble Vice-Chancellor

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India

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Vision:

- To be a leader in providing quality medical education, healthcare & to become an Institution of eminence involved in multidisciplinary and translational research, the outcome of which can impact the health & the quality of life of people of this region.

Mission:

- To be committed to promoting sustainable development of higher education, including health science education consistent with statutory and regulatory requirements.
- To reflect the needs of changing technology
- Make use of academic autonomy to identify dynamic educational programs
- To adopt the global concepts of education in the health care sector

SEMESTER I								
Course Code	Course Name Medical Anatomy	Credits	Teaching Hours pe week			Marks		
			L	SDL	P	Internal Assessment	Semester Exam	Total
Theory								
MANA 1.1 T	Medical Anatomy	4	4	1		20	80	100
MPHY 1.2 T	Medical Physiology	4	4	1		20	80	100
MBCHM 1.3 T	Medical Biochemistry	4	4	1		20	80	100
Practical								
MANA 1.1 P	Medical Anatomy	3			6	20	80	100
MPHY1.2 P	Medical Physiology	3			6	20	80	100
MBCHM 1.3 P	Medical Biochemistry	3			6	20	80	100
Elective Course (Any One)								
1.4 GE	Introduction to Quality Patient & Safety	3	3			100	--	100
1.5 GE	Computer Application					100	--	100
Total		24	36			220	480	700

SEMESTER II								
Course Code	Course Name	Credits	Teaching Hours Per week			Marks		
			L	SDL	P	Internal Assessment	Semester Exam	Total
Theory								
MANA 2.1	Medical Anatomy	4	4	1		20	80	100
MPHY 2.2	Medical Physiology	4	4	1		20	80	100
MBCHM 2.3	Medical Biochemistry	4	4	1		20	80	100
MCOM 2.4	Research Methodology & Biostatistics	3	3			20	80	100
Practical								
MANA 2.1P	Medical Anatomy	3			6	20	80	100
MPHY 2.2 P	Medical Physiology	3			6	20	80	100
MBCHM 2.3 P	Medical Biochemistry	3			6	20	80	100
Total		24	36			140	560	700

SEMESTER I ANATOMY

Course Content: ANATOMY THEORY

General Anatomy Overview

Introduction to Anatomy and Anatomical terms

Basic principles of tissues, Human cell & types of cells.

Skin	:	Thick Skin & Thin Skin
Fascia	:	Superficial Fascia & Deep Fascia
Connective tissue	:	Types of connective tissue Cells of connective tissue loose areolar tissue White fibrous tissue Adipose tissue Collagen fibers Reticular fibers Elastic fibers
Cartilage	:	Types of cartilage: White fibro cartilage, Elastic cartilage and Hyaline cartilage
Bones	:	Long bones, Short bones, Short long bones, Pneumatic bones, Sesamoid bones, Compact bone & Spongy Bone
Joints	:	General classification of Joints–Fibrous Cartilagenous, Synovial
Muscles	:	Skeletal Muscles, Cardiac Muscles, Smooth muscles
Nervous tissue	:	Neurons & Nerve fibers Introduction to Central and Peripheral Nervous system Autonomic nervous system in brief - Sympathetic nervous system - Parasympathetic nervous system
Blood vessels	:	Arteries, Veins, Capillaries and Sinusoids
Lymphatic system	:	Types of lymphocytes, Circulation of lymph Cysterna chyli Lymphoid tissues

General Histology-

Introduction to Histology and Microscopes

Epitheliu	:	Simple epithelium Pseudo stratified epithelium, Stratified epithelium
Connective tissue	:	Cells of connective tissue Loose areolar tissue White fibrous tissue Adipose tissue Collagen fibers Reticular fibers Elastic fibers
Cartilages	:	Hyaline cartilage Elastic cartilage White fibro cartilage.
Bone	:	Cells of bone Compact bone Spongy bone
Nervous tissue	:	Neurons & types Nerve fibers
Ganglia	:	Spinal ganglion, Autonomic ganglion
Muscle	:	Cardiac Muscle Skeletal Muscle Smooth Muscle
Vascular system	:	Large sized artery Medium sized artery Large sized vein Medium sized vein
Lymphatic system	:	Thymus, Lymphnodes, Spleen, Palatine tonsil
Skin & Appendages	:	Thick skin & Thin skin

General Embryology:

- Cell division
- Gametogenesis
- Ovarian cycle and Uterine/Menstrual cycle
- Fertilization, Cleavage, Blastocyst, Implantation
- Formation of fetal membranes, Chorion, Amnion, Chorionic villi, Placenta and Umbilical cord
- Phases of embryonic development, Primitive streak, Notochord, Bilaminar germ disc, Trilaminar germ disc
- Formation and Fate of germ layers and Derivatives
- Folding of embryo
- Formation of body cavities
- Genetics-Chromosomes, classification of chromosomes, modes of inheritance and gene disorders

Gross Anatomy:

Upper Extremity: Mammary gland, Pectoral region, Muscles of back, muscles of upper limb, vessels and nerves of upper limb. Joints of upper limb, movements and muscles producing movements.

Thorax: Introduction to Respiratory system, Thoracic cage and diaphragm, Lung & Pleura, Trachea & Bronchopulmonary segments, Mediastinum, Heart& Pericardium, Coronary Circulation.

**SEMESTER I ANATOMY
ANATOMY PRACTICALS**

Gross anatomy:

- Osteology: Spotters Identification of Bones of Axial and Appendicular skeleton identify parts of bones
 - Types of Joints with examples.
 - General Embryology models for spotters & discussion
- Histology: General Histology slides for spotters and disc

SEMESTER I PHYSIOLOGY

Course Code: MPHY 1.2

Course Contents

Physiology Theory

MPHY 1.2 Theory 60 Hrs

GENERAL PHYSIOLOGY

07 Hrs

1. Homeostasis –definition & feedback mechanisms
2. Cell organelles, Structure of cell membrane
3. Transport Mechanisms- active and passive transport
4. Intercellular communications
5. Body fluids –compartments & measurement.

BLOOD AND BODY FLUIDS

15 Hrs

1. Introduction, Fluid, compartments, composition of body fluids. Homeostasis - Definition, Composition and functions of blood.
2. Plasma Proteins - Types, Normal values, Origin, Functions, Variations in health and disease.
3. Red Blood cells. - Erythropoiesis, Definition. Sites and stages of Erythropoiesis: Regulation
4. Morphology of RBC, Functions, Normal values, variations, PCV and ESR, Determination. Normal values, Anemia, Clinical significance.
5. Haemoglobin - Structure, Functions, Types, Derivatives. Methods of estimation Normal values, Anemia, Types and features.
6. Life span and destruction of RBC, RE system. Functions, Jaundice, Types.
7. Leucocytes - Leucopoiesis, Sites of Granulopoiesis, Lymphopoiesis and Monocytopoiesis.
8. Morphology of different types of leucocytes, Functions, Variations, Immunity, Transplantation of tissues and organs.
9. Platelets - Thrombopoiesis, Sites, Stages, Morphology, Functions, Normal values, Variations.
10. Homeostasis and Blood coagulation - Definition Clotting factors Mechanism of clotting.
11. Clot retraction, Fibrinolysis. Bleeding disorders Tests for clotting. Anticoagulants, Actions and uses.
12. Blood groups - ABO system and Rh factor. Blood Typing. Significance.
13. Blood transfusion - Indications, Types, Reactions, Lymph - Origin. Circulation, Functions of lymph and Lymph nodes.

