

PONDICHERRY UNIVERSITY

Puducherry



Regulations and Syllabus

Bachelor of Science (Dialysis Technology)

B.Sc. (DT)

2022-2023

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Bachelor of Science in Dialysis Technology

I. Aim:

The aim of the undergraduate Dialysis Technology Program is to generate competent Dialysis Technologist who are completely efficient in making a significant impact in the life of someone suffering from renal failure.

II. Objectives:

On completion of Bachelor of Science in Dialysis Technology Program the graduates will be able to:

- learn about the common diseases causing kidney failure and the clinical manifestations.
- learn about the commonly used investigations for patients with kidney diseases.
- acquire theoretical knowledge on various forms of dialysis.
- gain knowledge on equipment used for dialysis.
- identify the temporary and permanent Arterio-Venous access (AVF/AVG) and complications of cannulation techniques and management.
- gain knowledge on indications, contraindications and complications of the procedures.
- perform hemodialysis, peritoneal dialysis, continuous renal replacement therapies and plasmapheresis.
- manage the circuits alarms, RO water preparation and distribution, dialyzer membrane and tubing, dialysate preparations.
- communicate effectively with patients and their relatives.
- maintain good relationship with professional colleagues.

III. Program Outcome:

- At the end of the program the graduates are able to perform hemodialysis, continuous renal replacement therapies and plasmapheresis, handle equipment, machines used for dialysis and water treatment plant and function as a dialysis technician to provide comprehensive care to the patients undergoing dialysis at various health care settings.

IV. Regulations

1. Eligibility for Admission

- The admission is based on the CENTAC process. The reservation and other process in as per the Govt norms from time to time. Candidates should have completed a minimum of 17 years of age as on 31st December of the year of admission. The upper age limit is 25 years. (Relaxation up to 5 years for SC/ST candidate and up to 3 years for MBC/OBC candidates.)
- Candidates should have a pass in the Higher Secondary Examination conducted by Board of Higher Secondary Examination of Tamil Nadu, or any other equivalent examination accepted by the University, there to with a minimum of 50% marks (40% for SC, ST, MBC, OBC the candidates) in aggregate of the Science subjects (Physics, Chemistry, Biology/ Botany & Zoology) and should have English as one of the subjects.
- Candidate shall be medically fit to undergo the Dialysis Technology program.
- **For Lateral entry:** Diploma in Dialysis Technology courses approved by the Government after completing 12th Class / 10 +2 of CBSE or equivalent with minimum aggregate of 50% marks in Physics, Chemistry and Biology provided the candidate has passed in each subject separately. The age limit is 35 years. The Government service candidates will be exempted if approved by the committee or the Government.
- **Provision of lateral entry:** lateral entry to second year for B.Sc Dialysis Technology program for candidates who have passed diploma program in Dialysis Technology from the Government Boards and recognized by State / Central University, full filling the conditions specified and these students are eligible to take admission on lateral entry system only if the same subject have been studies at 10+2 scheme and diploma level. The admission process is as per the Government rule and regulations from time to time. Students to be admitted under lateral entry shall be 10% over and above the sanctioned intake.
- The lateral entry candidates have the direct entry into the second year (i.e from III semester) are exempted from the I year (Semester I and II) curriculum. For the grant of the university degree the lateral entry candidate have to complete the semester III to semester VI, and the internship compulsory and mandatory.

2. Duration of the Program

- The duration of the program shall be **Three years / Lateral entry two years** of full-time study and **One year** of compulsory rotatory internship.

3. Medium of Instruction

- English shall be the medium of instruction for all the subjects of study and for the examinations of the program.

4. Program detail

- The program structure is shown in Table I.
- *The detailed syllabus in respect of the program is appended to this regulation.*

5. Attendance required for appearing examination

- Examination will be conducted in both theory and practical, as prescribed.
- Candidate will be permitted to appear for the University Examination in the subject only if they secure not less than 80% attendance (irrespective of the kind of absence) in each subject of that semester.
- Condonation of shortage of attendance in aggregate upto 10% in each semester may be granted by the College Academic Committee and as per regulations of University. For Students internship offered during VII and VIII semesters, 100% attendance is compulsory. However, the students may be condoned upto 15%, under extraordinary situation, by the Dean based on the genuineness of the case upon the recommendation of the concern program teaching and Head of the Department.
- The students failing to attend classes/examinations on non-official ground will be treated as absent. Student deputed for Sports, Cultural Meets, etc with prior permission of Principal / Dean of the College shall be given attendance for the period of absent.

6. Internal Assessment

- Internal assessment will be done in each subject of study and the marks will be awarded to the candidates as detailed in the scheme of examinations.
- The marks awarded will be on the basis of candidate's performance in the assignments, class tests, laboratory work, preparation and presentation of seminars and clinical cases.
- The marks secured by the candidate during each semester in each subject shall be forwarded to the University at the end of the semester, i.e., before the commencement of the written examination.

7. Examinations

- The University Examinations will be conducted in semester pattern for all the three years, each year consisting of two semesters.
- The particulars of subjects for various examinations and distribution of marks are shown separately in the Table II & III.
- The examination for the main subjects will be conducted by the University and for the non-examination subjects by the college.
- The maximum number of candidates for practical examination should not exceed 20 per day.
- One internal and one external examiner should jointly conduct practical examination for each student.
- An examiner should not be below the rank of an Assistant Professor or Tutor/Demonstrator.

8. Passing minimum

- Candidate has to pass separately in theory + Viva voce and Practical by getting a minimum of 50% marks in combined internal assessment and University examination. A candidate should secure 50% of the marks in theory and 50% in practical (wherever prescribed)

- If a candidate fails in either theory or practical, he/she has to re-appear for both theory and practical.
- A candidate should secure 50% of total marks in the test conducted by the college for the non-examination subject.

9. Procedure for passing the program

- The maximum period to complete the program successfully should not exceed a period of eight years.

10. Internship

- There shall be a compulsory full-time rotatory internship after the candidate having passed all the subjects prescribed in the scheme of examination.
- The internship should be done for a period of one year, in an Institution/ Hospital approved.
- No candidate shall be eligible for the award of the degree without successfully completing one-year internship.

Desirable:

- A Research study to be done and submit the report before the one year of Internship.
- One or more value added courses (like Swayam) during final year or Internship.

11. Eligibility for award of degree

The candidates shall be eligible for the *Degree of Bachelor of Dialysis Technology / lateral entry* when they have undergone the prescribed program of study for a *period of three years / two years* (for lateral entry) in an institution approved by the University and *have passed the prescribed examinations in all subjects* and *have completed a compulsory internship over a period of one year* in an approved institution.

12. Declaration of class

- A successful candidate obtaining **75% and more marks** in the grand total aggregate in the *First attempt* shall be declared to have passed these subjects with **Distinction**.
- A successful candidate obtaining **60% and more but less than 74.9% marks** in the grand total aggregate in the *First attempt* shall be declared to have passed with **First Class**.
- A successful candidate obtaining **50% and more but less than 59.9% marks** in the grand total aggregate in the *First attempt* and the candidate who *passed with more than one attempt* irrespective of the percentage of marks secured shall be declared to have passed these subjects with **Second Class**.
- Ranks shall be declared on the basis of the aggregate marks obtained by a candidate in the University examination subjects of the program.
- Only those candidates who *have passed all the subjects in all examinations in the First attempt* shall be eligible for the **Award of rank**.

