B.Sc. RENAL DIALYSIS TECHNOLOGY

Year 2019-20

VISION

To be an outstanding KAHER of excellence ever in pursuit of newer horizons to build self reliant global citizens through assured quality educational programs.

MISSION

- To promote sustainable development of higher education consistent with statutory and regulatory requirements.
- To plan continuously provide necessary infrastructure, learning resources required for quality education and innovations.
- To stimulate to extend the frontiers of knowledge, through faculty development and continuing education programs.
- To make research a significant activity involving staff, students and society.
- To promote industry / organization, interaction/collaborations with regional/national/international bodies.
- To establish healthy systems for communication among all stakeholders for vision oriented growth.
- To fulfill the national obligation through rural health missions.

OBJECTIVES

The objectives are to realize the following at KAHER and its constituent institutions:

- To implement effectively the programs through creativity and innovation in teaching, learning and evaluation.
- To make existing programs more careers oriented through effective system of review and redesign of curriculum.
- To impart spirit of enquiry and scientific temperament among students through research oriented activities.
- To enhance reading and learning capabilities among faculty and students and inculcate sense of lifelong learning.
- To promulgate process for effective, continuous, objective oriented student performance evaluation.
- To ordinate periodic performance evaluation of the faculty.
- To incorporate themes to build values, Civic responsibilities & sense of national integrity.
- To ensure that the academic, career and personal counseling are in-built into the system of curriculum delivery.
- To strengthen, develop and implement staff and student welfare programs.
- To adopt and implement principles of participation, transparency and accountability in governance of academic and administrative activities.
- To constantly display sensitivity and respond to changing educational, social, and community demands.
- To promote public-private partnership.

CONTENTS

B.Sc. RENAL DIALYSIS TECHNOLOGY

SECTION -I

PREAMBLE

The B.Sc. Renal Dialysis Technology Course is of 3 years (Semester) degree course aimed at training the young graduates in the technological aspects of dialysis care with a good scientific foundation. These students will be in a position to competently carry out hemodialysis and will also be trained in peritoneal dialysis, so as teach family members of ESRD patients how carry out peritoneal dialysis in their own home. They will be in demand both within the country and outside as Allied Healthcare personnel. With advanced training in the dialysis like SLED, CRRT and PD, these graduates will play an important role in determining the quality of health care provided.

REGULATIONS GOVERNING

1. Title of the Courses offered in Allied Health Sciences:

   Bachelor of Science in Renal Dialysis Technology (BSc. Renal Dialysis Technology)

2. Eligibility for admission:

   Those who have completed GNM Course (3 years or 3 year six months course)

   Or

   The two year Pre-University examination or equivalent as recognized university. with Physics, Chemistry and Biology as principal subjects of study.

   Or

   Those who has completed diploma dialysis course from a recognized university

   YEARLY INTAKE: 5 students per year

3. Duration of the course:

   Duration shall be for a period of three and half years including six months of Internship.

4. Medium of instruction:

   The medium of instruction and examination shall be in English.

5. Scheme of examination:

   There shall be six examinations during the course, each at the end of the first, second, third, fourth, fifth and sixth semester.

6. Attendance

   Every candidate should have attended at least 80% of the total number of classes conducted in an academic year from the date of commencement of the term to the last working day as notified by university in each of the subjects prescribed for that year separately in theory and practical. Only such candidates are eligible to appear for the university examinations in their first attempt. Special classes conducted for any purpose shall not be considered for the calculation of percentage of attendance for eligibility. A candidate lacking in prescribed percentage of attendance in any subjects either in theory or practical in the first appearance will not be eligible to appear for the University Examination in that subject .

FIRST SEMESTER

Scheme of Examination

Theory	Subjects	Theory + IA + Viva Voce	Total
Paper 1	Human Anatomy	60+20+20	100
Paper 2 Section A	Human Physiology	30+10+10	50
Section B	Basics of Biochemistry	30+10+10	50
Paper 3 Section A	Pathology – Basic Haematology	30+10+10	50
Section B	Microbiology	30+10+10	50
Paper 4 Elective	English	80+20	100
Grand Total			400

Practical	Subjects	Practical + IA	Total
Practical 1	Human Anatomy	80+20	100
Practical 2A	Human Physiology	40+10	50
2B	Basics of Biochemistry	40+10	50
Practical 3A	Haematology & Clinical Pathology	40+10	50
3B	Microbiology	40+10	50
Grand Total			400

Semester I

PAPER I: Human Anatomy Theory 25 Hours

The human body as a whole:

Definitions, Subdivisions of Anatomy, Terms of location and position, Fundamental Planes Vertebrate structure of man, Organization of the Body cells and Tissues.

Locomotion and support:

The Skeletal system: Types of bones, structure and growth of bones, Divisions of the skeleton, Appendicular skeleton, Axial skeleton, name of all the bones and their parts, joint-classification, types of movements with examples.

Anatomy of the Nervous System:

Central nervous system: Brain and Spinal cord, functions, meninges. The Brain- Brief structure of Hind Brain, Midbrain and Forebrain, Location, gross features, parts, functional areas, cerebral bood circulation and coverings, Functions of peripheral nervous system,Organization and Structure of Typical Spinal Nerve Spinal Cord: Gross features, extent, blood supply and coverings, reflex- arc. Applied Anatomy of spinal cord and brain.

Anatomy of circulatory system:

Heart: Size, location, external features, chambers, pericardium and valves, Blood supply and Nerve supply. Right and Left Atrium: Structural features, venous area, septum and appendages, structural features inflow and outflow characteristics. The study of blood vessels, General plan of circulation, pulmonary and systemic circulation. Names of arteries and veins and their positions, general plan of lymphatic system. Coronary Circulation, Lymphatic drainage of heart in brief Applied aspects of heart and pericardium.

Type of questions and distribution of marks for Theory examination in each subject in First Semester

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Maximum Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	3	2	2x10	20	20	20	20
2	Short Essay Question	7	5	5x5	25			
3	Short Answers	5	5	5x3	15			

Suggested Readings:

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1. Human Anatomy Regional and Applied Vol. 1, Vol. 2 & Vol. 3	B D Chaurasia	C B S Publishers, New Delhi
2. Hand Book of General Anatomy	B D Chaurasia	C B S Publishers, New Delhi
3. Text Book of Human Histology	Inderbir Singh	Jaypee Brothers, Medical Publishers, Delhi
4. Clinically Oriented Anatomy	Keith L. Moore	Williams and Wilkins, Baltimore
5. Gray's Anatomy	Susan Standring	Elsevier Churchill Livingstone, Edinburg

Practical 20 Hours

Anatomy

1. General Histology Slides:

- Epithelial Tissue,
- Connective Tissue,
- Hyaline Cartilage,
- Fibro Cartilage,
- Elastic Cartilage,
- T.S. & L.S. of Bone,
- Blood Vessels,
- Tonsil,

- Spleen,
- Thymus,
- Lymph node,
- Skeletal and Cardiac Muscle
- Peripheral Nerve and Optic Nerve

2. Systemic Histology Slides:

1. Renal: Kidney, ureter, urinary bladder

2. Cerebrum

3. Demonstration of all bones - Showing parts, joints,

4. X-rays of all normal bones and joints.

5. Demonstration of heart and normal angiograms.

6. Demonstration of Brain

7. Radiographs of abdomen-IVP, retrograde cystogram

PRACTICAL ASSESMENT

Scheme of Practical Examination for First Semester

Sl. No.	Practical	Practical	IA	Grand Total
1	Practical 1	80	20	100

Scheme of Exam for Practicals:

Practical Histology	Spotters	: 10 X 2 Marks = 20 marks
Gross Anatomy	Discussion	: 2 X 20 Marks = 40 marks
	Spotters	: 10 X 2 Marks = 20 marks
IA Marks		: 20 marks
Total		: 100 Marks

Suggested Readings:

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1. Human Anatomy Regional and Applied Vol. 1, Vol. 2 & Vol. 3	B D Chaurasia	C B S Publishers, New Delhi
2. Hand Book of General Anatomy	B D Chaurasia	C B S Publishers, New Delhi
3. Text Book of Histology – A Practical Guide	J P Gunasegaran	Elsevier Publication, Gurgaon, Hariyana
4. Practical Manual of Histology for Medical students	Neelkanth Kote	Jaypee Brothers, Medical Publishers, Delhi

PAPER 2 : Section A - Human Physiology Theory 35 Hours

General Physiology: Structure of Cell membrane and Cell Organelles, Intercellular junctions, Classification of Body fluid compartments & composition, Homeostasis, Transport across cell membrane -Definition and Classification.