NERVE MUSCLE PHYSIOLOGY:

08 Hrs

1. Types of neurons, Glia, with examples.
2. Structure of multipolar neuron and functions of each part
3. Types of nerve injuries, Wallerian degeneration. Retrograde degeneration, Chromatolysis, Regeneration of nerve fiber, factors affecting regeneration, Reaction of degeneration.

4. Properties of Nerve fiber :
 - a) Excitability. Electronic potentials, RMP Monophasic action potential, Ionic basis of RMP and AP, All or None Law, strength duration curve. Compound action potential.
 - b) Conduction - Classification of nerve fibers. Mechanism of conduction in myelinated and non-myelinated nerve fiber. Factors affecting conduction Orthodromic and antrodromic conduction Susceptibility of Nerve fiber to various conduction blockers
5. Differences between 3 types of muscles Light microscopic and Electron microscopic structure of skeletal muscle. Sarcotubular system — Sarcomere.
6. Excitation contraction coupling.
7. Properties of skeletal muscle, factors affecting excitability and contractility. Treppe, Isometric and Isotonic contraction, Summation (wave and quanta!, tetanus, clonus). Energy sources for muscle contraction. Types of skeletal muscle, occurrence and differences.
8. N.M.J. structure, (electron microscopic). Transmission of impulse across the NMJ.

CARDIO VASCULAR SYSTEM:

15 Hrs

1. Functional anatomy of heart, blood vessels. Conducting system, systemic and pulmonary circulation.
2. Innervation of the heart and Blood vessels, VMC.
3. Hemodynamics.
4. Properties of cardiac muscle.
5. Cardiac cycle.
6. Heart rate and regulation of heart rate.
7. Cardiac output definitions, variations. Method of determination, Regulation.
8. Blood pressure.
9. Shock
10. Regional circulation
11. Cardio vascular changes during muscular exercise.

RESPIRATORY SYSTEM:

15 Hrs

1. Introduction - Functional anatomy of respiratory tract. Pulmonary ventilation Mechanism of ventilation. Muscles, pressure changes, Pressure volume inter relationship, compliance. Airway resistance.
2. Surfactant - Source. Chemical nature. Functions. Lung volumes and capacities Definition. Determination. Normal values. Significance
3. Alveolar ventilation - Dead space. Significance. Pulmonary circulation Ventilation, Perfusion Ratio & its significance
4. Respiratory membrane. Partial pressure of gases. Diffusion of gases. Discussion capacity. Factors affecting diffusion of gas.
5. Oxygen transport – Forms of transport O₂, Oxygen Hemoglobin dissociation, Factors affecting it Myoglobin.
6. CO₂ Transport – forms of transport. CO₂ dissociation curve. Chloride shift. Haldane effect.
7. Regulation of respiration - Organization of respiratory centers. Neural regulation. Chemical regulation.

8. Non-chemical regulation. Respiration and Acid Base balance.
9. Hypoxia types, effects, voluntary Hyperventilation, Periodic breathing.
10. Dyspnoea, Asphyxia, Cyanosis Decompression sickness. Artificial Respiration, Methods.
11. Pulmonary function tests. Respiratory adjustments during muscular exercise.

SDL – 15 Hrs

1. SDL - Hemostasis
2. SDL- Sarcomere & Sarcotubler System
3. SDL Hemoglobin & its variants
4. SDL RMP & AP
5. SDL- N M Junction
6. SDL - Immunity
7. SDL- Properties of Cardiac Muscle
8. SDL Regulation of Respiration
9. SDL – Anemia
10. SDL- Hemophilia
11. SDL – Shock
12. SDL- Heart Blocks
13. SDL- Arrhythmia
14. SDL- Hypoxia
15. SDL – High altitude Physiology

Semester I Physiology Course Code: MPHY 1.2 P Physiology Practical

I. Hematology - 60 hrs

1. Study of the Microscope
2. Estimation of Hemoglobin
3. Study of haemocytometer and determination of red blood cell count
4. Determination of blood group
5. Determination of White Blood cell count
6. Erythrocyte sedimentation rate & packed cell volume. (Demonstration)
7. Osmotic fragility (Demonstration)
8. Blood indices.
9. Preparation and staining of a peripheral smear; differential leucocyte count.
10. Bleeding time & Clotting time.

Semester - I Biochemistry
Course Contents
Biochemistry Theory

I. Introduction and Scope of Biochemistry.

1. Biomolecules

Biomolecules and forces that stabilize the biomolecules, Principles of Thermodynamics and Donnan membrane equilibrium.

2. Cell and subcellular structures:

Structure and functions of - Mitochondria, Endoplasmic Reticulum, Golgi complex, Peroxisomes, Lysosome, Ribosome, Nucleolus, Centrosome, chromosomes, Nucleosomes, Histones.

3. Biological membranes:

Membranes Structure and function; composition of Cell Membrane-Fluid Mosaic Model, specialized membrane structures- liposomes, etc. Transport across biological membranes: Passive diffusion, Facilitated diffusion, Ionchannels, Ligand-gated channels, Voltage-gated channels, Ionophores, Active transport, Uniport, Symport, Antiport, Exocytosis, Endocytosis, Pinocytosis, Phagocytosis.

4. pH and buffers:

Definition of Acids, Bases, Buffers, pH, pH of biological fluids, Henderson-Hasselbalch equation: Derivation and Applications.

5. Chemistry of Carbohydrates:

Definition, functions, and classification of Carbohydrates.

Monosaccharides: Glucose, Fructose, Mannose, Galactose, Physical Properties & Chemical reactions of Monosaccharides.

Disaccharides: Sucrose, Lactose, Maltose. Physical Properties & Chemical reactions of Disaccharides.

Polysaccharides: Structure, Chemistry and Functions of Homopolysaccharides and Heteropolysaccharides/Mucopolysaccharides.

6. Chemistry of Amino Acids, Peptides, and Proteins

Definition and Classification of amino acids, properties of amino acids. Peptide bond- Properties and formation. Color reactions of amino acids. Proteins. -Definition, Classification and properties. Structural organization of proteins and their determination. Insulin – Primary structure and Structure-function relationship. Biologically important peptides.

7. Chemistry of Lipids.

Lipids. -Definition, classification and function.

Classification of fatty acids, properties of fatty acids, essential fatty acids.

Triglycerides: properties and their reactions.

Phospholipids, Glycolipids, and Lipoproteins: Sub-Classification and its functions.

Derived Lipids: Steroids and cholesterol.

8. Chemistry of Nucleic Acids.

Definition of nucleosides, nucleotides, and nucleic acids. Nucleotides: Structure, nomenclature, and functions of nucleotides.

DNA: Structure of DNA (Watson and Crick Model), Chargaff's rule, Organization of DNA, Genes, and chromosomes.

RNA: Types and functions of RNA.

Semester I Biochemistry Biochemistry Practical

1. Reactions of Monosaccharides: Glucose and fructose
2. Reactions of Disaccharides: Lactose, maltose and sucrose
3. Reactions of Polysaccharides: Starch
4. Identification of unknown carbohydrate
5. Precipitation and coagulation reactions of proteins
6. Colour reactions of proteins
7. Reactions of Albumin and Casein Identification of unknown solution.