V. Program Structure – Dialysis Technology

Table I

Year	Sem	S.No	Subject	Theory Hrs	Practical Hrs	Clinical Hrs	Total Hrs
I Year	I Sem	1.	Anatomy	60	30		90
		2.	Physiology	60	30		90
		3.	Biochemistry	60	30		90
		C 1	Communication and soft skills	60			60
			Library/Co-curricular	30			30
			Clinical Hours			140	140
			Total Hours	270	90	140	500
	II Sem	4.	Pathology	60	30		90
		5.	Microbiology	60	30		90
		C 2	Computer Application	30	30		60
		C 3	First Aid	30	30		60
			Library/Co-curricular	30			30
			Clinical Hours			270	270
			Total Hours	210	120	270	600
			I Year Overall Total	480	210	410	1100
II Year	III Sem	6.	Basic Concepts of Renal Diseases	60		300	360
		7.	Applied Pathology	60	30		90
		8.	Applied Microbiology	60	30		90
		C 4	Sociology	30			30
			Library/Co-curricular	30			30
			Total Hours	240	90	300	600
	IV Sem	9.	Pharmacology	60	30		90
		10.	Basics of Renal Dialysis Technology	60	30	330	420
		C 5	Biomedical Waste Management	30			30
		C 6	Environmental Science	30			30
			Library/Co-curricular	30			30
			Total Hours	210	60	330	600
			II Year Overall Total	450	120	630	1200
III year	V Sem	11	Applied Dialysis Technology - I	60		240	300
		12	Advance Dialysis Technology - I	60		180	240
		C 7	Medical Ethics	30			30
			Library/Co-curricular	30			30
			Total Hours	180		420	600
	VI Sem	13.	Applied Dialysis Technology - II	60		180	240
		14.	Advance Dialysis Technology - II	60		240	300
		C 8	Biostatistics and Research methodology	30			30
			Library/Co-curricular	30			30
			Total Hours	180		420	600
			III Year Overall Total	360		840	1200
IV year			Internship				1 year

Note: C 1 to C 8 -Subsidiary Subjects

Internship Details (1 year)

S.No	Clinical Area	In Months
1.	Hemodialysis Unit	2 Months
2.	Peritoneal Dialysis Unit	2 Months
3.	Renal Transplantation Unit	2 Months
4.	Operation Theatre	2 Months
5.	Urology Ward	2 Months
6.	Intensive Medical Care Unit	2 Months
	Total	12 Months

VI. Scheme of Examination with mark details

Table II

Duration: 3 Hours

Sem	S.No	Subject	University marks		Internal Marks		Viva		Total		Total Theory + Practical	
		Theory	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
I Sem	1.1.1	Anatomy	80	32	25		20	10	125	63	200	100
	1.1.2	Anatomy - Practical	50	25	25				75	37		
	1.1.3	Physiology	80	32	25		20	10	125	63	200	100
	1.1.4	Physiology - Practical	50	25	25				75	37		
	1.1.5	Biochemistry	75	30	25				100	50	100	50
	1.1.6*	Communication and soft skills			50	25			50	25	50	25
II Sem	1.2.1	Pathology	75	30	25				100	50	100	50
	1.2.2	Microbiology	75	30	25				100	50	100	50
	1.2.3*	Computer Application			50	25			50	25	50	25
	1.2.4*	First Aid			50	25			50	25	50	25
III sem	2.3.1	Basic Concepts of Renal Diseases	75	30	25				100	50	100	50
	2.3.2	Applied Pathology	80	32	25		20	10	125	63	200	100
	2.3.3	Applied Pathology - Practical	50	25	25				75	37		
	2.3.4	Applied Microbiology	80	32	25		20	10	125	63	200	100
	2.3.5	Applied Microbiology - Practical	50	25	25				75	37		
	2.3.6*	Sociology			50	25			50	25	50	25
IV sem	2.4.1	Pharmacology	75	30	25				100	50	100	50
	2.4.2	Basics of Renal Dialysis Technology	80	32	25		20	10	125	63	200	100
	2.4.3	Basics of Renal Dialysis Technology - Practical	50	25	25				75	37		
	2.4.4*	Biomedical Waste Management			50	25			50	25	50	25
	2.4.5*	Environmental Sciences			50	25			50	25	50	25
V sem	3.5.1	Applied Dialysis Technology - I	80	32	25		20	10	125	63	200	100
	3.5.2	Applied Dialysis Technology I- Practical	50	25	25				75	37		
	3.5.3	Advance Dialysis Technology - I	75	30	25				100	50	100	50
	3.5.4*	Medical Ethics			50	25			50	25	50	25
VI sem	3.6.1	Applied Dialysis Technology - II	75	30	25				100	50	100	50
	3.6.2	Advance Dialysis Technology - II	80	32	25		20	10	125	63	200	100
	3.6.3	Advance Dialysis Technology – II Practical	50	25	25				75	37		
	3.6.4*	Biostatistics & Research Methodology			50	25			50	25	50	25

*Subsidiary Subjects only Internal Exam

VII. Course Description

1. Anatomy

Placement: I Year (I Semester)

Time: Theory: 60 Hours

Practical: 30 Hours (Lab)

Course Description: The course is designed to assist students to acquire comprehensive knowledge of the normal structure of human body, to facilitate understanding of anatomical basic health, identify alteration in structure with emphasis on clinical application to practice.

Course Outline

Unit	Time (Hrs)	Content
I	15	Introduction to anatomy terms and organizations of the human body <ul style="list-style-type: none"> • Introduction to Anatomical terms relative to position - anterior, ventral, posterior dorsal, superior, inferior, median, lateral, proximal distal superficial, deep, prone, supine, palmar and planter • Anatomical planes (axial/ transverse /horizontal, sagittal /vertical plane and coronal/ frontal/ oblique plain) • Movement (flexion, extension, abduction, adduction, medial, rotation lateral rotation, inversion, eversion, supination, pronation, plantar flexion, dorsi flexion and circumduction) • Cell structure, cell division • Tissues – Definition, types, characteristic, classification, location • Membranes and glands -classification and structures • Identify major surface and body landmarks in each body region organization of human body • Hyaline, fibro cartilages elastic cartilages • Features of skeletal, smooth and Cardiac muscles
II	4	The Respiratory system <ul style="list-style-type: none"> • Structures of organ of Respiration • Muscles of Respiratory System
III	4	The Digestive system <ul style="list-style-type: none"> • Structures of alimentary canal and organs of digestion
IV	5	The Circulatory and Lymphatic system <ul style="list-style-type: none"> • Structures of blood components, anterior and venous system • Position of heart related to Associated structures • Chambers of heart, layers of heart • Nerve supply to and blood supply to heart • Veins used for IV injections • Lymphatic tissues
V	3	The Endocrine System <ul style="list-style-type: none"> • Structures of hypothalamus, Pineal gland, Pituitary gland, Thyroid Parathyroid, Thymus, Pancreas and Adrenal gland.

Unit	Time (Hrs)	Content
VI	3	The Sensory organ <ul style="list-style-type: none"> Structures of skin, eyes, ears, nose and tongue.
VII	5	The Musculo Skeletal System Muscular Systems <ul style="list-style-type: none"> Types and structures of muscles Muscle groups - Muscles of head, neck, thorax, abdominal, pelvis upper and lower Limb Principles of Muscles – deltoid, biceps, triceps, respiratory, abdominal, pelvic floor muscles gluteal muscle and vastus laterals Major muscles involved in procedure Skeletal System <ul style="list-style-type: none"> Anatomical position Bones - type, structures, growth and ossification Axial and appendicular skeleton Joints – Classification, major joints and structures
VIII	4	The Nervous Systems <ul style="list-style-type: none"> Review and structures of neurons Central Nervous system, Autonomic Nervous system, and Peripheral Nervous system Structures of brain, spinal cord, cranial nerve, spinal nerves, functional areas of cerebral cortex Ventricles of the brain- formation, circulation and drainage
IX	8	The Renal System <ul style="list-style-type: none"> Structures of Kidney, Ureters, bladder, urethra
X	7	The Reproductive System <ul style="list-style-type: none"> Structures of Male Reproductive Organs Structures of Female Reproductive Organs Structures of Breast
XI	2	Anatomical Techniques Basic principles of Karyotyping

Practical's:

- Histology of Types of Epithelium
- Histology of Serous, Mucous and Mixed Salivary gland
- Histology of the types of Cartilage
- Demo of all bones showing parts, radiographs of normal bones & Joints
- Histology of Skeletal (TS & LS), Smooth and Cardiac muscle
- Demonstration of Heart and Vessels of the body
- Histology of Large artery, Medium sized artery and vein, Large Vein
- Microscopic appearance of Large and Medium sized Artery and Vein, Large Vein
- Demonstration of all muscles of the body

- Pericardium
- Histology of Lymph node, Spleen, Tonsil and Thymus
- Demonstration of parts of Respiratory system
- Normal Chest radiograph showing Heart shadows
- Histology of Lung and Trachea
- Normal Angiograms
- Histology of Lymphatic tissues
- Radiographs of Abdomen – IVP, Retrograde cystogram
- Demonstration of parts of the Urinary system and Histology of Kidney, Ureter and Urinary bladder
- Demonstration of Male and Female Pelvis with organs in situ.
- Histology of Male and Female Reproductive organs
- Histology of Pituitary, Thyroid, parathyroid and Suprarenal glands
- Histology of peripheral nerve and optic nerve.
- Demo of all parts of brain.