Nervous system: Functions of Nervous system, Neurone structure, classification and properties. Neuroglia, nerve fiber, classification ,conduction of impulses continuous and saltatory. Velocity of impulse transmission and factors affecting. Synapse - structure, types, properties.
Receptors - Definition, classification ,properties. Reflex action - unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Ascending tracts, Descending tracts - pyramidal tracts - Extrapyramidal tracts. Functions of Medulla, pons, Hypothalamic disorders. Cerebral cortex lobes and functions, Sensory cortex, Motor cortex,Cerebellum functions of Cerebellum.Basal ganglion-funtions. EEG. Cerebro Spinal Fluid(CSF) : formation, circulation, properties, composition and functions lumbar puncture. Autonomic Nervous System Sympathetic and parasympathetic distribution and functions and comparison of functions.

Blood: Composition and functions of blood and plasma proteins
Red Blood Cells: Morphology & functions, Erythropoiesis, types & functions of hemoglobin,Definition and Classification of Anemia & Jaundice. White blood cells: Morphology, functions Definition of Leucopoiesis, Immunity - definition, and classification, Platelets and Blood Coagulation:Morphology & functions of platelets, Mechanism of Hemostasis, Anticoagulants, Bleeding disorders. Blood Groups: Classification of Blood Groups, ABO and Rh blood group systems, uses of blood grouping test and Cross matching, Blood Transfusion and its hazards.

Excretory System:
Excretory organs Kidneys: Functions of kidneys structural and functional unit nepron, vasarecta, cortical and juxtamedullary nephrons - Comparision, Juxta Glomerular Apparatus -Structure and function.
Renal circulation peculiarities.
Mechanism of Urine formation : Ultrafiltration criteria for filtration GFR, Plasma fraction, EFP, factors effecting EFR. Determination of GFR selective reabsorption - sites of reabsorption, substance reabsorbed, mechanisms of reabsorption Glucose, urea. H + Cl aminoacids etc. TMG, Tubular lead, Renal threshold % of reabsorption of different substances, selective e secretion.
Properties and composition of normal urine, urine output. Abnormal constituents in urine, Mechanism of urine concentration. Counter - Current Mechanisms : Micturition, Innervation of Bladder, Cysteurethrogram. Diuretics : Water, Diuretics, osmotic diuretics, Artificial kidney Renal function tests – plasma clearance Actions of ADH, Aldosterone and PTH on kidneys. Renal function tests

Scheme of examination

Theory Total 50 marks Duration 90 minutes

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Maximum Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	2	1	1x10	10	10	10	50
2	Short Essay Question	3	2	2x5	10			
3	Short Answers	5	5	5x2	10			

Suggested Readings:

Recommended Text Books (Latest Edition)

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1. Textbook of Physiology for MLT	Prof. A K Jain	Avichal Publishing Company
2. Textbook of Medical Physiology	D. Venkatesh & H H Sudhakar	Wolters Kluwers
3. Concise Medical Physiology	Sujit K Choudhari	New Central Books, Calcutta
4. Textbook of Physiology	Arthrur C Guyton	Prism Publishers, Bangalore
5. Practical Physiology	Prof. A K Jain	Arya Publication

Practical 1 : Section A - Physiology Practical 30 Hours

1) Study of Microscope and its use

2) Collection of Blood and study of Haemocytometer

3) Haemoglobinometry

4) White Blood Cell count

5) Red Blood Cell count

6) Determination of Blood Groups

7) Leishman's staining and Differential WBC Count

8) Determination of Bleeding Time

9) Determination of Clotting

Practical Total	50 marks
Major -	25 marks
Minor -	15 marks
Internal Assesment -	10 marks
Total -	50 marks

Semester I

PAPER 2 : Section B: Basics of Biochemistry Theory 35 Hours

1. Introduction to Medical lab Technology:

(a) Role of Medical lab Technologist (b) Ethics, Responsibility (c) Safety measures

(d) First aid (e) Cleaning and care of general laboratory glass ware and equipment.

2. Introduction to Apparatus- Chemical Balance: Different types, Principles and applications.

3. Units of Measurements: Concepts of Molecular weight, Atomic weight, Normality, Molarity, Standards, Atomic structure, Valence, Acids, Bases, Salts & indicators

4. Concepts of pH: Concepts of Acid Base reaction and hydrogen ion concentration. Definition of pH, buffer & pH meter

5. Chemistry of Carbohydrates:

a. Definition, Classification and biological importance.

b. Monosaccharaides, Oligosaccharides, Disaccharides & Polysaccharides:

6. Chemistry of Lipids:

a. Definition, Classification and biological importance.

b. Simple lipids: Triacylglycerol and waxes-composition and functions.

c. Compound lipids : Phospholipids, Sphingolipids, Glycolipid and Lipoproteins : Composition and functions.

d. Derived lipids: Fatty acids-saturated & unsaturated. Steroids and their properties

7. Chemistry of Proteins:

a. Amino acids: Classification, properties, side chains of amino acids.

b. Protein: Definitions, Classifications and functions.

c. Peptides: Biologically active peptides

d. Overview of Structural organization of proteins.

e. Denaturation of proteins and denaturating agents

8. Chemistry of Nucleic acids:

a) DNA Structure and function

b) RNA: Types, Structure (only t RNA) and Functions.

Scheme of examination

Theory Total- 30 Marks Duration: 90 minutes

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Maximum Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	2	1	1x10	10	10	10	50
2	Short Essay Question	3	2	2x5	10			
3	Short Answers	5	5	5x2	10			

Suggested Readings:

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1. Test Book of Biochemistry for Medical Students	Vasudevan (DM) & Sree Kumari (S)	Jaypee Brothers, New Delhi
2. Biochemistry	U. Satyanarayan	Books and Allied (P) Ltd. Kolkata – 700009. India
3. Clinical Chemistry	Varley	William Heinemann Medical Books Ltd & Inter Science Book. Inc. New York
4. Clinical Chemistry	TEITZ	W B Saunders Company Harcourt (India) Private Limited New Delhi - 110048

PAPER 2 : Section B - Biochemistry Practicals Practical 30 Hours

1. Introduction to apparatus, Instruments and use of Chemical Balance.

2. Maintenance of Laboratory Glassware and apparatus.

3. Reactions of Carbohydrates (Glucose, fructose, maltose, lactose, sucrose and starch)

4. Reactions of Proteins (Albumin and Casein)

5. Colour reactions of Proteins

6. Identification of Unknown Carbohydrates and proteins

Scheme of Examination

Major Practical

Topics	No. of Questions	No. of Questions and Marks	Total
Qualitative Analysis : Identification of Unknown Carbohydrate or protein	1	1x25	25 Marks

Minor Practical

Topics	No. of Questions	No. of Questions and Marks	Total
Color reactions of proteins (any one)	1	1x15	15 Marks

Practical Marks 40 Marks

IA Marks: 10 Marks

Grand Total 50 Marks

Semester I

PAPER 3 : Section A - Pathology Theory 25 Hours

Basic Haematology

- Introduction to Haematology: (a) Definition (b) Importance (c) Important equipment used.
- Laboratory organization and safety measures in haemotology Laboratory
- Introduction to blood, its composition, function and normal cellular components.
- Collection and preservation of blood sample for various haematological investigations
- Normal Values in Hematology
- Preparation of blood Films- Types. Methods of preparation (Thick and thin smear/film)
- Definition, principles & procedure, Normal values, Clinical significance, errors involved,means to minimize errors for the following:

  1. Haemoglobinometry, PCV, Red Cell Indices

  2. Total leucocytes count (TLC)

  3. Differential leucocytes count (DLC), Absolute Eosinophil count, Reticulocyte count and Platelet Count.

  4. Erythrocyte Sedimentation Rate (ESR)

  5. Blood Grouping

- Staining techniques in Haematology (Romanowsky's stains) :Principle, composition, preparation of staining reagents and procedure of the following

  1. Giemsa stain

  2. Leishman stain

  3. Wright's stain

  4. Field's stain

- Bone Marrow: Techniques of aspiration, Preparation and Staining of films, Bone Marrow Biopsy.