ANATOMY II SEM

Theory

Basic overview of the Gross Anatomy and Applied Anatomy and Systemic Histology of all related organs of the following systems

- Gastrointestinal System: Introduction, Digestive Tract with all related organs, Major Digestive Glands.
- Respiratory System: -Introduction, Components of Respiratory System, Conducting & Respiratory portions of the Respiratory system, Lungs
- Cardio-vascular system: Introduction, Functions of CVS, Components of CVS, Anastomosis, Circulation of Blood.
- Genitourinary system: - Introduction, Kidney, Ureters, Urinary bladder, Urethra, Male reproductive system, Female reproductive system
- Nervous System: Introduction, Subdivision of Nervous System, structural organization of Nervous System, Nerve Fibres, Autonomic Nervous system.
- Endocrine System: Introduction, Components of Endocrine system, scattered masses of endocrine cells in exocrine glands, Diffuse neuroendocrine cells
- Lower extremity: Gluteal region, femoral triangle, Muscles of lower limb, popliteal fossa, nerves and vessels of lower limb, joints of lower limb with movements and muscles producing movements.

Osteology: Lumbar vertebrae, Pelvis, Hip bone, Sacrum, Femur, Tibia, Fibula and Skelton of foot

Genetics: karyotyping, sex chromatin and lyon hypothesis, Prenatal diagnosis, structural and numerical anomalies of chromosomes

Systemic Embryology- Gastro-intestinal, Genito-urinary, Endocrine systems

SEMESTER II ANATOMY

Course Code: MANA 2.1P

ANATOMY PRACTICAL

Medical Anatomy Practical:

- Gross Anatomy: Demonstration of all important Prosected organs of Gastro-intestinal, Genito-urinary, Nervous, Endocrine systems.
- Related osteology
- Systemic Histology slides: Gastro-intestinal, Respiratory, Nervous, Genito-urinary, Endocrine systems.

Semester II Physiology
Course Name: Medical Physiology Practical
Course Code: MPHY 2.2 P

Practical's – 60 Hrs

Human Physiology Experiments – 30 hrs

1. Spirometry, PEFR
2. Ergography
3. Artificial Respiration
4. Arterial Pulse
5. Recording Blood Pressure a. Normal & Effect posture
 b. Effect of Exercise
6. ECG – Demo
7. Perimetry
8. Determination of MVV, DI, BMI, Body fat percentage

CLINICAL EXAMINATION. – 30 hrs

1. General physical examination
2. Introduction to clinical examination
3. Interpretation of charts, problems & case histories.

Semester II Biochemistry
Course Code: MBCHM
2.3 Course Contents
Medical Biochemistry Theory

Enzymology, Hormones and Nutrition

1. Enzymes:

Definition and IUBMB Classification of enzymes. Holoenzyme, Apoenzyme, coenzymes. Enzymology: General Concepts and Enzyme Kinetics- Classification, Enzyme structure, Co-enzymes, Active center

Mechanism of action of enzymes: Lock and key model, induced fit theory, substrate strain theory, covalent catalysis, acid base catalysis and entropy effect.

Enzyme Kinetics:

Factors affecting enzyme activity: concentration of enzyme, substrate, product, effect of temperature and pH. Michaelis constant, double reciprocal plot.

Enzyme regulation:

Competitive inhibition, Noncompetitive inhibition and uncompetitive inhibition. Allosteric inhibition, Key enzymes, Feedback inhibition, Covalent modification, Repression, Induction, zymogen activation, Specificity of enzymes, Iso-enzymes.

Clinical Enzymology and Biomarkers

Enzyme units, Plasma specific and non-specific enzymes, enzymes of clinical significance, enzymes as therapeutic agents, enzymes as laboratory reagents, non-protein enzymes, immobilized enzymes.

2. Mechanisms of Action of Hormones

G proteins, Cyclic AMP, Protein kinases, Phosphatidyl inositol biphosphate, Inositol triphosphate, Diacyl glycerol, Cyclic GMP, Steroid receptors, Insulin Signaling pathway, mTOR, Jak-STAT pathway, NFkB

Hypothalamic and Pituitary Hormones

Anti-diuretic hormone, Oxytocin, Hypothalamic releasing factors, Growth hormone, Adrenocorticotrophic hormone, Endorphins, Glycoprotein hormones, Thyroid stimulating hormone, Gonadotropins.

Steroid Hormones

Adrenal cortical hormones, Synthesis of steroid hormones, 17-ketosteroids, Assessment of glucocorticoid secretion, Assessment of mineralocorticoid function, Adrenal hyperfunction, Adrenal hypofunction, Primary hyperaldosteronism, Adrenogenital syndrome, Ovarian hormones, Testicular hormones.

Thyroid Hormones

Thyroid hormones, Synthesis, Secretion, Mechanism of action, Metabolic effects, Assessment of thyroid function, Hyperthyroidism, Hypothyroidism.

Signal Molecules and Growth Factors

Adiponectin, Cadherins, C-Jun, EGFR, Erythropoietin, ERK, Gastrin, GSK3, HSP, HIF, ICAM, IGF, IGFR, IR, IRS, Interferons, JNKs, MMP, Osteocalcin, Osteopontin, p38, p53, Pancreatic polypeptide, PDGF, Protein C, Rb, Secretin, Selectins, STAT, TGF, TNF.

3. Vitamins:

Fat Soluble Vitamins (A, D, E, K)

Chemistry, sources, RDA, biochemical functions and deficiency manifestations, and metabolism of fat soluble vitamins. hypervitaminosis

Vitamin A: Role in vision, Vitamin D, Vitamin E, Vitamin K. Water Soluble Vitamins

Thiamine (B1), Beriberi, Riboflavin (B2), Niacin, Pyridoxine (B6), Pantothenic acid, Acetyl CoA, Succinyl CoA, Biotin, Folic acid, Folate antagonists, Folate trap, Vitamin B12, Choline, Inositol, Ascorbic acid (Vitamin C), Scurvy.

4. Minerals

Sources, RDA, Functions and deficiency manifestations of Calcium, Phosphorus, Iron, Zinc, Copper, Iodine, Selenium and Fluoride. Calcium-Homeostasis, Parathyroid hormone, Calcitonin, Hypercalcemia, Hypocalcemia, Bone metabolism; Markers of bone metabolism; Phosphorus, Magnesium, Sulphur, Iron, Absorption, Iron deficiency, Hemochromatosis, Copper, Ceruloplasmin, Iodine, Zinc, Fluoride, Selenium, Manganese, Molybdenum, Cobalt, Nickel, Chromium, Lith

5. Nutrition and energy metabolism

- Calorific value of foods - Calorific value and nutritional importance of Carbohydrates, Lipids, Proteins and Dietary fibers. Respiratory quotient, Basic Metabolic Rate-definition, normal values.
- Principles of Nutrition
BMR (Basal Metabolic Rate)- Definition, Normal values and Factors affecting BMR. Factors affecting BMR and measurement of BMR. Specific dynamic action, nutritional importance of carbohydrates, dietary fibre lipids and proteins, Nitrogen balance, biological value of proteins, net protein utilization, mixed diet, Balanced Diet. Principles of Diet prescription for healthy individuals. Specialized diets-Diabetic, diet for hypertension, diet in renal and liver diseases. Diet prescription for obesity and under nutrition. Total parenteral nutrition.