Reference Books:

1. Inderbir Singh, Textbook of Anatomy, Jaypee, 7th Edi, Vol I to III, 2019
2. Chaurasia, Human Anatomy, CBS Publisher, 5th Edi, Vol 1 to 3, 2010.
3. Ross and Wilson Anatomy and Physiology in Health and illness, Elsever, 13th Edi, 2018.

Examination Pattern (Subject with Theory & Practical Exam)		Duration
Theory exam:	80 marks	3 hours
Practical exam	50 marks	3 hours
Oral exam	20 marks	
Internal assessment (Theory)	25 marks	
Internal assessment (Practical)	25 marks	

	200 marks	

The practical examination will have the following components

Identification of Gross Spotters (General)	20 marks
Identification of Gross Spotters (urinary tract)	15 marks
Identification of Histological slides (urinary tract)	15 marks

	50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Distribution of Course Content	80 Marks
1. General Anatomy	
2. Anatomy of Urogenital tract	
3. Systemic Anatomy	

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

2. Physiology

Placement: I Year (I Semester)

Time: Theory: 60 Hours
Practical: 30 Hours (Lab)

Course Description: The course is designed to assist students to acquire comprehensive knowledge of the normal functions of the organ systems of the human body to facilitate understanding of physiological basis of health, identify alteration in functions and provide the student with necessary physiological knowledge to practice.

Course Outline

Unit	Time (Hrs)	Content
I	4	General Physiology – Basic concepts <ul style="list-style-type: none">• Cell physiology including transportation across cell membrane• Body fluid compartments, Distribution of total body fluid, intracellular and extracellular compartments, major electrolytes and maintenance of homeostasis• Cell cycle• Tissue – formation, repair• Membranes and glands – functions
II	6	Respiratory system <ul style="list-style-type: none">• Functions of respiratory organs• Physiology of respiration• Pulmonary circulation – functional features• Pulmonary ventilation, exchange of gases• Carriage of oxygen and carbon-dioxide,• Exchange of gases in tissue• Regulation of respiration• Hypoxia, cyanosis, dyspnea, periodic breathing• Respiratory changes during exercise
III	8	Digestive system <ul style="list-style-type: none">• Functions of the organs of digestive tract• Saliva – composition, regulation of secretion and functions of saliva• Composition and functions of gastric juice, mechanism and regulation of gastric secretion• Composition of pancreatic juice, functions, regulation of pancreatic secretion• Functions of liver, gall bladder and pancreas• Composition of bile and functions• Secretion and functions of small and large intestine• Movements of alimentary tract• Digestion in mouth, stomach, small intestine, large intestine, absorption of food

Unit	Time (Hrs)	Content
IV	6	Circulatory and Lymphatic system <ul style="list-style-type: none"> • Functions of heart, conduction system, cardiac cycle, Stroke volume and cardiac output • Blood pressure and Pulse • Circulation – principles, factors influencing blood pressure, pulse • Coronary circulation, Pulmonary and systemic circulation • Heart rate – regulation of heart rate • Normal value and variations • Cardiovascular homeostasis in exercise and posture
V	5	Blood <ul style="list-style-type: none"> • Blood – Functions, Physical characteristics • Formation of blood cells • Erythropoiesis – Functions of RBC, RBC life cycle • WBC – types, functions • Platelets – Functions and production of platelets • Clotting mechanism of blood, clotting time, bleeding time, PTT • Homeostasis – role of vasoconstriction, platelet plug formation in hemostasis, coagulation factors, intrinsic and extrinsic pathways of coagulation • Blood groups and types • Functions of reticuloendothelial system, immunity
VI	5	The Endocrine system <ul style="list-style-type: none"> • Functions and hormones of Pineal Gland, Pituitary gland, Thyroid, Parathyroid, Thymus, Pancreas and Adrenal glands. • Other hormones • Endocrine Alterations in diseases
VII	4	The Sensory Organs <ul style="list-style-type: none"> • Functions of skin • Vision, hearing, taste and smell • Errors of refraction, aging changes
VIII	6	Musculoskeletal system <ul style="list-style-type: none"> • Bones – Functions, movements of bones of axial and appendicular skeleton, Bone healing • Joints and joint movements • Joint diseases • Properties and Functions of skeletal muscles – mechanism of muscle contraction • Structure and properties of cardiac muscles and smooth muscles
IX	4	Renal system <ul style="list-style-type: none"> • Functions of kidney in maintaining homeostasis • GFR • Functions of ureters, bladder and urethra • Micturition • Regulation of renal functions

Unit	Time (Hrs)	Content
X	4	The Reproductive system <ul style="list-style-type: none"> Female reproductive system – Menstrual cycle, function and hormones of ovary, oogenesis, fertilization, implantation, Functions of breast Male reproductive system – Spermatogenesis, hormones and its functions, semen
XI	8	Nervous system <ul style="list-style-type: none"> Overview of nervous system Review of types, structure and functions of neurons Nerve impulse Review functions of Brain-Medulla, Pons, Cerebrum, Cerebellum Sensory and Motor Nervous system Peripheral Nervous system Autonomic Nervous system Limbic system and higher mental Functions - Hippocampus, Thalamus, Hypothalamus Vestibular apparatus Functions of cranial nerves Autonomic functions Physiology of Pain-somatic, visceral and referred Reflexes CSF formation, composition, circulation of CSF, blood brain barrier and blood CSF barrier

Practical's :

- Hemoglobinometry
- White Blood Cell Count
- Red Blood Cell Count
- Determination of Blood Groups
- Leishman's Staining and Differential WBC Count
- Determination of Packed Cell Volume
- Erythrocyte Sedimentation Rate (ESR)
- Determination of Clotting Time, Bleeding Time
- Recording of Blood pressure
- Auscultation for Heart sounds
- Artificial Respiration
- Determination of Vital capacity.

Reference Books :

1. Sembulingam (K), Essentials of Medical Physiology, Jaypee, 8th Edi, 2019.
2. Guyton & Hall, Textbook of Medical Physiology, Elsevier, 2nd Edi, 2018.
3. Pal (GK), Comprehensive Textbook of Medical Physiology, Jaypee, 2nd Edi, Vol I & II, 2019.
4. Surinder Singh, Principles of Human Physiology for Course in Nursing & Allied Health Sciences, CBS, 2017.
5. Ross and Wilson Anatomy and Physiology in Health and illness, Elsevier, 13th Edi, 2018.

Examination Pattern (Subject with Theory & Practical Exam)**Duration**

Theory exam: (one paper)	80 marks
Practical exam	50 marks
Oral exam	20 marks
Internal assessment (Theory)	25 marks
Internal assessment (Practical)	25 marks

	200 marks

3 hours
3 hours

The practical examination will have the following components

Practical Major	20 marks
Practical Minor	10 marks
Spotters	20 marks

	50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Distribution of Course Content

Musculo Skeletal, Blood, Renal, GI tract, Endocrines and Reproductive system.

Cardio vascular system, Respiratory System, Nervous System and Special Senses

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

3. Biochemistry

Placement: I Year (I Semester)

Time: Theory: 60 Hours
Practical: 30 Hours (Lab)

Course Description: The course is designed to assist the students to acquire knowledge of the normal biochemical composition and functioning of human body, its alterations in disease conditions and to apply this knowledge in to practice.