Scheme of Examination

Type of questions and distribution of marks for Theory examination in each subject in First Semester

Duration 90 minutes

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Maximum Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	2	1	1x10	10	10	10	50
2	Short Essay Question	3	2	2x5	10			
3	Short Answers	5	5	5x2	10			

Suggested Readings:

Reference books (Latest Edition)

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1. Practical Pathology	P. Chakraborty Gargi Chakraborty	New Central Book Agency, Kolkata
2. Text book of Haematology	Dr. Tejinder Singh	Arya Pulications, Sirmour(HP)
3. Text book of Medical Laboratory Technology	Praful Godkar	Bhalani Publication House, Mumbai
4. Practical Haematology	Sir John Dacie	Churchill Livingstone, London
5. Todd & Sanford, Clinical Diagnosis & Management by Laboratory Methods	John Bernard Henry	All India Travellar Bookseller, Delhi
6. Practical Pathology	Dr. Ganga S Pilli	Prabhu Publications, Dharwad

Practical 3 : Section A - Pathology Practical 30 Hours

Basic Haematology

1. Hb Estimation-Sahli's method & Cyanmethhaemoglobin method
2. RBC Count
3. Retic Count
4. Preparation of blood smears and staining with Leishman stain
5. WBC Count
6. WBC -Differential Count
7. Platelet Count
8. Absolute Eosinophil Count
9. ESR- Westergreens & Wintrobe's method,
10. PCV.
11. Sickling test-Demonstration
12. Bone Marrow Smear preparation & staining procedure- Demonstration
13. Demonstration of Malarial Parasite.

Exam Pattern

I. Major Experiment: Perform any two exercises: 20 Marks
- Hb Estimation-Sahli's method
- RBC Count
- Preparation of blood smears and staining with Leishman stain- WBC - Differential count
- WBC Count
- Platelet Count
- Absolute Eosinophil Count

II. Minor Experiment: Any one examination 10 Marks
- Reticulocyte Count
- ESR- Westergreens & Wintrobe's method,
- PCV

III. Spotters 10 Marks

IV. Internal Assessment: 10 Marks

Total: 50 Marks

Practical Assesment

Scheme of Practical Examination for First Semester.

(Section A Pathology -50 Marks + Section B Microbiology 50 Marks)

Sl. No.	Practical	Practical	IA	Grand Total
1	Section A	40	10	50
2	Section B	40(Major 30 + Minor 10)	10	50

Scheme of Exam for Practicals:

Major Experiment : 20 Marks

Minor Experiment : 10 Marks

Spotters : 10 Marks

Internal Assessment : 10 Marks

Total : 50 Marks

Semester I

PAPER 3: Section B - Microbiology Theory 25 Hours

- Introduction to Medical Microbiology: - Definition - History - Host-Microbe relationship.
- Microscopy: - Introduction and history - Types of microscopes
    - Light microscope
    - Dark ground Microscope
    - Fluorescent Microscope
    - Phase contrast Microscope
    - Electron microscope:
    - Principles and operational mechanisms of various types of microscopes
- Sterilization: - Definition -- Types and principle of sterilization methods
- Physical methods- (a) Heat (dry heat, moist heat with special Reference to autoclave - their care and maintainance.) (b) Radiation (c) Filtration, Efficiency testing to various sterilizers.
- Chemical methods
- Antiseptics and disinfectants: Definition, Types and properties - Mode of action - Uses of various disinfectants, Precautions while using the disinfectants - Qualities of a good disinfectant, In-house preparation of alcoholic hand/skin disinfectants, Testing efficiency of various disinfectants
- Antibiotics and drug resistance
- Classification of Microbes
- Bacterial Cell Growth and Nutrition
- Overview and mechanisms of Bacterial gene transfer.
- Ubiquity of microbes.

Scheme of Examination for Theory

Type of questions and distribution of marks for Theory examination in each subject in First Semester. Section B - Microbiology - 50 marks

Sl. No.	Question	Question asked	Question to attempt	Marks	Max. Marks	IA	Viva	Total Marks
1	Long Essay Question	2	1	1x10	10	10	10	50
2	Short Essay Question	3	2	2x5	10			
3	Short Answers	5	5	5x2	10			

Suggested Readings:

1. Ananthanarayan and Paniker's Textbook of Microbiology. Tenth Edition. Reba Kanungo
2. Textbook of Microbiology for MLT. Second Edition.Dr. C. P. Baveja.

Practical 3: Section B - Microbiology Practical 30 Hours

- Focusing, handling and care of Microscopes
- Hanging drop
- Simple stain
- Gram stain
- ZN stain
- Sterilization and Disinfection

Scheme of Practical Examination for First Semester: Practical Examination for First Semester.

Sl. No.	Practical	Practical	IA	Grand Total
1	Section A	40 (Major 30 + Minor 10)	10	50
2	Section B	40 (Major 30 + Minor 10)	10	50

Major : 30 Marks

Gram Stain 15 Marks

ZN Stain 15 Marks

Minor : 10 Marks

Spotter 10 Marks

IA : 10 Marks

Total 50 Marks

Suggested Readings:

Practical Microbiology, Fourth Edition. C.P Baveja

I YEAR B.Sc. ENGLISH

COURSE CONTENTS:

Subsidiary subject 60 hours for 1st year marks to be sent to university before 2nd year exam. Course description: It is designated to help the students to acquire a good command over English language for common and medical terminology used in medical practice.

Behavioural objectives:

Ability to speak and write proper English

Ability to read and understand English

Ability to understand and practice medical terminology.

Paragraph

Letter writing

Note making

Description

The use of paragraphs

Essay writing

Telegrams

Precise-writing and abstracting

Report writing

Medical Terminology

Use of dictionary

Scheme of examination

Theory: 80 Marks	Duration: 3 hours
1) Fill in the blanks -	10 marks
2) Articles (Passage/fill in the blanks) -	10 marks
3) Tense (Sentence identification/rewriting a sentence) -	10 marks
4) Voice (Rewrite) -	10 marks

5) Speech (Rewrite) - 10 marks

6) Linkers (Paragraph) - 10 marks

7) Paragraph writing - 10 marks

8) Letter writing - 10 marks

Text Books Recommended (Latest Edition)

Sl. No.	Name of the Book & Title	Author	Publisher's Name Place of Publication
1	Sharma Strengthen your writing	V R Narayan	New Delhi, Orient Longman
2	Grammer and Composition	Wren and Martin	Delhi, Chand & Co.
3	Spoken English	Shashikumar V. D'Souza P V	New Delhi, TataMergaw Hill
4	Medical Dictionary	Dorland's pocket IBH Publishing Co.	New Delhi: Oxford &

SECOND SEMESTER

Scheme of Examination

Theory	Subjects	Theory + IA + Viva Voce	Total
Paper 1	Human Anatomy	60+20+20	100
Paper 2 Section 2A	Human Physiology	30+10+10	50
Section 2B	Basics of Biochemistry	30+10+10	50
Paper 3 Section 3A	Haematology & Clinical Pathology	30+10+10	50
Section 3B	Microbiology	30+10+10	50
Paper 4 Elective	Environmental Studies	80+20	100
Grand Total			400

Practical	Subjects	Practical + IA	Total
Practical 1	Human Anatomy	80+20	100
Practical 2 2A	Human Physiology	40+10	50
2B	Basics of Biochemistry	40+10	50
Practical 3 3A	Haematology & Clinical Pathology	40+10	50
3B	Microbiology	40+10	50
Grand Total			300

Semester II

PAPER 1: Human Anatomy Theory 40 Hours

Anatomy of the Respiratory system:

Organization of Respiratory System, Gross structure and interior of Nose, Nasal cavity, Para nasal air sinuses,

Gross structure and interior of Pharynx, Larynx, trachea, bronchial tree, Pleura

Gross structure and Histology of Lungs, Pulmonary Circulation, Pulmonary Arteries, Pulmonary Veins and Bronchial Arteries.

Nerve Supply of Respiratory System and Applied aspect of Respiratory System

Anatomy of the Digestive System:

Components of Digestive system, Alimentary tube, Anatomy of organs of digestive tube, mouth, tongue, tooth, salivary glands, liver, Biliary apparatus, pancreas, Names and positions and brief functions - with its applied anatomy.

Anatomy of Reproductive System.

Male Reproductive System: Testis, Duct system - with its applied anatomy.

Female Reproductive System: Uterus, Ovaries, Duct system, Accessory organs- with its applied anatomy.