Nutritional value of different foods Nutrition in health and diseases Protein energy malnutrition (PEM), Marasmus, Kwashiorkor, Obesity. **Prescription of diet.**

Special diets: Mediterranean diet, Diabetic diet, Diet for renal disease, Diet for liver disease. Food exchange system, Glycemic index, Total parenteral nutrition Research

Semester II Biochemistry

Course Code: MBCHM

2.3 P Medical Biochemistry

Practical

1. **Basics calculations:** Calculation of Normality, Molarity, and preparation of Normal and Molar solutions, Preparation of Buffers, Factors affecting enzyme activity (temperature and pH)
2. **Equipment and Instrumentation**
 - A. Principles, Types, and Application of
 - a) Weighing Balances,
 - b) Centrifuges and ultracentrifuges
 - c) Hot air Ovens.
 - d) Water Baths,
 - e) Distillation plants,
 - f) Automatic dispensers, and Diluters.
 - B. Principles, Types, Application and Standard operating procedure
 - a) pH meter and flame photometry.
 - b) Colorimeter and spectrophotometer. (Measurement of the region of maximal absorption of a colored solution)
 - c) Electrophoresis
 - d) Chromatography.

SEMESTER-III						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MPHA 3.1 T	Details of general pharmacology, CVS, ANS	4	4	20	80	100
Core Elective course		3	4	Internal Exam 80 Marks		
MPHA 3.2 DSE	Pharmacovigilance					
MPHA 3.3 DSE	Drug development using vertebrate animals					
MPHA 3.4 CP	Clinical Postings	5	15	50		50
MPHA 3.5	Dissertation/Project Proposal	4	8	50	-	50
MPHA 3.6	Seminar	-	-			
Practical						
MPHA 3.7 P	Clinical pharmacokinetic, Pharmacy, dosage form	1	2	20	80	100
MPHA 3.2 P	Core Elective practical Pharmacovigilance,	1	2	Internal Exam 70 Marks		
MPHA 3.8 P	Clinical Pharmacology	1	2			
Total		20	37	140	160	300

SEMESTER- IV						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MPHA 4.1T	Details of Endocrinology, CNS, Ethics,	4	4	20	80	100
General elective		3	3			
MPHA 4.2 GE	Bioethics, Biosafety, IPR & Technology Transfer	Internal Exam of 80 Marks				
MPHA 4.2 GE	Disaster Management and Mitigation Resources					
MPHA 4.2 GE	Human rights					
MPHA 4.3 CP	Clinical Postings	5	15	50	--	50
MPHA 4.4	Dissertation / Project	5	10	50	--	50
MPHA 4.5	Seminar	2	--	50	--	50
Practical						
MPHA 4.6 P	Bioassay, Experimental graphs	2	4	20	80	100
Total		21	36	190	160	350

SEMESTER –V						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MPHA 5.1 T	Drug discovery and development	4	4	20	80	100
MPHA 5.2 CP	Clinical Postings	5	15	50		50
MPHA 5.3	Dissertation / Project*	10	20	50		50
Practical						
MPHA 5.4PP	Clinical research, Instrumentation	1	2	20	80	100
Total		20	41	140	160	300

SEMESTER-VI						
Course Code	Course Name	Credits	Teaching hours	Marks		
				Internal Assessment	Semester Exam	Total
Theory						
MPHA 6.1 T	Drug screening and Evaluation methods	4	4	20	80	100
MPHA 6.2 CP	Clinical Postings	5	15	50		50
MPHA 6.3	Dissertation / Project*	9	18		100	100
Practical						
MPHA 6.4 P	Animal handling, short procedures	2	4	20	80	100
Total		20	41	90	260	350

*(a) Dissertation / Project Course commences in IIIrd Semester.

Students should undergo ICMR Online Course of Research Methodology before submitting the protocol for their Dissertation. (Ist / IInd Semester)

**Elective courses may or may not have practical and/or field work.

(Elective): Any one subject is to be chosen from the subjects offered (Subjects offered may change from time to time depending on the availability of expertise)

Rules and Regulations of Curriculum

M.Sc. Medical Pharmacology

Definitions of Key Words:

1. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year. Choice Based Credit System (CBCS).
2. The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
3. **Course:** Usually referred to, as “papers” is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/ laboratory work/ outreach activities/ project work/ viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.
4. **Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.
5. **Credit:** A unit by which the course work is interpreted. It functions the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.
6. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the sum total of the credit points obtained by the student in various courses in all semesters and the sum of the total credits of all courses in all the semesters.
7. **Grade Point:** It is a numerical marking allotted to each letter grade on a 10-point scale.
8. **Letter Grade:** It is an appreciated point of the student's performance in a selected course. Grades are denoted by letters O, A+, A, B, C and RA x. Programme: An educational programme leading to award of a Degree certificate.
9. **Semester Grade Point Average (SGPA):** It is index of performance of all performance of work in a semester. Its total credit points obtained by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
10. **Semester:** Each semester will consist of minimum of 180 working days. The odd semester may be scheduled from June/ July to December and even semester from December/ January to June.

Duration of Study Programme:

The duration of the study for M.Sc. Medical Pharmacology will be of 3 years.

Eligibility Criteria:

A candidate seeking admission into this course shall have one of the following qualifications

- a) B.Sc. Degree with life sciences as one of the optional
- b) M.B.B.S

Any of the following bachelor degree passing with not less than II class

- a) B.Sc graduates of biological Sciences.
- b) B.Sc. Zoology/Microbiology/Botany/Physiology
- c) Other health sciences
- d) BHMS
- e) BAMS
- f) B.Vsc

Medium of Instruction:

English shall be the Medium of Instruction for all the Subjects of study and for examinations.

CBCS – Definition and benefits: Choice Based Credit System is a flexible system of learning. The distinguishing features of CBCS are the following:

- It permits students to learn at their own pace.
- The electives are selected from a wide range of elective courses offered by the other University Departments.
- Undergo additional courses and acquire more than the required number of credits.
- Adopt an inter-disciplinary and intra-disciplinary approach in learning.
- Make best use of the available expertise of the faculty across the departments or disciplines.
- Has an inbuilt evaluation system to assess the analytical and creativity skills of students in addition to the conventional domain knowledge assessment pattern.

Semester System and Choice Based Credit System:

The semester system initiates the teaching-learning process and screws longitudinal and latitudinal mobility of students in learning. The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a sun shone" type approach in which the students can take choice of courses, learn and adopt an interdisciplinary approach of learning.