Course Outline

Unit	Time (Hrs)	Content
I	3	Introduction to Biochemistry
II	3	Biophysical aspect of Biochemistry
III	7	Carbohydrates <ul style="list-style-type: none"> Chemistry of carbohydrates, Classification and biological importance Digestion and absorption, Glycolysis, glycogen metabolism, glucono-genesis, TCA cycle Regulation of blood glucose, Diabetes mellitus
IV	7	Proteins <ul style="list-style-type: none"> Biological importance, Classification of amino acids & proteins Digestion and absorption Urea synthesis, Transamination
V	7	Lipids <ul style="list-style-type: none"> Biological importance Classification of lipids, lipoproteins, Overview of lipid metabolism
VI	6	Enzymes <ul style="list-style-type: none"> Classification, Factors affecting enzyme action Enzyme inhibition & Chemical enzymology
VII	7	Endocrinology <ul style="list-style-type: none"> Hormones, Role of biological important hormones Pituitary, thyroid, adrenal cortex and medulla Sex hormones
VIII	7	Mineral metabolism <ul style="list-style-type: none"> Regulation of blood level Consequences of excess and deficiency of calcium, Phosphate, iron, copper & zinc
IX	7	Vitamin <ul style="list-style-type: none"> Fat soluble vitamins, Water soluble vitamins Biochemical function, Deficiency, Manifestation, Source & RDA
X	6	Clinical Biochemistry <ul style="list-style-type: none"> LFT, RFT Urine analysis

Practical's:

- Simple Color reactions of Carbohydrates and Proteins
- Qualitative estimations of Glucose, Urea, Creatinine, Total Protein and Cholesterol
- Normal constituents of Urine
- Abnormal (pathological) Urine
- Glucose Tolerance Test and its significance
- Demonstration of Electrophoresis and Interpretation of important clinical conditions based on Electrophoresis appearance
- Demonstration of Paper Chromatography and its utility in the diagnosis of inborn errors of metabolism.

Reference Books:

1. Vasudevan (DM), Text Book of Biochemistry for Medical Students, Jaypee Pub, 9th Edi, 2019.
2. Wilson & Walkers Principles & Techniques of Biochemistry & Molecular Biology, University Press, 8th Edi, 2018.
3. Harbans Lal and Rajesh Pandey Textbook of biochemistry, CBS, 3rd Edi, 2017
4. Harold Varley, Practical Clinical Biochemistry, CBS, 4th Edi, 2010.

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

C 1. Communication and Soft skills

Placement: I Year (I Semester)

Time: Theory: 60 Hours

Course Description: The course is designed to enable students to enhance their ability to speak and write the language (and use English) required for effective communication in their professional work. Students will practice their skills in verbal and written English during clinical and classroom experience.

Course Outline

Unit	Time (Hrs)	Content
I	10	Review of Grammar <ul style="list-style-type: none"> • Remedial study of Grammar • Building Vocabulary • Phonetics • Public Speaking
II	3	Communication <ul style="list-style-type: none"> • What is communication? • What are communication roles of listeners, speakers, readers and writers as healthcare professionals?
III	5	Introduction to LSRGW <ul style="list-style-type: none"> • L – Listening: Different types of listening • S – Speaking: Understanding Consonants, Vowels, Word and Sentence Stress, Intonation • R – Reading: Medical vocabulary • Gr – Grammar: Understanding tenses, linkers • W – Writing simple sentences and short paragraphs – emphasis on correct grammar
IV	7	Attentive Listening <ul style="list-style-type: none"> • Focusing on listening in different situations, announcements, descriptions, narratives, instructions, discussions, demonstrations • Reproducing Verbatim • Listening to academic talks/ lectures • Listening to presentation
V	12	Speaking – Effective Conversation <ul style="list-style-type: none"> • Conversation situations – informal, formal and neutral • Factors influencing way of speaking – setting, topic, social relationship, attitude and language • Greetings, introductions, requesting, asking for and giving permission, speaking personally and casual conversations • Asking for information, giving instructions and directions • Agreeing and disagreeing, giving opinions • Describing people, places, events and things, narrating, reporting & reaching conclusions • Evaluating and comparing • Complaints and suggestions • Telephone conversations • Delivering presentations

Unit	Time (Hrs)	Content
VI	8	Reading <ul style="list-style-type: none"> • Reading strategies, reading notes and messages • Reading relevant articles and news items • Vocabulary for everyday activities, abbreviations and medical vocabulary • Understanding visuals, graphs, figures and notes on instructions • Reading reports and interpreting them • Using idioms and phrases, spotting errors, vocabulary for presentations • Remedial Grammar
VII	7	Writing Skills <ul style="list-style-type: none"> • Writing patient history • Note taking • Summarizing • Anecdotal records • Letter writing • Diary/Journal writing • Report writing • Paper writing skills • Abstract writing
VII	8	LSRW Skills <ul style="list-style-type: none"> • Critical thinking strategies for listening and reading • Oral reports, presentations • Writing instructions, letters and reports • Error analysis regarding LSRW

Reference Books:

1. Clement, I, Essentials of English for Paramedical Courses, EMMESS, 2nd Edi, 2018.
2. Lakshminarayanan K.R., English for Technical Communication, Scitech publication, 2nd Edi 2015

4. Pathology

Placement: I Year (II Semester)

Time: Theory: 60 Hours
Practical: 30 Hours(Lab)

Course Description: The course is designed to understand pathology laboratory reports, the normal ranges of investigations, severity and specificity of disease conditions which will help to perform International Classification of diseases to clinical pertinence.

Course Outline

Unit	Time (Hrs)	Content
I	3	Basic Concepts in Cellular Adaption's Cell injury and Cell death Cellular response to stress and other stimuli Over view of Cell injury and Cell death
II	5	Basic Principles in Inflammatory Process General features including inflammatory mediators and Basic Mechanisms of disorders of Immunity, General features of the immune system, Disorders of the Immune System, Acute and Chronic inflammation
III	5	Infectious Diseases Infectious diseases, Bacterial Infections (Typhoid, Tuberculosis and Leprosy) Viral infections (HIV, HbSAg and Polio) Specific Examples of Fungal, Parasitic and Syphilis infections
IV	3	Neoplasia Nomenclature, Rudimentary aspects on Tumor growth and Metastasis Definition of Neoplasia, Differences between Benign and Malignant tumors Staging and Grading of Tumors (Basic Aspects), Oncogenes and Tumor Suppressor genes
V	5	Hematology Structure and functions of Formed elements Objective use of anticoagulants, Mechanisms of Hemostasis Tests to monitor Coagulation, Blood Grouping and Blood Bank (Basic aspects on Blood Components) Fixatives and Basic details in Cytology, Aspiration Cytology of Bone marrow Basic concepts in Anemia, Cellular aspects of Leukemia (Basic Concepts)
VI	3	Histopathology Use of Microscopes, Grossing and Mounting Techniques Processing of Biopsy specimen, Paraffin sections
VII	3	Biomedical Waste Management and Environmental Pathology Biomedical waste management from perspectives of Pathology Environment and Disease – Smoking hazards, Asbestosis and Silicosis & Occupational Exposure
VIII	3	Clinical Pathology Collection, transport, preservation and processing of Clinical Specimen Clinical Pathology of specialized Body Fluids (CSF), Synovial fluid, Pleural Fluid Urine Examination (Urinalysis)

Unit	Time (Hrs)	Content
IX	20	Overview of Systemic Pathology Rheumatic Heart Disease Lungs: Pneumonia, COPD, Asthma, ARDS Liver: Hepatitis, Cirrhosis Muscle: Myasthenia Gravis Brain: Meningitis, Aspergillosis, CNS Tumor – (Classification)
X	10	Practical Demonstration Demo of Coagulation Profile, Phlebotomy techniques Blood Grouping and Rh typing, Urine Routine, Hemogram, Fecal Examination Safety Precautions in Clinical Pathology

Practical's:

- Blood Grouping and Rh typing
- Urine Routine
- Hb, TLC, DLC
- Gross Specimens
- Slides

Reference Books:

1. Mohan (H), Textbook of Pathology, Jaypee Pub, 5th Edi, 2019.
2. Kumar, Robbins & Cotran Pathologic Basis of Disease, WB Saunders, 10th Edi, 2020.
3. Kawthalkar(S), Essentials of Clinical Pathology, Jaypee Brothers, 2nd edi, 2018.
4. Nayak (R), Essentials of Hematology & Clinical Pathology, Jaypee Brothers, 2nd Edi, 2017.
5. Sengupta, Synopsis of Clinical Pathology & Microbiology, CBS Pub, 8th Edi, 2017.

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

5. Microbiology

Placement: I Year (II Semester)

Time: Theory: 60 Hours
Practical: 30 Hours (Lab)

Course Description: The course is designed to assist students to acquire understanding of fundamentals of microbiology and identification of microorganisms. It also provides opportunities for practicing infection control measures in hospital setting.