Anatomy of the Endocrine System.

Name of all endocrine glands their positions, Hormones and their functions- Pituitary, Thyroid and parathyroid glands, Adrenal glands, Gonads and Endocrine part of pancreas- with its applied anatomy.

Anatomy of Renal System.

Organization of renal system Kidneys: Location, gross features, relations, structure, blood supply, nerve supply, lymphatic drainage and with its applied anatomy. Ureters and urinary bladder-Location, gross features, structure and with its applied anatomy. Urethra in brief along with its applied anatomy.

Type of questions and distribution of marks for Theory examination in each subject in Second Semester

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Max. Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	3	2	2x10	20	20	20	100
2	Short Essay Question	7	5	5x5	25			
3	Short Answers	5	5	5x3	15			

Suggested Readings:

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1. Human Anatomy Regional and Applied Vol. 1, Vol. 2 & Vol. 3	B D Chaurasia	C B S Publishers, New Delhi
2. Text Book of Human Histology	Inderbir Singh	Jaypee Brothers, Medical Publishers, Delhi
3. Clinically Oriented Anatomy	Keith L. Moore	Williams and Wilkins, Baltimore
4. Gray's Anatomy	Susan Standring	Elsevier Churchill Livingstone, Edinburg
5. Text Book of Histology – A Practical Guide	J P Gunasegaran	Elsevier Publication, Gurgaon, Hariyana
6. Practical manual of Histology for Medical students	Neelakanth Kote	Jaypee Brothers, Medical Publishers, Delhi

Practical 1: Human Anatomy Practicals- 20 Hours

Systemic Histology slides:

1. G.I.T - oesophagus, stomach, small intestine, large intestine, liver, pancreas and gall bladder.

2. RS -Lungs and Trachea

3. Endocrine glands - Adrenal, Pancreas, Pituitary, Thyroid and Parathyroid

4. Uterus, Ovary, Testis.

Practical:

1) Demonstration of the digestive system organs

2) Demonstration different parts of respiratory system and normal X-rays

3) Demonstration of Male & Female reproductive organs

4) Demonstration of Endocrine glands.

Practical Assessment

Scheme of Practical Examination for Second Semester

Sl. No.	Practical	Practical	IA	GRAND TOTAL
1	Practical 1	80	20	100

Scheme of Exam for Practicals:

Practicals

Gross Anatomy

Discussion	3 x 10 marks :	30 Marks
Spotters	10 x 2 marks :	20 Marks

Histology

Spotters	15 x 2 marks :	30 Marks

IA marks : 20 Marks

Total : 100 Marks

PAPER 2 : Section A - Physiology Theory 35 Hours

Respiratory System

Physiological Anatomy of Respiratory System and Functions, Dead Space.

Mechanism of Respiration, Lung volume and capacities, Surfactant, definition of compliance

Transport of Oxygen, ODC Curve and CO2 transport.

Regulation of Respiration - Types and functions of Respiratory Centres

Cyanosis, Dyspnea, Apnea, Hypoxia - definition and types.

Cardiovascular System

Physiological Anatomy of Heart

Cardiac Cycle - Definition and Phases

Cardiac Output - Definition, and factors affecting cardiac output,

Blood pressure - Definition, Determinants & Factors affecting blood pressure, regulation of blood pressure,

Defination Hypertension, Hypotention Myocardial Ischemia and Infarction.

Normal Electrocardiogram - Definition, Waves and Uses.

Digestive System

Functional Anatomy of GIT, composition & functions of saliva

Composition of gastric juice, mechanism of secretion & function of HCL

Composition and functions of pancreatic juice

Functions of Liver and bile Juice

Defination of Jaundice and it types

Movements of GI Tract - Deglutition, Movements of Small Intestines

Endocrines

Major Endocrine glands

- Pituitary Gland: Anterior & Posterior Pituitary Hormones and functions
- Thyroid Gland: Hormones Secreted and Functions, Goitre
- Adrenal Gland: Hormones secreted by adrenal cortex and medulla and their functions
- Pancreas: Endocrine Hormones of Pancreas and their functions, Diabetes Mellitus
- Parathyroid Gland: PTH, calcitonin and its actions.

Reproductive System

Puberty: Puberty, Pubertal changes in male and female.

Male Reproductive System: Male reproductive organs, Spermatogenesis, Morphology of a sperm, Semen, Factors influencing spermatogenesis, Functions of testosterone.

Female Reproductive System: Female reproductive organs, Oogenesis, Ovulatory cycle with its hormonal basis, Tests for Ovulation, Menstrual cycle with its hormonal basis, Functions of Estrogen & Progesterone

Pregnancy & Lactation: Fertilization, Functions of Placenta, Hormones of Placenta, Pregnancy tests, Contraceptive methods, Milk Ejection Reflex, Composition of Milk, Advantages of breast feeding

Scheme of Examination

Type of questions and distribution of marks for Theory examination in each subject in Second Semester.

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Max. Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	2	1	1x10	10	10	10	50
2	Short Essay Question	3	2	2x5	10			
3	Short Answers	5	5	5x2	10			

Suggested Readings:

Recommended Text Books (Latest Edition)

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1.Textbook of Physiology for MLT	Prof. A K Jain	Avichal Publishing Company
2. Textbook of Medical Physiology	D. Venkatesh & H H Sudhakar	Wolters Kluwers
3. Concise Medical Physiology	Sujit K Choudhari	New Central Books, Calcutta
4. Textbook of Physiology	Arthrur C Guyton	Prism Publishers, Bangalore
5.Practical Physiology	Prof. A K Jain	Arya Publication

Practical 2 : Section A-Human Physiology Practicals 30 Hours

1) Recording of Pulse

2) Blood Pressure Recording

3) Effect of Exercise on BP

4) Effect of Posture on BP

5) Auscultation for Heart Sounds

6) Spirometry - Description of Normal Findings

7) Electrocardiogram of a normal person - Description of ECG waves in Lead II

8) Artificial Respiration.

Practical Assesment

Practical	Total 50 marks
Major -	25 marks
Minor -	15 marks
Internal Assesment -	10 marks
Total -	50 marks

PAPER 2 : Section B - Basics of Biochemistry Theory 35 Hours

1. Specimen collection of blood, urine, cerebrospinal fluid and other body fluids, preservation and preparation of protein free filtrate.

2. Enzymes: definition, classification, coenzymes, factors affecting enzyme activity and inhibitors, units of measurements, isoenzymes, Diagnostic enzymology (AST, ALT ALP, LDH, CPK and Troponin).

3. Digestion and Absorption of Carbohydrates, proteins and lipids

4. Nutrition - Calorific value and nutritional importance of Carbohydrates, Lipids, Proteins and Dietary fibers. BMR & Factors affecting BMR

5. Vitamins- Sources, RDA, functions and deficiency manifestations.

6. Minerals-Calcium, Phosphorus, Iron, copper, zinc, selenium and fluoride

7. Non Protein Nitrogenous compounds-Clinical Significance of Urea, Uric acid, creatinine, acetone and HCL

8. Overview of Metabolism

Carbohydrate Metabolism-Glycolysis, Gluconeogenesis and TCA Cycle

Protein Metabolism- General Reactions of amino acids and Urea cycle.