Semesters:

An academic year consists of two semesters:

	PG
Odd Semester 1 st Semester	July - December
Odd Semester 3 rd & 5 th Semester	
Even Semester 2 nd , 4 th & 6 th Semester	December - June

Credits:

Credit defines the coefficient of contents/syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus, normally in each of the courses, credits will be assigned on the basis of the number of lectures/ tutorial laboratory work and other forms of learning required, to complete the course contents in a 15-20 week schedule:

a) **1 credit** = 1 hour of lecture per week

b) **3 credits** = 3 hours of instruction per week

✓ Credits will be assigned on the basis of the lectures (L) / tutorials (T) / Clinical Training (CR) / laboratory work (P) / Research Project (RP) and other forms of learning in a 15- 20 week schedule L - One credit for one hour lecture per week

c) **P/T** - One credit for every two hours of laboratory or practical

d) **CR** - One credit for every three hours of Clinical training/Clinical rotation/posting

e) **RP** - One credit for every two hours of Research Project per week – Max Credit 20- 25

	Lecture – L	Tutorial – T	Practical – P	Clinical Training/ Rotation – CT/CR	Research Project – RP*
1 Credit	1 Hour	2 Hours	2 Hours	3 Hours	2 Hours
RP*	Maximum Credit 20-25/ Semester				

Types of Courses: Courses in a programme may be of three kinds:

- Core Course
- Elective Course
- Ability Enhancement Compulsory Courses

Core Course: A course, which should compulsorily be studied by a candidate as a basic requirement is termed as a Core course. There may be a Core Course in every semester. This is the course which is to be compulsorily studied by a student as a basic requirement to complete programme of respective study.

Elective Course: A course which can be chosen from a very specific or advanced the subject of study or which provides an extended scope or which enables an exposure to some other domain or expertise the candidates ability is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses offered by the main subject of study are referred to as Discipline Specific Elective. The University / Institute may also offer discipline related Elective courses of interdisciplinary nature. An elective may be “Discipline Specific Electives (DSE)” gazing on those courses which add intellectual efficiency to the students.

Dissertation / Project: An Elective/Core course designed to acquire special / advanced knowledge, such as supplement study / support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher / faculty member is called dissertation / project.

Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline / subject may be treated as an elective by other discipline / subject and vice versa and such electives may also be referred to as Generic Elective.

Ability Enhancement Compulsory Courses: The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC).

“AECC” courses are the courses based upon the content that leads to Knowledge enhancement

- Environmental Science and
- English/MIL Communication. These are mandatory for all disciplines.

Assigning Credit Hours per Course: While there is flexibility for the departments in allocation of credits to various courses offered, the general formula would be:

- All core course should be restricted to a maximum of 4 credits.
- All electives should be restricted to a maximum of 3 credits.
- All ability enhancement course should be restricted to a maximum of 2 credits.
- Projects should be restricted to a maximum of 20-25 credits.

Rules and Regulation for Examination of M.Sc. Medical Microbiology under CBCS Pattern

1. **Title of the Programme offered:** M.Sc. Medical Pharmacology
2. **Duration of the Programme:** Three years.
3. **Medium of instruction:** The medium of instruction and examination shall be in English

Letter Grades and Grade Points:

Adopted the UGC recommended system of awarding grades and CGPA under Choice Based Credit Semester System.

- 4.1 Would be following the absolute grading system, where the marks are compounded to grades based on pre-determined class intervals.
- 4.2 The UGC recommended 10-point grading system with the following letter grades will be followed:

Table 1: Grades and Grade Points:

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B (Good)	7
C (Above Average)	6
F (Fail)/RA (Reappear)	0
Ab (Absent)	0
Not Completed (NC)	0
RC (< 50% in attendance or in Internal Assessment)	

- 4.3 A student obtaining Grade F/RA will be considered failed and will require reappearing in the examination.
- 4.4 Candidates with NC grading are those detained in a course (s); while RC indicate student not fulfilling the minimum criteria for academic progress or less than 50% attendance or less than 50% in internal assessments (IA). Registrations of such students for the respective courses shall be treated as cancelled. If the course is a core course, the candidate has to re- register and repeat the course when it is offered next time.

CBCS Grading System - Marks Equivalence Table

5.1 Table 2: Grades and Grade Points

Letter Grade	Grade	% of Marks
O (Outstanding)	10	86-100
A+ (Excellent)	9	70-85
A (Very Good)	8	60-69
B (Good)	7	55-59
C (Above Average) – Passing Criteria for M.Sc. Medical Pharmacology	6	50-54
F (Fail) / RA (Reappear)	0	Less than 50
Ab (Absent)	0	-
NC - Not Completed	0	-
RC – Repeat the Course	0	0

Table 3: Cumulative Grades and Grade Points

Letter Grade	Grade	% of Marks
O (Outstanding)	10	9.01 – 10.00
A+ (Excellent)	9	8.01 – 9.00
A (Very Good)	8	7.01 – 8.00
B (Good)	7	6.00 – 7.00
C (Above Average)	6	5.01 – 6.00

Assessment of a Course: Evaluation for a course shall be done on a continuous basis. Uniform procedure will be adopted under the CBCS to conduct internal assessments (IA), followed by one end-semester university examination (ES) for each course.

- 6.1 For all category of courses offered (Theory, Practical, Discipline Specific Elective [DE]; Generic Elective [GE] and Ability Enhancement Courses [AE]; Skills Enhancement Courses [SE] Theory or P (Practical) & RP (Research Project), assessment will comprise of Internal Assessment (IA) in the form of continuous comprehensive evaluation and mid-semester exam, end-semester (ES) examination or college exam as applicable.
- 6.2 Courses in programs wherein Theory and Practical/Clinical are assessed jointly. The minimum passing mark has to be 50% Grade each for theory and practicals separately. RA grade in any one of the components will amount to reappearing in both components. i.e. theory and practical.
- 6.3 Evaluation for a course with clinical rotation or clinical training will be done on a continuous basis.

Eligibility to appear for the end-semester examinations for a course includes:

- 7.1 Candidates having $\geq 75\%$ attendance and obtaining the minimum 40% in internal assessment in each course to qualify for appearing in the end-semester university examinations.

7.2 The students desirous of appearing for university examination shall submit the application form duly filled along with the prescribed examination fee.

7.3 Incomplete application forms or application forms submitted without prescribed fee or application form submitted after due date will be rejected and student shall not be allowed to appear for examination.

Passing Heads

8.1 Courses where theory and practical are involved, the minimum passing head shall be 50% in total including the internal assessment.

8.2 Elective subjects – the minimum prescribed marks for a pass in elective subject should be 50%. The marks obtained in elective subjects should be communicated to the university before the commencement of the university examination.

Detention: A student not meeting any of the above criteria maybe detained (NC) in that particular course for the semester. In the subsequent semester, such a candidate requires improvement in all, including attendance and/or IA minimum to become eligible for the next end-semester examination.

The maximum duration for completing the program will be 6 years (minimum duration of program x 2) i.e. $(3 \times 2) = 6$ years, failing which his/her registration will be cancelled. Full fees of entire program of 3 years may be liable to be paid by the students.

Carry over benefit:

11.1 A student will be allowed to keep term for Semester II irrespective of number of heads of failure in Semester I.

11.2 A student will be allowed to keep term for Semester III if she/he passes each Semester I and II OR fails in not more than 2 courses each in semester I and II.

11.3 Student will be allowed to keep term for Semester IV irrespective of number of heads of failure in Semester III. However, student must mandatorily have passed each course of Semester I and II in order to appear for semester IV exam.

11.4 Student will be allowed to keep term for Semester V, if she/he passes Semester I, II, III and IV OR has passed in all courses of Semester I and II and fails in not more than two courses each of Semester III and IV.