Course Outline

Unit	Time (Hrs)	Content
I	5	Introduction: History of microbiology- (contribution of Louis Pasteur, Robert Koch, Joseph Lister, Edward Jenner, Alexander Fleming) Importance of Microbiology in the practice of Radiology Microscope –Types & Uses
II	5	General Microbiology: Infection, parasite, host, vector, fomite, contagious disease, infectious disease, epidemic, endemic, pandemic, Zoonosis, Epizootic, Attack rate Normal flora of the human body Routes of infection and spread, endogenous and exogenous infections at reservoir of infections Antimicrobials: mode of action, interpretation of susceptibility tests, resistance spectrum of activity Staining techniques: Gram staining, Acid fast staining, Culture methods Laboratory diagnosis of infection
III	10	Sterilization & Disinfection: Definition of Asepsis, Sterilization and Disinfection Hospital Acquired infection, Universal safety precautions and Biomedical waste Disposal & Management
IV	10	Immunology: Antigen- Antibody-reaction & application for Diagnosis, Immune response- Normal / Abnormal, Innate Immunity & acquired immunity (Vaccination) Hyper sensitivity & auto-immunity, Serological tests, Immunoprophylaxis
V	10	Bacteriology: Morphology, Classification according to the Pathogenicity, Mode of Transmission, methods of prevention, Collection and transport of samples for laboratory diagnosis, Interpretation of laboratory reports Staphylococci, Streptococci, & Pneumococci Neisseria, Mycobacterium: Tuberculosis, M. Leprae, Enterobacteriaceae, Escherichia Coli, Salmonella, Corynebacterium, Vibrios, V. Cholerae and other medically important Vibrio's, Campylobacters and Helicobacters Pseudomonas, Mycoplasma, Rickettsiae, Chlamydia, Bacillus anthracis, Sporing & nonsporing anaerobes, Clostridium

Unit	Time (Hrs)	Content
VI	10	Virology: General Properties, Basic structure and broad Classification of Viruses. Pathogenesis and Pathology of viral infection (HIV, Hepatitis, Polio, Measles, Congenital viral infections, Rubella, CMV, Herpes) Immunity and Prophylaxis of viral Diseases, Principles of viral diseases List of commonly used antiviral agents
VII	5	Parasitology: Amoebiasis, Malaria, Filaria, Toxoplasma, cystisarcosis, Roundworm, Hookworm, & Echinococcus.
VIII	5	Mycology: General Properties of Fungi, Classification based on fungal infection Candidiasis, Cryptococcosis, Dermatophytosis, Mycetoma, Aspergillosis.

Practical's:

- Introduction & visit to microbiology lab + Morphology of bacteria + Identification of bacteria (Culture plates & Basic biochemical reactions)
- Gram stain, Acid fast Stain
- Spotters, Instruments, Culture media inoculated & uninoculated
- Applied Immunology (Bacterial) Serological tests – CRP, ASO, RPR, Widal Applied Immunology (Virology) Serological tests: HIV, HBsAg (Rapid Tests)
- Stool Examination for eggs + Parasitology specimens

Reference Books:

1. Ananthanarayanan (R), Textbook of Microbiology, Orient Longman Ltd., 10th Ed, 2017.
2. Mackie and McCartney Practical Medical Microbiology, Relx India Pvt Ltd, 14th Ed, 2018.
3. Baveja CP, Textbook of Microbiology, APC, 6th ed, 2021.
4. Sriram Kumar (S), Textbook of Microbiology, All win Publication, 1st Ed, 2019

Examination Pattern

Theory exam: 75 marks
Internal assessment (Theory) 25 marks

Duration

3 hours

100 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
 2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.
-

Pattern of Question Paper:

- | | | |
|--------------------------|---|-------------------|
| 1. Long answer question | - | 2 X 10 = 20 marks |
| 2. Short answer question | - | 7 X 5 = 35 marks |
| 3. Very Short answer | - | 10 X 2 = 20 marks |

C 2. Computer Application

Placement: I Year (II Semester)

Time: Theory: 30 Hours
Practical: 30 Hours (Lab)

Course Description: The course is designed for student to acquire the knowledge, develop basic understanding, use of computer and its applications in clinical field.

Course Outline

Unit	Time (Hrs)	Content
I	7	Introduction to Computer <ul style="list-style-type: none">• Concepts of computers• Hardware and Software• Trends and Technology• Application of Computer
II	8	Introduction to Disk Operating System <ul style="list-style-type: none">• DOS• Windows (all version)• MS Word• MS Excel with Pictorial Presentation• MS - Access• MS-Power Point
III	7	Statistical packages <ul style="list-style-type: none">• Types and their features
IV	8	Hospital Management System <ul style="list-style-type: none">• Types and uses• Electronic patient records

Reference Books:

1. Bansal Surabhi, Computer Applications for Allied Health Sciences, AITBS, 1st Edi, 2022.
2. Priyanka Randhir, Computer for Paramedical,CBS, 1st Edi, 2020
3. Pooja Jain & Neelam Kumari, Introduction to Computer, S.Vikas & Co, 5th edi, 2019
4. Shah Y.I, Paradkar A.R et.al, Introduction to Biostatistics and Computer Science, Nirali Prakashan Pub, 16th Edi, 2019.

C 3. First-Aid

Placement: I Year (II Semester)

Time: Theory – 30 Hrs
Practical - 30 Hrs(Lab)

Course description:

This course is designed to help students to understand the basics of first aid to render first aid services as and when need arises.

Course Outline

Unit	Time (Hrs)	Content
I	3	Introduction <ul style="list-style-type: none">• Definition of first aid, importance of first aid,• Golden rules of the first aid• Scope and concept of emergency
II	7	First aid in Skeletal injuries <ul style="list-style-type: none">• Definition, types of fractures of various parts of the body, causes, signs and symptoms, rules of treatment, transport of patients with fracture.• First aid measures in dislocation of joints, treatment of muscle injuries
III	3	Respiratory emergencies <ul style="list-style-type: none">• Asphyxia – Etiology, signs and symptoms, rules of treatment• Drowning – definition and management• Artificial respiration – types and techniques
IV	4	Shock and Unconsciousness <ul style="list-style-type: none">• Definition• Types of shock• Common causes of shock• Signs and symptoms of shock (assessment of established shock)• General and special treatment of established shock
V	3	Transportation of the injured <ul style="list-style-type: none">• Methods of transportation – single helper, hand seat, stretcher, wheeled transport (ambulance)• Precautions taken – blanket lift, air and sea travel
VI	2	Community emergencies <ul style="list-style-type: none">• Role of first aider (immediate and later) in<ul style="list-style-type: none">- Fires- Explosions- Floods- Earthquakes- Famine
VII	8	Bandages <ul style="list-style-type: none">• Bandaging• Basic turns• Bandaging extremities• Triangular bandages and their application

Reference Books:

1. Sanju Sira, First Aid Manual for Nurses, CBS, 1st Edi, 2017.
2. Gupta L.C. Manual of First Aid, Jaypee, 2nd Edi, 2017. Indian Red Cross Society (RRC), Indian First Aid Manual, St. John Ambulance Association, 7th Edi, 2016.

6. Basic concepts of Renal Diseases

Placement: II Year (III Semester)

Time: Theory: 60 Hrs

Clinical: 330 Hrs

Course Description:

The course is designed to help the students to develop an understanding of the basic concepts of Renal diseases and its management with emphasis on clinical application to practice.

Course Outline

UNIT	Time (Hrs)	Content
I	15	Fluid and Electrolyte: <ul style="list-style-type: none">• Fluid and electrolyte disorders• Hyponatremia, hypernatremia, hypokalemia & hyperkalemia: Etiology, clinical presentation and management• Disorders of calcium, phosphorous & magnesium ions.• Acid- base disorders: Basics of ABG• Metabolic acidosis & metabolic alkalosis: pathophysiology, etiology, clinical features and management.
II	5	Urinary tract infections: <ul style="list-style-type: none">• Definition, types of UTI, risk factors, diagnosis, treatment
III	10	Renal Stone Diseases: <ul style="list-style-type: none">• Renal stone diseases, inherited and cystic renal diseases• Composition of kidney stones, risk factors for recurrent stones, clinical presentation, prevention of recurrent stones & treatment
IV	10	Hypertension <ul style="list-style-type: none">• normal BP control, definition, evaluation, primary & secondary HTN, complications, antihypertensive drugs
V	20	Nephrotic syndrome <ul style="list-style-type: none">• definition, clinical features, causes (MCNS, FSGS, MGN...), Primary & secondary NS, complications, management• Acute glomerulonephritis/RPGN- definition, causes (PSGN, vasculitis, anti GBM, SLE, HSP), clinical features, management.