Scheme of Examination

Theory total 30 Marks Duration 90 minutes

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Max. Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	2	1	1x10	10	10	10	50
2	Short Essay Question	3	2	2x5	10			
3	Short Answers	5	5	5x2	10			

Suggested Readings:

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1. Test Book of Biochemistry for Medical Students	Vasudevan (DM) & Sree Kumari (S)	Jaypee Brothers, New Delhi
2. Biochemistry	U. Satyanarayan	Books and Allied (P) Ltd. Kolkata – 700009. India
3. Clinical Chemistry	Varley	William Heinemann Medical Books Ltd & Inter Science Book. Inc. New York
4. Clinical Chemistry	TEITZ	W B Saunders Company Harcourt (India) Private Limited New Delhi - 110048

Practical 2 : Basics of Biochemistry Practical - 30 hours

1. Demonstration of Colorimeter, spectrophotometer, pH meter.

2. Quantitative analysis of Glucose, Urea and creatinine

3. Estimation of urine creatinine

4. Biochemically important substance- Urea, Uric acid, Creatinine, Acetone and HCL

Practical Examination-Semester II

Major Practical

Topics	No. of Questions	No. of Questions and Marks	Total
Qualitative Analysis : of Glucose/Urea/Creatinine/Estimation of Urine Creatinine	1	1x25	25 Marks

Minor Practical

Topics	No. of Questions	No. of Questions and Marks	Total
Analysis of biochemically important substances	1	1x15	15 Marks

Practical Marks 40 Marks

IA Marks: 10 Marks

Grand Total 50 Marks

PAPER 3 : Section A - Haematology & Clinical Pathology Theory 25 Hours

Hematology:

1. Bone marrow

    a. Techniques of aspiration, preparation and staining of films

    b. Bone marrow biopsy

2. Preparation of buffy coat smears

3. Laboratory tests used in the investigation of anemia's

    a. B 12 and folate assay Normal values, derangements and interpretation of results.

    b. Schilling test - Method and interpretation

    c. Serum iron and iron binding capacity and other tests for Iron deficiency anemia- Normal values, derangements and interpretation of results

4. Laboratory test used in investigation of hemolytic anemia's

    a. Osmotic fragility

    b. Investigation of G-6 PD deficiency

    c. Test for sickling

    d. Estimation on of Hb-F, Hb-A2

    e. Plasma haemoglobin and Haptoglobin, demonstration of haemosiderin in urine

    f. Haemoglobin electrophoresis

    g. Coomb's test (Direct & Indirect) - Test for auto immune hemolytic Anaemias.

Clinical Pathology

    1. Urine examination: Physical, Chemical & Microscopic

    2. Semen analysis

BLOOD BANKING

(Blood transfusion and Immunohaematology).

1. Collection & processing of Blood –Donor selection, Registration, Medical history, Physical examination.

2. Collection of Blood

3. Processing of Donor Blood

4. Storage & preservation of Blood.

5. ABO Blood group System

6. R.h typing and weaker variants in R.h system

7. Subgroup and weaker various of A and B and Bombay Phenotype

8. Preparations and standardization of Anti Human globulin reagent

9. Coomb's test.

10. Blood grouping and cross-matching in blood bank.

11. Diseases transmitted by Blood and their screening - Australia Antigen and Hepatitis

C. Virus (HCV), HIV, Syphilis, CMV & Malaria in Blood transfusion

12. Investigation of transfusion reaction.

13. HLA Antigens and their significance in blood transfusion.

14. Blood Components- its preparation and their use in clinical practice.

15. Haemapheresis- Apheresis using cell separators Leucapheresis, plateletpheresis, plasmapheresis Adverse effects on donors.

16. Blood Bank Administration.

17. Record keeping

Immuno - cytochemistry:

1. Introduction

2. Basic concepts of immunochemistry

3. Monoclonal antibodies and their preparations

4. Fluorescence reactions

5. PAP Technique - principle, preparation of reagents and Procedure

Scheme of Examination

Type of questions and distribution of marks for Theory examination in each subject in Second Semester.

(Section A - Pathology - 50 marks + Section B - Microbiology - 50 marks)

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Max. Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	2	1	1x10	10	10	10	50
2	Short Essay Question	3	2	2x5	10			
3	Short Answers	5	5	5x2	10			

Suggested Readings:

Reference books (Latest Edition)

Name of the Books & Title	Author	Publisher's Name, Place of Publication
1.Practical Pathology	P. Chakraborty Gargi Chakraborty	New Central Book Agency, Kolkata
2.Text book of Haematology	Dr. Tejinder Singh	Arya Pulications, Sirmour(HP)
3.Text book of Medical Laboratory Technology	Praful Godkar	Bhalani Publication House, Mumbai
4.Practical Haematology	Sir John Dacie	Churchill Livingstone, London
5.Todd & Sanford, Clinical Diagnosis & Management by Laboratory Methods	John Bernard Henry	All India Travellar Booksellar, Delhi
6.Practical Pathology	Dr. Ganga S Pilli	Prabhu Publications, Dharwad
7.Hematology Blood Banking & Transfusion (PB)	Dutta B A	CBS Publishers & Distributors Pvt. Ltd
8.Blood Transfusion in Clinical Practice (HB)	Kochhar P K	CBS Publishers & Distributors Pvt. Ltd
9.Transfusion Medicine, 3e (PB)	Mc Cullough	CBS Publishers & Distributors Pvt. Ltd
10.Practical Transfusion Medicine, 4e (HB)	Murphy	CBS Publishers & Distributors Pvt. Ltd

Practical 3 : Pathology Practicals Practical 35 Hours

I. HAEMATOLOGY

- Sickling test-Demonstration
- Bone Marrow Smear preparation & staining procedure- Demonstration
- Demonstration of Malarial Parasite.
- Blood grouping. , Cross matching, Blood Transfusion and immunohaematology.
- Coomb's Test (Demonstration).

II. CLINICAL PATHOLOGY

- Visit to pathology laboratory – Postings in batches - 15 days for 2 hours
- Urine examination
  - Physical
  - Chemical – Reducing substances ketone bodies, proteins and blood
  - Microscopy
  - Dipstick method – Demonstration
- Semen Analysis Demonstration

Practical Assesment
Scheme of Practical Examination for Second Semester.
(Section A Pathology 50 Marks + Section B Microbiology -50 Marks)

Sl. No.	Practical	Practical	IA	Grand Total
1	Section A	40 (Major 30 + Minor 10)	10	50
2	Section B	40 (Major 30 + Minor 10)	10	50

Pathology Practicals

I. Major 30 marks

a. Urine Examination 10 marks

b. Urine Microscopy 10 marks

c. Blood Grouping 10 marks

II. Minor 10 marks

a. Spotters 05 marks

b. Coombs (Direct / Indirect) test

Interpretation/Proceedure writing 05 marks

IA 10 marks

Total 50 marks

PAPER 3 : Section B - Microbiology Theory 25 Hours

- Culture media and different methods of cultivation.

- Immunology– Introduction, Specific and non-specific immunity, Antigens, Antibodies- Structure and function, Complement and antigen-antibody reaction.

Scheme of Examination

Theory 40 Marks Duration 90 minutes

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Max. Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	2	1	1x10	10	10	10	50
2	Short Essay Question	3	2	2x5	10			
3	Short Answers	5	5	5x2	10			

Suggested Readings:

1) Ananthanarayan and Paniker'sTestbook of Microbiology. Tenth Edition. Reba Kanungo

2) Textbook of Microbiology for MLT. Second Edition.Dr.C.P.Baveja.

Practical 3 : Section B - Microbiology Practicals: 25 Hours

- Biomedical waste management
- Collection of various clinical specimens.
- Serological tests
- Un-inoculated culture media and culture techniques.

Practical Exam Pattern

Major : -		25 marks
• Biomedical waste management -	10 marks	
• Serological tests/Inoculation techniques -	15 marks	
Minor : -		15 marks
• Spotters -	15 marks	
IA -		10 marks
Total -		50 marks

ENVIRONMENTAL STUDIES

GOAL:

The students should gain knowledge to understand the multidisciplinary nature of the environment and the awareness of the eco system, which maintains the natural environment.

OBJECTIVES:

a) KNOWLEDGE

At the end of the II Phase 1st term MBBS Course the student is expected to know:

1. The natural resources like forest, water, mineral, food, energy and land.

2. Functions of the eco system.

3. Bio-diversity and its conservation.

4. Environmental pollution & its prevention.

5. Social issues.

b) SKILLS

At the end of the second term Course the student is expected to:

1. Visit local areas to understand and document environmental assets like river, forest, grassland, hill and mountain.

2. Visit an industrial area or agricultural area to know about local pollutants.

3. Identify common plants, insects and birds in their local areas.

4. Identify rivers, hills and mountains in their local areas.

5. To make use of the knowledge to protect natural resources.

COURSE CONTENTS

Theory and Field work: 50 Hours

- Theory - 45 hours
- Field work - 5 hours

1: Multi-disciplinary nature of environmental Studies: Definition, scope and importance, need for public awareness. 2 hours

2: Natural Resources:

Renewable and non-renewable resources:

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

g) Role of an individual in conservation of natural resources.

h) Equitable use of resources for sustainable lifestyles 8 hours

3: Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following

ecosystems:-

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) 6 hours

4: Biodiversity and its conservation 8 hours

- Introduction - Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

5: Environmental Pollution 8 hours

Definition

Cause, effects and control measures of:-

a. Air pollution

b. Water pollution

c. Soil pollution

d. Marine pollution

e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

Solid waste Management : Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Pollution case studies.