11.5 Student will be allowed to keep term for Semester VI, irrespective of heads of failure in Semester V. However, student must mandatorily have passed each course of Semester I, II, III and IV in order to appear for Semester VI exam.

Grace Marks for PG Courses:

- 12.1 A student shall be eligible for grace marks, provided he/she appeared in all the papers prescribed for the examination.
- 12.2 Maximum up to 5 grace marks may be allowed for passing, spread over between subjects.
- 12.3 No grace marks will be awarded in internal evaluation.

University End-Semester Examinations

- 13.1 There will be one final university examination at the end of every semester.
- 13.2 A student must have minimum 75% attendance (Irrespective of the type of absence) in theory and practical in each subject to be eligible for appearing the University examination.
- 13.3 The Principal / Director shall send to the university a certificate of completion of required attendance and other requirements of the applicant as prescribed by the university, two weeks before the date of commencement of the written examination.
- 13.4 A student shall be eligible to sit for the examination only, if she / he secure a minimum of 40% in internal assessment (individually in theory and practical as applicable). Internal examination will be conducted at college/department level.
- 13.5 Notwithstanding any circumstances, a deficiency of attendance at lectures or practical maximum to the extent of 10% - may be condoned by the Principal / Director.
- 13.6 If a student fails either in theory or in practical, he/ she have to re-appear for both.
- 13.7 There shall be no provision of re-evaluation of answer sheets. Student may apply to the university following due procedure for recounting of theory marks in the presence of the subject experts.
- 13.8 Internal assessment shall be submitted by the Head of the Department to the University through Dean at least two weeks before commencement of University theory examination.

Supplementary examination: The supplementary examination will be held in the next semester. Eligibility to appear for supplementary examination will be as per rule number 11.1-11.5.

Re-Verification There shall be provision of re-totaling of the answer sheets; candidate shall be permitted to apply for recounting/re-totaling of theory papers within 8 days from the date of declaration of results.

Scheme of University Exam Theory PG Program: General structure / patterns for setting up question papers for Theory / Practical courses, for PG program are given in the following tables. Changes may be incorporated as per requirements of specific courses.

Dissertation work:

During the course of study every candidate has to prepare a dissertation work on a selected topic under the guidance of a recognized post-graduate teacher. The dissertation is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, and comparison of results and drawing conclusions.

Every candidate shall submit to the Registrar (Academics) of the University in the prescribed proforma, a synopsis containing particulars of proposed dissertation work within six months from the date of commencement of the II year on or before the dates notified by the University. The synopsis shall be sent through the proper channel. Such synopsis will be reviewed and the dissertation topic will be registered by the University. No change in the dissertation topic or guide shall be made without prior approval of the University.

The dissertation should be written under the following headings

1. Introduction
2. Aims or Objectives of study
3. Review of Literature
4. Material and Methods
5. Results
6. Discussion
7. Conclusion
8. Summary
9. References
10. Tables
11. Annexure

Six copies of dissertation thus prepared shall be submitted to the Controller of Examinations six months before final examination on or before the dates notified by the University.

The dissertation shall be valued by examiners appointed by the University. Approval of dissertation work is an essential precondition for a candidate to appear in the University examination.

A Co-guide may be included provided the work requires substantial contribution from a sister department or from another medical institution recognized for teaching/training. The co-guide shall be a recognized post graduate teacher of the University.

Change of guide: In the event of a registered guide leaving the college for any reason or in any other event, guide may be changed with prior permission from the university.

Eligibility for award of degree

18.1 A candidate shall have passed in all the subjects of all semester's I-VI and submitted research project report to be eligible for award of M.Sc. Medical Pharmacology degree.

The performance of a candidate in a course will be indicated as a letter grade, whereas grade point will indicate the position of the candidate in that batch of candidates. A student is considered to have completed a course successfully and earned the prescribed credits if he/she secures a letter grade other than F/RA. A letter grade RA in any course implies he/she has to Re-appear for the examination to complete the course

18.2 The RA grade once awarded in the grade card of the student is not deleted even when he/she completes the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the subsequent semester in which the candidate has appeared for clearance in supplementary exams

18.3 If a student secures RA grade in the Project Work/Dissertation, he/she shall improve it and resubmit it, if it involves only rewriting / incorporating the revisions suggested by the evaluators. If the assessment indicates lack of student performance or data collection then the student maybe permitted to re-register by paying the prescribed re-registration fee and complete the same in the subsequent semesters.

A candidate shall be declared to have passed the examination if he/she obtains the following minimum qualifying grade / marks:

- a) For Core courses CT (Core Theory), CL (Core Lab), DE (Discipline centric Electives), clinical rotation shall obtain Grade B (50 % of marks) in the University End Semester Examination (ES) and in aggregate in each course which includes both Internal Assessment and End Semester Examination.
- b) For Generic Electives (GE), Ability Enhancement (AE) and Skill Enhancement (SE) courses student shall obtain Grade C (40 % of marks) in the College Examination.

Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone & earned by a student, i.e.,

$$SGPA(S_i) = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

Where C_i is the number of credits of the course and G_i is the grade point scored by the student in the course.

- ii. The CGPA is also calculated in the same manner taking into account all the courses undergone & earned by a student over all the semesters of a programme, i.e.

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

Where S_i is the SGPA of the semester and C_i is the total number of credits in that semester.

- iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of Computation of SGPA and CGPA

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit X Grade)
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X 10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			139
Illustration for SGPA Thus, SGPA = 139/20 = 6.95				

Semester 1	Semester 2	Semester 3	Semester 4
Credit : 20 SGPA: 6.9	Credit : 22 SGPA: 6.8	Credit : 25 SGPA: 6.6	Credit : 26 SGPA: 6.0
Semester 5	Semester 6		
Credit : 26 SGPA: 6.3	Credit : 25 SGPA: 8.0		
Illustration for SGPA			

Thus,

$$CGPA = \frac{20 \times 6.9 + 22 \times 6.8 + 25 \times 6.6 + 26 \times 6.0 + 26 \times 6.3 + 25 \times 8.0}{144} = 6.75/B+$$

Transcript: Based on the above recommendations on Letter grades, grade points and SGPA and CGPA, the transcript for each semester and a consolidated transcript indicating the performance in all semesters may be issued.

Course Registration

17.1. After admission to a Program, a student identity number is generated. This PRN number may be used in the process of registration for a course.

17.2 The registration process is a registration for the courses in a semester. The registration card is generated after a student completes the choice of electives. Every student shall register for the stipulated number of Courses/Credits semester wise even if electives are not prescribed in their regulations for the said semester. Every student must register for Elective/Ability Enhancement Courses semester-wise for the courses he/she intends to undergo in that semester within two weeks of commencement of the semester.

The list of students registered for each elective will be communicated to the HoDs/ Course Chairpersons. Students will be requested to authenticate the chosen electives by appending their signature in acceptance with approval by the HoDs/ Course Chairpersons. A soft copy of the registered students will be submitted to the elective course offering departments for their official use.

Re - Entry after Break of Study:

The University regulations for readmission are applicable for a candidate seeking re-entry to a program.

- Students admitted the program and absents for more than 3 months must seek readmission into the appropriate semester as per university norms.
- The student shall follow the syllabus in vogue (currently approved / is being followed) for the program.
- All re-admissions of students are subject to the approval of the Vice-Chancellor.