Practicals:

- Priming of dialysis apparatus
- Demonstration of dialyser reuse
- Charts /spotters: nephrotic syndrome, nephritic, AKI, CKD, BP apparatus, stethoscope, pulse oximeter, cardiac monitor, thermometer

Reference Books

1. Kasi Viseswaran, Basics of Renal Diseases, Fluid, Electrolytes & Acid-Base Balance, CBS Pub, 2nd Edi, 2020.
2. Pradeepkumar, Text book of Renal System and its disorders, Taneesha publishers, 1st Edi, 2022.
3. Kasi Viseswaran, Essential Nephrology, CBS Publications& Distributors pvt.
4. Muhammad Rafiquel Alam, Manual of Clinical Nephrology, CBS Publications pvt.
5. John T Daugirdas, Hand book of Chronic Kidney Diseese management, Wolters, 2nd Edi, 2014.
6. Irfan.K.moinuddin & David J Leehey, Handbook of Nephrology, Nephrology Publ, 5th edi, 2013
7. Schrier R.W, Diseases of the Kidney and The Urinary Tract (Vol I, II, & III), 8th Edi, Lippincott, 2006.

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

7. Applied Pathology and Practical's

Placement: II Year (III Semester)

Time: Theory Hours: 60 Hrs
Practical Hours: 30 Hrs (Lab)

Course Description:

The course is designed to help the students to develop an understanding of the Pathogenesis of various congenital malformations and kidney diseases, clinical examinations, histopathology with emphasis on clinical application to practice.

Course Outline

Unit	Time (Hrs)	Content
I	10 Hrs	<ul style="list-style-type: none">• Congenital and cystic diseases of kidney• Introduction and clinical manifestations of glomerular diseases• Pathogenesis of glomerular diseases -brief
II	15 Hrs	<ul style="list-style-type: none">• Nephritic syndrome - Acute post infectious glomerulonephritis, Rapidly progressive glomerulonephritis• Nephrotic syndrome – Membranous Nephrotic syndrome, Minimal change disease, Focal segmental glomerulosclerosis,
III	15 Hrs	<ul style="list-style-type: none">• IgA nephropathy and chronic glomerulonephritis• Glomerular lesions in systemic diseases - diabetes, amyloidosis, systemic lupus erythematosus• Vascular diseases - benign hypertension, malignant hypertension, renal artery stenosis, thrombotic microangiopathy
IV	10 Hrs	<ul style="list-style-type: none">• Tubulo-interstitial diseases:<ul style="list-style-type: none">a. Acute tubular injuryb. Pyelonephritis - acute and chronicc. Tubulointerstitial nephritis due to drugs and toxins, others mention briefly• Obstructive uropathy
V	10 Hrs	<ul style="list-style-type: none">• Urolithiasis and lower urinary tract infections• Pathology of peritoneum, peritonitis, bacterial, tubular & sclerosing peritonitis, dialysis induced changes

Reference Books:

1. Mohan (H), Textbook of Pathology, Jaypee Pub, 5th Edi, 2019.
2. Kumar, Robbins & Cotran Pathologic Basis of Disease, WB Saunders, 10th Edi, 2020.
3. Kawthalkar(S), Essentials of Clinical Pathology, Jaypee Brothers, 2nd edi, 2018.
4. Nayak (R), Essentials of Hematology & Clinical Pathology, Jaypee Brothers, 2nd Edi, 2017.
5. Sengupta, Synopsis of Clinical Pathology & Microbiology, CBS Pub, 8th Edi, 2017.

Examination Pattern (Subject with Theory & Practical Exam)		Duration
Theory exam:	80 marks	3 hours
Practical exam	50 marks	3 hours
Oral exam	20 marks	
Internal assessment (Theory)	25 marks	
Internal assessment (Practical)	25 marks	

	200 marks	

The practical examination will have the following components

Hb estimation	5 marks
Urine examination	20 marks
Blood grouping	5 marks
Spotter / chart	20 marks

	50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks in such a way that the question paper shall contain
 2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.
-

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

8. Applied Microbiology and Practical's

Placement: II Year (III Semester)

Time: Theory Hours: 60 Hrs
Practical Hours: 30 Hrs (Lab)

Course Description:

The course is designed to help the students to develop an understanding of the Sterilization and disinfection. It also provides opportunity for infection control measures for various urinary and blood born infections with emphasis on clinical application to practice.

Course Outline

Unit	Time (Hrs)	Content
I	10 Hrs	Sterilization and disinfection <ul style="list-style-type: none">• Sterilization and disinfection - classification, principles, methods• Central sterile supply department
II	10 Hrs	Importance of sterilization and disinfection <ul style="list-style-type: none">• Disinfection of instruments used in patient care• Disinfection of patient care unit• Infection control measures for ICUs
III	15 Hrs	Health care associated infections <ul style="list-style-type: none">• Surgical site infections• Ventilator associated pneumonia• Catheter associated blood stream infections• Antibiotic associated diarrhea
IV	10 Hrs	Urinary tract infections <ul style="list-style-type: none">• Anatomy• Types of infections• Etiology• Pathogenesis• Laboratory diagnosis - Specimen collection, processing, interpretation
V	15 Hrs	Blood borne viral infections <ul style="list-style-type: none">• Morphology, pathogenesis, clinical features, laboratory diagnosis and prophylaxis of following viral infections Hepatitis B, D and C virus• Human immunodeficiency virus

Reference Books:

1. Ananthanarayanan (R), Textbook of Microbiology, Orient Longman, 10th Edi, 2017.
2. Mackie and McCartney Practical Medical Microbiology, Relx India Pvt, 14th Edi, 2018.
3. Baveja CP, Textbook of Microbiology, APC, 6th edi, 2021.
4. Sriram Kumar (S), Textbook of Microbiology, All win Publication, 1st Edi, 2019

Examination Pattern (Subject with Theory & Practical Exam)		Duration
Theory exam:	80 marks	3 hours
Practical exam	50 marks	3 hours
Oral exam	20 marks	
Internal assessment (Theory)	25 marks	
Internal assessment (Practical)	25 marks	

	200 marks	

The practical examination will have the following components

Gram stain	10 marks
Serology	10 marks
Disinfection / Hospital Infection control measure	10 marks
Spotter / chart	20 marks

	50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
 2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.
-

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

C 4. Sociology

Placement: II Year (III Semester)

Time: 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.

Course Outline

Unit	Time (Hrs)	Content
I	10	Introduction : <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• Meaning of social factors• Role of social factors in health and disease Socialization : <ul style="list-style-type: none">• Meaning and nature of socialization• Primary, Secondary and Anticipatory socialization, Agencies of socialization
II	5	Social Groups: <ul style="list-style-type: none">• 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 : <ul style="list-style-type: none">• The family, meaning and definitions Functions and 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 : <ul style="list-style-type: none">• Rural community: Meaning and features - Health hazards to rural communities, health hazards to tribal community.• Urban community - Meaning and features - Health hazards of urbanities

Unit	Time (Hrs)	Content
III	5	Culture and Health : <ul style="list-style-type: none"> • Concept of Health • Concept of culture • Culture and Health • Culture and Health Disorders Social Change : <ul style="list-style-type: none"> • 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 program • The role of social planning in the improvement of health and rehabilitation
IV	10	Social Problems of disabled : <ul style="list-style-type: none"> • 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 : <ul style="list-style-type: none"> • Social Security and social legislation in relation to the disabled Social Work : <ul style="list-style-type: none"> • Meaning of Social Work • The role of a Medical Social Worker

Reference Books:

1. Anthony Giddens: Sociology, Atlantic Publications & Distributors Pvt Ltd, 8th Edi, 2022.
2. Vidya Bhushan & Sachdeva, An Introduction to Sociology, Kitab Mahal, 1st Edi, 2017.
3. Ralhan.S, introduction to Sociology, Common Wealth publications, 1st Edition, 2018.