Disaster management : floods, earthquake, cyclone and landslides.

6: Social Issues and the Environment 7 hours

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics: Issues and possible solutions.

- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and control of Pollution) Act.
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.

7: Human Population and the Environment 6 hours

- Population growth, variation among nations.
- Population explosion - Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

8: Field work

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site - Urban / Rural/ Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

SCHEME OF EXAMINATION

A. Theory: 80 Marks

- Long Essay 2 X 10 = 20
- Short Essay 8 X 5 = 40
- Short Answers 5 X 4 = 20

B. Field Work: 20 Marks

Recommended Books

Sl. No.	Title	Author	Edition & Year	Publisher
1	Environmental Biology	Agarwal, K C	2001	Nidi Publication Ltd. Bikaner
2	The Biodiversity of India	Bharucha Erach		Mapin Publishing Pvt. Ltd., Ahmedabad – 380013
3	Environmental Encyclopedia	Cunningham W P Copper T H Gorhani E & Hepworth M T	2001	Jaico Publication House, Mumbai
4	Global Biodiversity Assessment	Heywood V H & Waston R T	1995	Cambridge University Press 1140p
5	Environmental Protection and Laws	Jadhav H & Bhosale V M	1995	Himalaya Publishing House, Delhi 284p
6	Environmental Science Systems & Solutions	Mckinney M L & School R M	1996	

THIRD SEMESTER

Scheme of Examination

Sl. No.	Theory	Subjects	Theory+Viva+IA	Grand Total
1	Paper 1	Concepts of renal disease & its management	60+20+20	100
2	Paper 2	Applied aspects of Pathology & Microbiology	60+20+20	100
3	Paper 3	Pathology – Practical	100	100
4	Paper 4	Microbiology – Practical	100	100
5	Paper 5	Sociology	100	100
6	Paper 6	Communication Skills	100	100

Scheme of Examination

Theory Examination (Total Marks 100)							
Topic	No of Questions	Questions to be answered	Number of Questions & Marks	Total Marks	Internal Assessment	Viva	Total Marks
Long Essay Questions	2	2	2x10	20	20	20	20
Long Essay Questions	5	5	5x5	25			
Short answers	5	5	5x3	15			

PRACTICAL ASSESMENT

Scheme of Practical Examination

Theory	Practical	IA	Grand Total
Practical paper	80	20	100

Semester III

PAPER I

Theory 30 Hours

Concepts of renal disease & its management

1. Acute renal failure
2. Nephrotic syndrome - primary & secondary
3. Nephritic syndrome
4. UTI - urinary tract infections
5. Asymptomatic urinary abnormalities
6. Chronic renal failure
7. Renal stone diseases
8. Obstructive uropathies
9. Tumors of kidney

Scheme of Examination

Type of Questions	Questions to be asked	Questions to be answered	Marks
Long Essay Questions	2	2	20
Short Essay Questions Topics not covered in long questions	5	5	25
Short Essay Questions Topics not covered in long questions	5	3	15
		Total Marks	60

Books

1. Primer in Kidney Disease by Scott Gilbert
2. Kidney Disease – Guide for Living by Walter A Hunt

Semester III

PAPER II

Theory 30 Hours

Applied aspects of Pathology & Microbiology

Pathology: 50 marks

1. Congenital abnormalities of urinary system
2. Classification of renal diseases
3. Glomerular diseases - causes, types & pathology
4. Tubulointerstitial diseases
5. End stage renal diseases - causes & pathology
6. Pathology of kidney in hypertension, diabetes mellitus, pregnancy
7. Pathology of peritoneum - peritonitis - bacterial, tubular & sclerosing peritonitis dialysis induced changes
8. Pathology of urianry tract infections
9. Pyelonephritis & tuberculous pyelonephritis

Microbiology: 50 marks

1. Hepatotrophic viruses in detail - mode of transfusion, universal precautions, vaccinations
2. Human immunodeficiency virus (hiv), mode of transfusion, universal precautions
3. Oppurtunistic infections
4. Microbiology of urinary tract infections
5. Microbiology of vascular access infection (femoral, jugula, subclavian catheters)
6. Sampling methodologies for culture & sensitivity

Scheme of Examination

Type of Questions	Questions to be asked	Questions to be answered	Marks
Long Essay Questions	2	2	20
Short Essay Questions Topics not covered in long questions	5	5	25
Short Essay Questions Topics not covered in long questions	5	3	15
		Total Marks	60

Semester III

PAPER III

Pathology – Practical

Total Marks - 100

I. Urine routine

1. Macroscopic 20 marks

   A) Physical and B) Chemical

2. Microscopic 20 marks

   24 hrs Urine Practice
   Hematuria
   Crystal
   RBC cast/WBC cast

II. Spotters 20 marks

1. Horseshoe shaped kidney
2. Double Ureter
3. Duplication of PCS
4. Pyelonephritis
5. PCKD
6. Renal Hypoplasia
7. Unilateral renal agenosis
8. Malrotation of kidney
9. Ureterocele

III. Specimens – Grossing 20 marks

IV. Internal Assessment 20 marks

Semester III

PAPER IV

Microbiology – Practical

Total Marks 100

I.	Spotters	20 marks
II.	Bacteriology	20 marks
III.	Virology Exercise	20 marks
IV.	Sample collection & Universal Precaution	20 marks
V.	Internal assessment	20 marks

Semester III

Paper V

Sociology Theory 30 Hours

Course Description

This course will introduce student to the basic sociology concepts, principles and social process, social institutions in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India will be studied.

Introduction:

Meaning - Definition and scope of sociology

Its relation to Anthropology, Psychology, Social Psychology

Methods of Sociological investigations - Case study, social survey, questionnaire, interview and opinion poll methods.

Importance of its study with special reference to health care professionals

Social Factors in Health and Disease:

Meaning of social factors

Role of social factors in health and disease

Socialization:

Meaning and nature of socialization

Primary, Secondary and Anticipatory socialization

Agencies of socialization

Social Groups:

Concepts of social groups influence of formal and informal groups on health and sickness. The role of primary groups and secondary groups in the hospital and rehabilitation setup.

Family:

The family, meaning and definitions

Functions of types of family

Changing family patterns

Influence of family on individual's health, family and nutrition, the effects of sickness in the family

and psychosomatic disease and their importance to physiotherapy

Community:

Rural community: Meaning and features - Health hazards to rural communities, health hazards to tribal community. Urban community - Meaning and features - Health hazards of urbanities

Culture and Health:

Concept of Health

Concept of culture

Culture and Health

Culture and Health Disorders

Social Change:

Meaning of social changes

Factors of social changes

Human adaptation and social change

Social change and stress

Social change and deviance

Social change and health programme

The role of social planning in the improvement of health and rehabilitation

Social Problems of disabled:

Consequences of the following social problems in relation to sickness and disability remedies to

prevent these problems

Population explosion

Poverty and unemployment

Beggary

Juvenile delinquency

Prostitution

Alcoholism

Problems of women in employment

Social Security:

Social Security and social legislation in relation to the disabled

Social Work:

Meaning of Social Work

The role of a Medical Social Worker

Semester III

PAPER VI

Communication Skills Theory 30 Hours

Unit-I :
Communication, its types and significance: Communication, Process of communication its kinds, channels and role in the society.
Methods of Communication (Oral, Written, One way, two way communication skills).
Reading skills: - Process of reading, reading purpose, models, strategies methodologies, reading activities, structure of meaning techniques.

Unit-II
Précis and Communication.
Writing skills :- Elements of effective writing, writing styles, scientific and technical writing.
Grammar: - Transformation of sentences, words used as different parts of speech, one word substitution, abbreviations, technical terms etc.

Unit-III
Listening skills: - Process of listening, barriers to listening, effective listening skills, feedback skills.
Speaking skills :- Speech mechanism, organs of speech, production and classification of speech sounds, phonetic transcription, skills of effective speaking components of an effective talk, oral presentation and the role of audio visual aids in it.
Reading of text book.

Unit-IV
Barriers of communication and technique to overcome those.
Meaning of effective communication.
Technical Report writing.
Practice of writing personal resume and writing application for employment.