Ranking

The first two ranks of the programme will be decided on the basis of grades of CGPA in the courses (core and DE courses only). In case of a tie, marks % [of core and DE courses only] will be taken into account.

Classification of Successful Candidates

Overall Performance in a Program and Ranking of a candidate is in accordance with the University regulations.

Consolidated Grade Card– M. Sc. Medical Microbiology			
Letter Grade	% Marks Range	Grade Point	CGPA Range
O	80 & Above	10	9.01 – 10
A+	75 – 80	9	8.01 – 9.00
A	60 -74	8	7.01 – 8.00
B+	55 – 59	7	6.01 – 7.00
B	50 – 54	6	5.01 – 6.00
F/RA (Reappear)	Less than 50	0	4.51 – 5.00

Ab (Absent)		0	
Not completed (NC)		0	
Repeat the Course (RC = < 50% in attendance or Internal Assessment)		0	

A successful candidate will be:

- Who secures not less than O grade with a CGPA of 9.01 – 10.00 shall be declared to have secured 'OUTSTANDING' provided he/she passes the whole examination in the FIRST ATTEMPT;
- Who secures not less than A+ grade with a CGPA of 8.01 – 9.00 shall be declared to have secured 'EXCELLENT' provided he/she passes the whole examination in the FIRST ATTEMPT;
- Who secures not less than A grade with a CGPA of 7.01 – 8.00 and completes the course within the stipulated course period shall be declared to have passed the examinations with 'Very Good'
- All other candidates (with grade B and above) shall be declared to have passed the examinations.

SEMESTER-III

Course Objective (Teaching Objectives)	<ul style="list-style-type: none"> This course is designed to enable students to understand concepts of pharmacology. To acquire basic knowledge and skill of pharmacodynamics, principles of therapeutics and pharmacokinetics of commonly used drug and essential medicines
Course Outcomes (Learning Objectives)	<p>At the end of course student should be able to</p> <ol style="list-style-type: none"> Understand basic concepts of pharmacology Describe pharmacodynamics and pharmacokinetics of essential and commonly used drugs List indication, contraindication, interaction and adverse reaction of commonly used drugs Indicate the use of appropriate drug in particular disease with consideration of efficacy, safety and cost of the therapy Explain and understand the pharmacological basis for prescribing drug in special medical situations

Unit no.	Theory Topics	Hours allotted No. of-hrs
1	General Pharmacology: Introduction to Pharmacology, Sources of Drugs, Routes of Drug Administration, Pharmacokinetics, Pharmacodynamics, Factors Modifying Drug action and Adverse drug reactions.	15
2	Autonomic Nervous System: General Consideration, Adrenergic agonist, Adrenergic antagonists, Cholinergic agonists, Anticholinesterases drugs, Anticholinergic drugs, Skeletal muscle relaxants.	15
3	Autacoids and related drugs: Drugs modulating autacoids, Nonsteroidal anti-inflammatory drugs (NSAIDs), Drugs used in rheumatoid arthritis and gout.	15
	Total	45

Unit no.	Tutorial Topics	Hours allotted No. of hrs
1	Bioavailability of Drug	1
2	Dosage Form of drugs	1
3	Pharmacovigilance	1
4	Management of Organophosphorus Compound Poisoning (OPC)	1
5	Factors Modifying Drug action	1
6	Atropine Substitutes	1
7	β adrenergic blockers	1
8	Scientific Methods of Research: Definition of Research, Assumptions, Operations and Aims of Scientific Research. Research Process, Significance and Criteria of Good Research, Research Methods versus Methodology, Different Steps in Writing Report, Technique of Interpretation, Precaution in interpretation, Significance of Report Writing, Layout of the Research Report	4
9	Research Designs: Prospective, retrospective, Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre- test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case Control Studies, Cross sectional studies, Intervention studies, Panel Studies.	3
10	Skeletal muscle relaxants	1
	Total	15

Unit no.	Practical Topics	Hours allotted No. of hrs
1	Introduction to Practical Pharmacology	4
2	Prescription Writing	4
3	PharmacokineticsI	4
4	Routes of Administration Oral	4
5	Routes of Administration Parenteral	4
6	Routes of Administration Topical	4
7	Introduction to Pharmacy	4
8	Introduction to Experimental Pharmacology	2
Total hours		30

Reference Books:

1. K.D. Tripathi, Essentials of Medical Pharmacology, Japye Brothers, Post 7193, G- 16,
2. Madhav Mutalik, Sudarshan Reddy, Practical pharmacology simplified practical record book. Jaypee Publication, New Delhi.
3. R.S. Satoakar, A.D. Bhandarkar, S.S. Ainapure, Pharmacology & Pharmacotherapeutics
4. H.L. Sharma &K.L. Sharma,Principles of Pharmacology, ParasMedical Publisher, Hyderabad, New Delhi

SEMESTER-IV

Course Objective (Teaching Objectives)	<ul style="list-style-type: none"> This course is designed to enable students to understand concepts of pharmacology. To acquire basic knowledge and skill of CVS drugs, principles of therapeutics and commonly used drug and essential medicines
Course Outcomes (Learning Objectives)	<p>At the end of course student should be able to</p> <ol style="list-style-type: none"> Understand basic concepts of pharmacology Describe pharmacodynamics and pharmacokinetics of essential and commonly used drugs List indication, contraindication, interaction and adverse reaction of commonly used drugs Indicate the use of appropriate drug in particular disease with consideration of efficacy, safety and cost of the therapy Explain and understand the pharmacological basis for prescribing drug in special medical situations

Unit No.	Theory Topics	No. of -hrs
1	Cardiovascular System: Antihypertensive Agents, Diuretics and Anti-diuretics, Antianginal Agents, Coagulants & Anticoagulants, Thrombolytics & Antiplatelet agents, Drugs for congestive cardiac failure, Management of shock, Hypolipidemic agents and Haematinics.	19
2	Gastrointestinal System: Emetics and Antiemetics, Drugs for peptic ulcer, Anti-diarrheal agents and Laxative & purgatives.	11
3	Respiratory System: Treatment of Cough, Drugs for Bronchial asthma.	10
4	Anesthetics: Local Anesthetics and General Anesthetics	5
	Total	45

Unit no.	Tutorial Topics	Hours allotted No. of hrs
1	Management of Hypertension (HT)	1
2	Management of Angina pectoris	1
3	Management of Congestive Cardiac Failure (CCF)	1
4	Management of Myocardial Infarction (MI)	1
5	Management of Diarrhea	1
6	Management of Bronchial Asthma	1
7	Sampling Designs: Census and Sample Survey, Implications of a Sample Design, Steps in Sampling Design Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs (Probability sampling and non-probability sampling), How to Select a Random Sample? Systematic sampling, Stratified sampling, Cluster sampling, Area sampling, multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.	4
8	Measurement in research: Measurement Scales, Sources of Error i Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques Possible sources of error in measurement, Tests of sound measurement Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method, Collection of Primary Data	5
	Total	15

Unit no	Practical	No. of hrs
1	Pharmacokinetics –II	7
2	Pharmacodynamics -I	6
3	Pharmacodynamics -II	11
4	Screening techniques for new drugs	6
	Total	30

Reference Books:

1. K.D. Tripathi, Essentials of Medical Pharmacology, Japye Brothers, Post 7193, G- 16,
2. Madhav Mutalik, Sudarshan Reddy, Practical pharmacology simplified practical record book. Jaypee Publication, New Delhi.
3. R.S. Satoakar, A.D. Bhandarkar, S.S. Ainapure, Pharmacology & Pharmacotherapeutics
4. H. L. Sharma & K. L. Sharma, Principles of Pharmacology, Paras Medical Publisher, Hyderabad, New Delhi.