9. Applied Pharmacology

Placement: II Year (IV Semester)

Time: Theory: 60 Hours
Practical: 30 Hours(Lab)

Course Description:

This course is designed to enable students to acquire understanding of Pharmacodynamics, Pharmacokinetics, principles of therapeutics & possible implications.

Course Outline

Unit	Time (Hrs)	Content
I	5	Introduction to pharmacology <ul style="list-style-type: none">• Definitions & Branches• Nature & Sources of drugs• Dosage Forms and Routes of drug administration• Terminology used• Classification, Abbreviations, Prescription,• Drug Calculation, Weights and Measures• Pharmacodynamics: Actions, Drug Antagonism, Synergism, Tolerance, Receptors, Therapeutic, adverse, toxic effects, pharmaco vigilance• Pharmacokinetics: Absorption, Bioavailability, Distribution, Metabolism, Interaction, Excretion• Review-Principles of drug administration and treatment individualization, Factors affecting dose, route etc• Indian Pharmacopoeia: Legal Issues, Drug Laws, Schedule Drugs• Rational Use of Drugs• Principles of Therapeutics
II	3	Pharmacology of commonly used antiseptics and disinfectants <ul style="list-style-type: none">• Antiseptics and Disinfectants• Composition, action, dosage, route, indications, contraindications, Drug interactions, side effects, adverse effects, toxicity
III	4	Drugs acting on G.I system <ul style="list-style-type: none">• Pharmacology of commonly used drugs<ul style="list-style-type: none">- Emetics and Antiemetics- Laxatives and Purgatives- Antacids and anti-peptic ulcer drugs- Anti diarrhoea – Fluid and electrolyte therapy, Furazolidone, dicyclomine• Composition, action, dosage, route, indications, contraindications, drug interactions, side effects, adverse effects, toxicity

Unit	Time (Hrs)	Content
IV	4	Drugs acting on respiratory system <ul style="list-style-type: none"> Pharmacology of commonly used <ul style="list-style-type: none"> Anti-asthmatics Bronchodilators (Salbutamol inhalers) Decongestants Expectorants, Antitussives and Mucolytics Broncho-constrictors and Antihistamines Composition, action, dosage, route, indications, contraindications, drug Interactions, side effects, adverse effects, toxicity
V	5	Drugs used in treatment of Cardiovascular system and blood disorders <ul style="list-style-type: none"> Hematinic in treatment of anemia Cholinergic and anti-cholinergic Adrenergic Drugs for CHF, anti-adrenergic & vasodilators Anti-anginal Antiarrhythmic Antihypertensive Coagulants & Anticoagulants Antiplatelet & thrombolytic Hypolipidemics Plasma expanders & treatment of shock Drugs used to treat blood disorders Composition, action, dosage, route, indications, contraindications, drug Interactions, side effects, adverse effects, toxicity
VI	4	Drugs used in treatment of endocrine system disorders <ul style="list-style-type: none"> Insulin & oral hypoglycemic agents Thyroid and anti-thyroid drugs Steroids, Corticosteroids, Anabolic steroids Calcitonin, parathormone, vit D3, calcium metabolism, Calcium salts
VII	4	Drugs used in treatment of integumentary system <ul style="list-style-type: none"> Antihistaminic and antipruritic Topical applications for skin Benzyl benzoate, Gamma BHC, Clotrimazole, Miconazole, Silver Sulphadiazine (burns) Composition, action, dosage, route, indications, contraindications, drug interactions, side effects, adverse effects toxicity
VIII	5	Drugs used in treatment of communicable diseases (common infections, infestations) <ul style="list-style-type: none"> General Principles for use of Antimicrobials Pharmacology of commonly used drugs: <ul style="list-style-type: none"> Penicillin, Cephalosporin's, Aminoglycosides, Macrolide & broad-spectrum antibiotics, Sulfonamides, quinolones, Misc. antimicrobials Anaerobic infections Anti- tubercular drugs Anti-leprosy drugs Antimalarial Antiretroviral drugs

Unit	Time (Hrs)	Content
		<ul style="list-style-type: none"> • Antiviral agents • Anthelmintic, Anti scabies agents • Antifungal agents • Composition, action, dosage, route, indications, contraindications, Drug Interactions, side effects, adverse effects, toxicity.
IX	3	Drugs used in disorders of ear, nose, throat & Eye <ul style="list-style-type: none"> • Antihistaminic • Topical applications for eye (Chloramphenicol, Gentamycin eye drops), ear (Soda glycerin ear drops, boric acid ear drops, spirit boric ear drops), nose and buccal cavity-chlorhexidine mouthwash • Composition, action, dosage, route, indications, contraindications, drug Interactions, side effects, adverse effects, toxicity.
X	3	Drugs used on urinary system <ul style="list-style-type: none"> • Pharmacology of commonly used drugs Renin angiotensin system Diuretics and antidiuretics Drugs toxic to kidney Urinary antiseptics Treatment of UTI – acidifiers and alkalinizers • Composition, action, dosage, route, indications, contraindications, Drug Interactions, side effects, adverse effects toxicity and role of nurse
XI	5	Drugs acting on nervous system <ul style="list-style-type: none"> • Basis & applied pharmacology of commonly used drugs • Analgesics and anaesthetics Analgesics - Non steroidal anti-inflammatory (NSAID) drugs Antipyretics Opioids & other 1 analgesics, General (techniques of GA, preanesthetic medication) & local anesthetics Gases: oxygen, nitrous oxide, carbon-dioxide & others • Hypnotics and sedatives • Skeletal muscle relaxants • Anti-psychotics • Mood stabilizers
		<ul style="list-style-type: none"> • Antidepressants • Anti-Anxiety Drugs • Anticonvulsants • Drugs for neurodegenerative disorders & miscellaneous drugs • Stimulants, ethyl alcohol and treatment of methyl alcohol poisoning • Composition, action, dosage, route, indications, contraindications, drug Interactions, side effects, adverse effects toxicity.

Unit	Time (Hrs)	Content
XII	3	Drugs used for hormonal, disorders and supplementation, contraception and medical termination of pregnancy <ul style="list-style-type: none"> • Estrogens and progesterone's • Oral contraceptives and hormone replacement therapy • Vaginal contraceptives • Drugs for infertility and medical termination of pregnancy, Uterine stimulants and relaxants • Composition, actions, dosage, route, indications, contraindications, drugs interactions, side effects, adverse, effects, adverse effects, toxicity.
XIII	3	Drugs used for pregnant women during antenatal, labor and postnatal period <ul style="list-style-type: none"> • Tetanus prophylaxis • Iron and Vit K1 supplementation • Oxytocin, Misoprostol • Ergometrine • Methyl prostaglandin F2-alpha • Magnesium sulphate • Calcium gluconate
XIV	5	Miscellaneous <ul style="list-style-type: none"> • Drugs used for de-addiction • Drugs used in CPR and emergency-adrenaline, Chlorpheniramine, hydrocortisone, Dexamethasone • IV fluids & electrolytes replacement • Common poisons, drugs used for treatment of poisoning Activated charcoal Ipecac Antidotes Anti-snake venom (ASV) • Vitamins and minerals supplementation • Vaccines & sera (Universal immunization program schedules) • Anticancer drugs, Chemotherapeutic drugs commonly used • Immuno-suppressants and Immunostimulants
XV	4	Introduction to drugs used in alternative systems of medicine: <ul style="list-style-type: none"> • Ayurveda, homeopathy, unani and siddha etc. • Drugs used

Reference Books:

1. Padmaja Udaykumar, Text book of Medical Pharmacology, CBS , 7th Edition, 2022.
2. Sharma.H.L & Sharma.K.K, Principles of Pharmacology, Paras Medical, 3rd Edi, 2017.
3. Tripathi.KD, Essentials of Medical Pharmacology, Jaypee Brothers, 8th Edition, 2018.

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

10. Basics of Renal Dialysis Technology

Placement: II Year (III Semester)

Time: Theory Hours: 60 Hrs
Practical Hours: 30 Hrs (Lab)
Clinical Hours: 330 Hrs

Course Description:

The course is designed to help the students to develop an understanding of the basic concepts, Principles, equipment, composition and membrane of dialysis, Water treatment and reuses, anticoagulation therapy in dialysis with emphasis on clinical application to practice.