Theory	: 80 Marks
IA	: 20 Marks

FOURTH SEMESTER

Scheme of Examination:

Sl. No.	Theory	Subjects	Theory+Viva+IA	Grand Total
1	Paper 1	Applied anatomy & physiology related to dialysis technology	60+20+20	100
2	Paper 2	Pharmacology related to dialysis technology	60+20+20	100
3	Paper 3	Basics in Renal Dialysis Technology	100	100
4	Paper 4	Law – Indian Constitution	100	100

Scheme of Examination:

Theory Examination (Total Marks 100)							
Topic	No of Questions	Questions to be answered	Number of Questions & Marks	Total Marks	Internal Assessment	Viva	Total Marks
Long Essay Questions	2	2	2x10	20	20	20	100
Long Essay Questions	5	5	5x5	25			
Short answers	5	3	5x3	15			

PRACTICAL ASSESMENT

Scheme of Practical Examination

Theory	Practical	IA	Grand Total
Practical paper	80	20	100

Semester IV
Paper I

Applied anatomy & physiology related to dialysis technology — Theory 30 Hrs

Applied Anatomy

1. Basic Anatomy Of Urinary System - Structural Anatomy Of Kidney, Bladder, Uretr, Urethra, Prostate
2. Histology Of Kidney
3. Blood Supply Of Kidney
4. Development Of Kidney In Brief
5. Anatomy Of Peritoneum Including Concept Of Abdominal Hernias
6. Anatomy Of Vasculat System
    - Upper Limb Vessels - Course, Distribution, Branches, Origin & Abnormalities
    - Neck Vessels - Course, Distribution, Branches, Origin & Abnormalities
    - Femoral Vessels - Course, Distribution, Branches, Origin & Abnormalities

Physiology

1. Mechanism Of Urine Formation
2. Glomurular Filtration Rate (gfr)
3. Clearance Studies
4. Physiological Values - Urea, Creatinine, Electrolytes, Calcium, Phosphorous, Uric Acid, Magnesium, Glucose 24 Hours Urinary Indices - Urea, Creatinine, Electrolytes, Calcium, Magnesium
5. Physiology Of Renal Circulation
    - Factors Contributing & Modifying Renal Circulation
    - Autoregulation
6. Hormones Produced By Kidney & Physiologic Alterations In Pregnancy
7. Haemostasis - Coagulation Cascade, Cogulation Factors, Auto Regulation, Bt, Ct, Pt, Ptt, Thrombin Time
8. Acid Base Balance - Basic Principles & Common Abnormalities Like Hypokalemia, Hyponatremia, Hyperkalemia, Hypernatremia, Hypocalcemia, Hypercalcemia, Ph, Etc.
9. Basic Nutrition In Renal Diseases

Scheme of Examination

Type of Questions	Questions to be asked	Questions to be answered	Marks
Long Essay Questions	2	2	20
Short Essay Questions Topics not covered in long questions	5	5	25
Short Essay Questions Topics not covered in long questions	5	3	15
		Total Marks	60

Semester IV

Paper II

Pharmacology related to dialysis technology — Theory 30 Hrs

1. IV fluid therapy with special emphasis in renal diseases
2. Diuretics - classification, actions, dosage, side effects & contraindications
3. Anti hypertensives - classification, actions, dosage, side effects & contraindications, special reference during dialysis , vasopressors, drugs used in hypotention
4. Drugs & dialysis - dose & duration of administrationc of drugs
5. Dialysable drugs - phenobarbitone, lithium, methanol etc.
6. Vitamin d & its analogues, phosphate binders, iron, folic acid & other vitamins of therapeutic value
7. Erythropoietin in detail
8. Heparin including low molecular weight heparin
9. Protamine sulphate
10. Formalin, sodium hypochlorite, hydrogen peroxide - role as disinfactants & adverse effects of residual particles applicable to formalin
11. Haemodialysis concentrates - composition & dilution (acetate & bicorbonates)
12. Peritoneal dialysis fluid in particular hypertonic solutions - composition
13. Potassium exchange resins with special emphasis on mode of administration

Scheme of Examination

Type of Questions	Questions to be asked	Questions to be answered	Marks
Long Essay Questions	2	2	20
Short Essay Questions Topics not covered in long questions	5	5	25
Short Essay Questions Topics not covered in long questions	5	3	15
		Total Marks	60

NO PRACTICAL EXAMINATION

Semester IV

Paper III

Basics in Renal Dialysis Technology Theory 30 Hrs

1. Indications of dialysis
2. Types of dialysis
3. Principles of dialysis - definition
4. Haemodialysis apparatus - types of dialyser & membrane
5. Types of vascular access for haemodialysis
6. Introduction to haemodialysis machine
7. Priming of dialysis apparatus
8. Dialyser reuse
9. Common complications of haemodialysis
10. Monitoring of patients during dialysis

Books

1. Handbook of Dialysis Therapy by Allen R. Nissension

Semester IV

Paper IV

Constitution of India Theory 30 Hrs

Unit-I: Meaning of the team 'Constitution' making of the Indian Constitution 1946-1940.

Unit-II: The democratic institutions created by the constitution Bicameral system of Legislature at the Centre and in the States.

Unit-III: Fundamental Rights and Duties their content and significance.

Unit - IV: Directive Principles of States Policies the need to balance Fundamental Rights with Directive Principles.

Unit - V: Special Rights created in the Constitution for: Dalits, Backwards, Women and Children and the Religious and Linguistic Minorities.

Unit-VI: Doctrine of Separation of Powers legislative, Executive and Judicial and their functioning in India.

Unit - VII: The Election Commission and State Public Service commissions.

Unit - VIII: Method of amending the Constitution.

Unit - IX: Enforcing rights through Writs:

Unit - X: Constitution and Sustainable Development in India.

Books:

1. J.C. Johari: The Constitution of India- A Politico-Legal Study-Sterling Publication, Pvt. Ltd. New Delhi.

2. J.N. Pandey: Constitution Law of India, Allahbad, Central Law Agency, 1998.

3. Granville Austin: The Indian Constitution - Corner Stone of a Nation-Oxford, New Delhi, 2000.

FIFTH SEMESTER

Scheme of Examination

S NO	THEORY	SUBJECTS	THEORY+IA+VIVA	GRAND TOTAL
1	PAPER 1	BASICS OF NEPHROLOGY	60+20+20	100
2	PAPER2	APPLIED DIALYSIS TECHNOLOGY 1	60+20+20	100
3	PAPER 3	APPLIED DIALYSIS TECHNOLOGY 2	60+20+20	100
4	PAPER 4	APPLIED DIALYSIS TECHNOLOGY 3	60+20+20	100
5	PAPER 5	FUNDMENTALS OF COMPUTERS	60+20+20	100

Type of questions and distribution of marks for Theory examination in each subject in Fifth Semester.

Sl. No.	Question	Question Asked	Question to Attempt	Marks	Max. Marks	Internal Assessment	Viva	Total Marks
1	Long Essay Question	2	1	2x10	20	20	20	100
2	Short Essay Question	5	5	5x5	25			
3	Short Answers	5	5	5x3	15			

PRACTICAL ASSESMENT

Sr NO	THEORY	PRACTICAL	IA	GRAND TOTAL
1	PRACTICAL PAPER	160	40	200

Semester V

PAPER 1

BASICS OF NEPHROLOGY Theory 30 hours

1. Pregnancy and renal diseases
   - Pregnancy with Preexisting Kidney Diseases
   - Renal Physiology in Normal Pregnancy
   - Renal Complications in Normal Pregnancy
1. Renal vascular disorders & hypertension associated renal diseases
   - Nonpharmacologic Prevention and Treatment of Hypertension
   - Pharmacologic Treatment of Hypertension
2. Hereditary and Congenital Diseases of the Kidney
   - Autosomal Dominant Polycystic Kidney Disease
   - Other Cystic Kidney Diseases
3. Diabetic nephropathy
4. Renal Disease in Cancer Patients

Scheme of Examination

Type of questions	No of questions	Questions to be answered	Number of questions	Total marks
Long Essay	2	2	2×10	20
Short Essay	5	5	5×5	25
Short answers	5	3	3×5	15
			Total marks	60