SEMESTER-IV

Course Objective (Teaching Objectives)	<ul style="list-style-type: none"> This course is designed to enable students to understand basic concepts of pharmacology. To acquire basic knowledge and skill of pharmacodynamics, principles of therapeutics and pharmacokinetics of commonly used drug and essential medicines
Course Outcomes (Learning Objectives)	<p>At the end of course student should be able to</p> <ol style="list-style-type: none"> Understand basic concepts of pharmacology Describe pharmacodynamics and pharmacokinetics of essential and commonly used drugs List indication, contraindication, interaction and adverse reaction of commonly used drugs Indicate the use of appropriate drug in particular disease with consideration of efficacy, safety and cost of the therapy Explain and understand the pharmacological basis for prescribing drug in special medical situations

Unit no.	Theory Topics	No. of-hrs
1	Drugs affecting Central Nervous system (CNS) : Introduction to CNS, Sedative and Hypnotics, Local Anaesthetics, General Anaesthetics, Antiepileptics, Antidepressants, Antipsychotics, NSAIDS, Opioids and Antiparkinson agents.	20
2	Blood: Drugs used in the disorders of blood	10
3	Drugs Acting on Kidney: Diuretics and antidiuretics	8
	Total	38

Tutorial sessions	
Biostatistics	
Data Presentation: Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, one way scatter plots, Box plots, two way scatter plots, line graphs	2
Measures of Central Tendency and Dispersion: Mean, Median, Mode Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	2
Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, Normal distribution, data transformation Important Parametric Tests, Hypothesis Testing of Means, Hypothesis Testing for Differences between Means, Hypothesis Testing for Comparing Two Related Samples, Hypothesis Testing of Proportions, Hypothesis Testing for Difference between Proportions, Testing the Equality of Variances of Two Normal Populations.	4
Chi-square Test: Chi-square as a Non-parametric Test, Conditions for the Application Chi-square test, Steps Involved in Applying Chi -square Test, Alternative Formula, Yates' Correction, and Coefficient by Contingency.	2
Measures of Relationship: Need and meaning, Correlation and Simple Regression Analysis	2
Analysis of Variance and Covariance: Analysis of Variance (ANOVA): Concept and technique of ANOVA, One -way ANOVA, Two - way ANOVA, ANOVA in Latin - Square Design Analysis of Co -variance (ANOCOVA), ANOCOVA Technique.	3
Nonparametric or Distribution -free Tests: Important Nonparametric or Distribution - free Test Sign test, Wilcoxon signed - Rank Test, Wilcoxon Rank Sum Test: Mann - Whitney U test Kruskal Walli's test, Friedman's test, and Spearman Correlation test.	1
Vital Health Statistics: Measurement of Population: rate, crude rate specific rate, Measurement of fertility: specific fertility rate, Total fertility rate, Reproduction rate, Gross Reproduction Rate, Net Reproduction Rate Measures related to mortality: Crude Death Rate (CDR), Age -specific death Rate, Infant and child mortality rate, Measures related to morbidity.	3
Computer Application: Use of Computer in data analysis and research, Use of Software and Statistical package.	3
Total hours	22

Unit no	Practical	No. of hrs
1	Adverse drug reactions	4
2	Sources of drug Information	4
3	Computer assisted learning (CAL) – Experimental pharmacology	9
4	CNS Screening instruments and equipments	13
	Total	30

Reference Books:

1. K.D. Tripathi, Essentials of Medical Pharmacology, Japye Brothers, Post 7193, G- 16,
2. Madhav Mutalik, Sudarshan Reddy, Practical pharmacology simplified practical record book. Jaypee Publication, New Delhi.
3. R.S. Satoakar, A.D. Bhandarkar, S.S. Ainapure, Pharmacology & Pharmacotherapeutics
4. H.L. Sharma &K.L. Sharma, Principles of Pharmacology, ParasMedical Publisher, Hyderabad, New Delhi.

Semester-VI

Course Objective (Teaching Objectives)	<ul style="list-style-type: none"> This course is designed to enable students to understand basic concepts of pharmacology. To acquire basic knowledge and skill of pharmacodynamics, principles of therapeutics and pharmacokinetics of commonly used drug and essential medicines
Course Outcomes (Learning Objectives)	<p>At the end of course student should be able to</p> <ol style="list-style-type: none"> Understand basic concepts of pharmacology Describe pharmacodynamics and pharmacokinetics of essential and commonly used drugs List indication, contraindication, interaction and adverse reaction of commonly used drugs Indicate the use of appropriate drug in particular disease with consideration of efficacy, safety and cost of the therapy Explain and understand the pharmacological basis for prescribing drug in special medical situations

Unit no.	Theory Topics	Hours allotted No. of-hrs
1	Hormones and Antagonists: Introduction to Endocrinology, Glucocorticoids, Insulin, Oral hypoglycemic agents, Thyroxine & Antithyroid drugs, Estrogens and Antagonists, Progestins and Antagonists, Oral Contraceptives, Testosterone and Anabolic steroids.	15
2	Chemotherapeutic agents: General consideration, Sulphonamides and Cotrimoxazole, Fluroquinolones, Penicillins, Cephalosporins and Other beta lactam antibiotics, Aminoglycosides, Macrolides, Tetracyclines and Chloramphenicol, Antitubercular drugs, Antileprotic agents, Antimalarial agents, Antiamoebic agents, Anthelmintics, Antifungal agents, Antiviral agents and Cancer Chemotherapy.	20
3	Miscellaneous: Immunopharmacology, Toxicology, Drugs administration in special situations Pregnancy, lactation, Paediatrics, geriatrics, renal and hepatics disease. Drugs used in Skin Disease, ocular disease, Vitamins and enzymes in therapy.	10
	Total	45

Tutorial Topics	
Ethics and Ethical practice in research and plagiarism	3
Sampling Fundamentals: Need and importance for Sampling, Central Limit Theorem, Sampling Theory, Concept of Standard Error, Estimation, Estimating the Population Mean Estimating Population Proportion, Sample Size and its Determination, Determination of Sample Size through the Approach Based on Precision Rate and Confidence Level.	12
Total	15

Unit no	Practical	No. of hrs
1	Experimental Animal Handling and procedure	30
	Total	30

Recommended Reference Books:

1. K.D. Tripathi, Essentials of Medical Pharmacology, Jpyee Brothers, Post 7193, G- 16,
2. Madhav Mutalik, Sudarshan Reddy, Practical pharmacology simplified practical record book. Jaypee Publication, New Delhi.
3. R.S. Satoakar, A.D. Bhandarkar, S.S. Ainapure, Pharmacology & Pharmacotherapeutics
4. H.L. Sharma & K.L. Sharma, Principles of Pharmacology, Paras Medical Publisher, Hyderabad, New Delhi.