PAPER 2

APPLIED DIALYSIS TECHNOLOGY 1 Theory 30 Hours

1. Indications of dialysis
2. History & types of dialysis
3. Theory of haemodialysis - diffusion, osmosis, ultrafilteration & solvent drag
4. Haemodialysis appratus - types of dialyser & membrane, dialysate
5. Physiology of peritoneal dialysis
6. Vascular access for haemodialysis & associated complications
7. Peritoneal access devices - types of catheter, insertion techniques & associated complications
8. Dialysis machines - mechanism of functioning & management
    - Haemodialysis machine
    - Peritoneal dialysis machine
9. Complications of dialysis
    - Haemodialysis - acute & long term complications
    - Peritoneal dialysis - mechanical & metabolic complications
10. Biochemical investigations required for renal dialyss
11. Adequacy of dialysis
    - Haemodialysis
    - Peritoneal dialysis
    - Peritoneal equilibriation test (pet)
12. Anti coagulation
13. Peritonitis & exit site infection
14. Withdrawal of dialysis criteria
    - Acute dialysis
    - Chronic dialysis

Scheme of Examination

Type of questions	No of questions	Questions to be answered	Number of questions	Total marks
Long Essay	2	2	2×10	20
Short Essay	5	5	5×5	25
Short answers	5	3	3×5	15
			Total marks	60

PAPER 3

APPLIED DIALYSIS TECHNOLOGY 2 Theory 75 Hours

1. Dialysis in special situations
   - Patients with congestive cardiac failure
   - Advanced liver disease
   - Patients positive for HIV, HBsAg& HCV
   - Failed transplant
   - Poisoning cases
   - Pregnancy
   -
2. Dialysis in infants & children

3. Dialyser reuse

4. Special dialysis procedures

   - Continuous therapies in haemodialysis
   - Different modalities of peritoneal dialysis
   - Haemodiafiltration
   - Haemoperfusion
   - Sled
   - Mars

Scheme of Examination

Type of questions	No of questions	Questions to be answered	Number of questions	Total marks
Long Essay	2	2	2×10	20
Short Essay	5	5	5×5	25
Short answers	5	3	3×5	15
			Total marks	60

PAPER 4

APPLIED DIALYSIS TECHNOLOGY 3 Theory 75 Hours

1. Plasmapheresis

2. Special problems in dialysis patients
    - Psychology & rehabilitation
    - Diabetes
    - Hypertension
    - Infections
    - Bone diseases
    - Aluminium toxicity

3. Recent advances in haemodialysis
    - Nocturnal dialysis
    - Online dialysis
    - Daily dialysis

4. Telemedicine in dialysis practice

5. Water treatment system

6. Renal anaemia management
    - Chronic dialysis

Scheme of Examination

Type of questions	No of questions	Questions to be answered	Number of questions	Total marks
Long Essay	2	2	2×10	20
Short Essay	5	5	5×5	25
Short answers	5	3	3×5	15
			Total marks	60

Practical 50 Hours

1. Setting up dialysis machine for dialysis
2. AV cannulation
3. AV fistula/ AV graft cannulation
4. Initiation of dialysis through central venous catheters like internal jugular, femoral & subclavian vein
5. Packing & sterilisation of dialysis trays
6. Closing of dialysis
7. Preparation of concentrates depending on the situations
8. Reuse of dialysis apparatus
9. Isolated ultrafiltration
10. Performance of peritoneal dialysis exchange manually
11. Setting up of automated peritoneal dialysis equipment
12. First assistant in minor procedures
13. Skin suturing
14. CPR demonstrations

Practical examinations

Four papers	40×4= 160
IA	40
Total	200 marks

PAPER 5

Fundamentals of Computers Theory 45 Hours

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices),output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views formatting and enhancing text, slide with graphs.

Introduction of Operating System: introduction, operating system concepts, types of operating system.

Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree hybrid), components of network.

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW), www browsers, use of the internet.

Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

Introduction to installation of different software and introduction about different software related to MLS.

Practicals : Learning to use MS Office: MS WORD, MS EXCEL & MS PowerPoint
Practical Examination : 80 Marks
IA : 20 Marks

SIXTH SEMESTER

Scheme of Examination

Sl. No.	Theory	Subjects	Theory Max. + IA	Grand Total
1	Paper 1	Professional training (Six Months)	180 + 20	200
2	Paper 2 Practicals	Internal assessment + Project/Practical file (Log Book) + Practical (Performance) + viva	100 + 150 + 100 + 50	400
3	Paper 3	Human Values and Professional Ethics	80 + 20	100

Paper 2

Internal assessment + Project/Practical file + Practical (Performance) + viva

- Internal Assessment
    1. Work behavior
    2. Clinical work (compulsory for all students)

- Project/Practical file

Every candidate shall maintain a work dairy and record. His/her participation in the training programmes conducted by the department such as journal reviews, seminars etc. special mention may be made of the presentation by the candidate as well as details of procedures. The work diary shall be scrutinized and certified by the Head of the department and presented in the university practical/clinical examination.

- Practical Performance
- Performing Haemodialysis
- Performing SLED
- Performing CRRT
- Performing PD

Guest Lecture/ Tutorial/ Seminar/visit to any medical research institution or reputed clinical laboratory (Compulsory). For evaluation of Professional Training, out of 200 marks, 100 will be awarded by the Department where the candidate has taken training. The Candidate has to submit his/her project report (Log Book and Small Project on Instrument) before end of sixth semester.Then at the end of the semester he/she will appear for the Practical examinations in the presence of Internal & external Examiners. Out of rest 400 marks 150 will be for Project/ Practical file and 100 for Practical and 50 for Viva voce (by external examiner)

The Practicals learned in all five semester will be part of final practical exam at the end of sixth semester

Paper 3

Human Values and Professional Ethics Theory 45 Hours

Unit-I

1. Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Understanding the need, basic guidelines, content and process for Value Education.
- Self Exploration–what is it?- its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit-II

2. Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - Sukhand Suvidha
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyamand Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyamand Swasthya(6 Hrs)

Unit-III

3. Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

- Understanding harmony in the Family- the basic unit of human interaction
- Understanding values in human-human relationship; meaning of Nyayaand program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
- Understanding the meaning of Vishwas; Difference between intention and competence
- Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj),
- Universal Order (Sarvabhaum Vyawastha)- from family to world family! (6 Hrs.)

Unit-IV

4. Understanding Harmony in the Nature and Existence - Whole existence as Co- existence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
- Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
- Holistic perception of harmony at all levels of existence (4 Hrs)

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics:
- Ability to utilize the professional competence for augmenting universal human order
- Ability to identify the scope and characteristics of people-friendly and eco- friendly production systems
- Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
- At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- At the level of society: as mutually enriching institutions and organizations (6 Hrs.)

Text Book:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.

Other Suggested Readings / Books:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.

3. A Nagraj, 1998, JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.

4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.

6. A.N. Tripathy, 2003, Human Values, New Age International Publishers

7. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.

8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.

9. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press

10. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd

11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

12. B L Bajpai, 2004, Indian Ethos and Modern Management, New

Internal Assessment

Internal Assessment will be undertaken for theory and practical periodically as per the semester system and the average marks of the tests will be calculated and reduced to 20 or 10 as applicable and the marks are to be communicated to the university.

Declaration of result

Criteria for pass

a. Main subject: A Candidate is declared to have passed the examination in a subject, if he/she secures 40% of the total marks in Theory and Practical separately.

b. Elective Subjects: The minimum marks for a pass in a elective subject shall be 35% of the maximum marks prescribed for a subject and the marks shall be communicated to the University before the commencement of the Practical examination.

c. In case a candidate fails in either theory or practical, he/she has to appear for both theory and Practical in the subject in any subsequent examination and he/she must obtain the minimum for a pass in the subject (theory and practical separately)

d. A candidate shall be declared to have passed the examination if he/she passes in all the main subjects.

Carry over System:

At any given point of time a candidate shall have subjects pending to clear of only previous semester in addition to the subjects of the current semester that he/she is appearing for.

Example:-

• If the candidate has not cleared semester I, he/she can appear for semester II and pending subjects of semester I simultaneously.

• For appearing for semester III he/she should have cleared semester I and can appear for papers pending from semester II along with semester III subjects.

• For appearing for semester IV he/she should have cleared semester II and can appear for papers pending from semester III along with semester IV subjects.

• For appearing for semester V he /she should have cleared semester III and can appear for papers pending from semester IV along with semester V subjects.

• For appearing for semester VI he/she should have cleared semester IV and can appear for papers pending from semester V along with semester VI subjects.

Examiners:

There should be minimum two examiners, one internal from the same university and one external Examiner for the First year subjects and for Pharmacology in the second year shall have Postgraduate degree in the respective subject with 3 years teaching experience of M.Sc. (Medical) with 5 years teaching experience.