Course Outline

Unit	Time (Hrs)	Content
I	5 Hrs	Dialysis <ul style="list-style-type: none"> The concept (Brief history, definition, mechanism) Components of Dialysis Access, blood flow, anticoagulant, dialysate, initiation of dialysis, Indications of dialysis) Hemodialysis :Basics (Blood circuit: tubing, pump, dialyzer, flow rate, dialysate circuit, concentrates, delivery systems, flow rate) Peritoneal Dialysis: Basic concepts
II	3 Hrs	Principle of dialysis <ul style="list-style-type: none"> Types of Hemodialysis, Principles of Hemodialysis Principles of peritoneal dialysis Solute transport mechanism in both types of dialysis
III	2 Hrs	Dialysis teams <ul style="list-style-type: none"> Dialysis Team (Doctors, Technologist, Nurses, Technician, Renal Dietician) rights, responsibilities and relationship with patients
IV	10 Hrs	Water Treatment and Reuse <ul style="list-style-type: none"> Purpose Preventing harm to patients Preventing harm to equipment. How water becomes impure? Types of contaminants and effects on Patients <ul style="list-style-type: none"> Microbiological pollutions Solid impurities Chemical impurities Components of water treatment plant & their arrangement (Feed water components, R.O process) Monitoring water treatment plant continuous Periodic monitoring Microbiological testing <ul style="list-style-type: none"> Chemical monitoring (Chloramines, Na⁺, K⁺) Routine blood chemistries, Monitoring Pt.Symptoms Disinfection. Water quality AAMI Standard Ultra-pure water Dialyzer reprocessing and reuse of dialyzers

Unit	Time (Hrs)	Content
V	5 Hrs	Equipment <ul style="list-style-type: none"> • Machine front panel • Blood Circuit • Dialysate Circuit. • Proportioning system • Various Alarms and safety profile • Temperature • UF Controller • Disinfection
VI	5 Hrs	Composition of Dialysate <ul style="list-style-type: none"> • The concept (Brief history, definition, mechanism) Components of Dialysis Access, blood flow, anticoagulant, dialysate, initiation of dialysis, Indications of dialysis) • Types of dialysate solution • Composition of acid, bicarbonate • Electrolytes managed through dialysate solution • RO water for composition, mixing proportional
VII	3 Hrs	Dialysis Membrane <ul style="list-style-type: none"> • Characteristics (Molecular weight cut off; Ultrafiltration coefficient (Kuf); Mass transfer coefficient (KoA) and efficiency; Low and high flux; Clearance(K) Biocompatibility, Newer membranes/ High performance membranes
VIII	10 Hrs	Vascular access for Haemodialysis Arteriovenous fistula <ul style="list-style-type: none"> -Types of vascular access -Vessel preservation -Preoperative evaluation -Physical examination -Imaging studies <ul style="list-style-type: none"> -Allen Test -Venography • Possible locations for upper extremity AV fistulas • Perioperative care and fistula maturation <ul style="list-style-type: none"> -Rules of six -Details of fistula maturation • Initial trial cannulation of a new AV fistula • Initial cannulation procedure Arteriovenous grafts <ul style="list-style-type: none"> • Potential AV graft locations <ul style="list-style-type: none"> -Common locations -Uncommon locations • Postoperative care • Maturation • Physical examination of AV fistulas and grafts

Unit	Time (Hrs)	Content
		<ul style="list-style-type: none"> -Inspection -Palpation and auscultation -Pulse -Thrill -Auscultation -Pulse augmentation and arm elevation tests
IX	3Hrs	Anticoagulation <ul style="list-style-type: none"> • Heparin including Low Molecular Weight • Heparin • Warfarin • Regional citrate anticoagulation • Antiplatelet Drugs • Thrombolytic agents
X	5 Hrs	Complications during haemodialysis <ul style="list-style-type: none"> • Biochemical investigations for dialysis patients and its significance • Urea Kinetic modelling • Mechanisms of solute transport • Solute removal from the perspective of the dialyser • Concept of clearance • URR, spKt/V, eKt/V • Solute removal from the patient perspective • Access re-circulation • Cardiopulmonary re-circulation • Urea nitrogen generation rate (g) and the Npna • Residual renal function
XI	4 Hrs	Adequacy of Dialysis <ul style="list-style-type: none"> • HD Prescription • Hemodialysis adequacy • Anticoagulation • Infection control and universal precautions • Drugs and dialysis
XII	5Hrs	Investigations in nephrology: <ul style="list-style-type: none"> • History taking • Urine examination • Hemogram • Serology biomedical tests • Radio imaging in nephrology • Renal biopsy • Investigations required before starting of dialysis

Practical's:

- Case discussion - Nephrotic syndrome, nephritis, Acute renal failure, chronic renal failure.
- Screening and investigation of kidney diseases
- Hemodialysis unit
- Demineralization plant
- Machine use

- Initiation of Dialysis
- Conduction of Dialysis
- Dialysis – closure
- Washing, cleaning, reuse
- Anticoagulation

Reference Books:

- 1 Kasi Visweswaran, Handbook of dialysis, Bhalani Publication 1st Edition, 2022.
- 2 Anjani Sharma, Handbook of Dialysis Technician, Mount book Pub, 2nd edi, 2022.
- 3 Allen R Nisenson, Handbook of Dialysis Technology, Elsevier, 1st Edi, 2017.
- 4 Judith.Z.Kallenbach, Review of Hemodialysis, Elsevier, 9th Edition, 2016.
- 5 John T Daugirdas & Peter G Blake, Hand Book of Dialysis, Wolters Kluwer Pvt, 5th Edi, 2014.

Examination Pattern

Theory exam: (one paper)	80 marks
Practical exam	50 marks
Oral exam	20 marks
Internal assessment (Theory)	25 marks
Internal assessment (Practical)	25 marks

	200 marks

Duration

3 hours
3 hours

The practical examination will have the following components

Identification of Spotters	20 marks
Identification of machine parts	20 marks
Water treatment and re use	10 marks

50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Distribution of Course Content

1. Dialysis, Principles, water treatment and re use, equipment and composition of dialysis.
2. Dialysis Membrane, Composition of Dialysate, Vascular access for hemo dialysis, anticoagulation, Complication, Adequacy of dialysis and investigation.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

C 5. Biomedical waste management

Placement: II Year (IV Semester)

Time: Theory: 30hrs

Course Description:

The course is designed to assist student to acquire the knowledge to provide the fundamentals of biomedical wastes and various aspects of their management right from generation through collection and disposal with emphasis on clinical application to practice.

Course Outline

Unit	Time(Hrs)	Content
I	5	Introduction to Hospital Waste <ul style="list-style-type: none">• Definition, Classification of hospital wastes• Types and composition: Types of solids, liquids, sharps, blood and blood tissue, radioactive material, biological and chemical material• Hospital effluents: Nature and composition, Levels of Generation in a small clinic, nursing home, small and large hospitals, Storage of hospital waste; Types of bags and containers used for storage
II	5	Biomedical Waste Management Guideline <ul style="list-style-type: none">• Requirement• Documentation of Biomedical waste types and guidelines• Bio-medical wastes (Management & Handling) Rules, 1998; and amendments
III	5	Principles of Biomedical Waste Management <ul style="list-style-type: none">• Segregation of biomedical waste• Handling and transport of hospital waste: Authorization and accidental spilling• Methods / treatments required for disposal of pathogens• Waste disposal methods• Techniques of waste management• Protocols for HW management
IV	5	Waste prevention <ul style="list-style-type: none">• Waste reduction activities• Waste recycling
V	5	Biomedical Waste Treatment Facility <ul style="list-style-type: none">• Introduction, location, land requirements• Coverage area, types of equipment• Infrastructure requirements• Record keeping• Waste collection, transport and storage facilities• Precautions required

Reference Books:

1. P.N.Harikumal & Ann Naisy Jacob, Medical Waste Management, Abhijieet, 1st Edi, 2021.
2. Shishir Basarkar, Hospital Waste Management, Jaypee, 1st Edition, 2019.
3. Anantpreet Singh & Sukhgit Kaur, Biomedical Waste Disposal, Jaypee, 1st Edi 2012.

C 6. Environmental Science

Placement: II Year (IV Semester)

Time: Theory: 30 Hours

Course Description:

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.

Course Outline

Unit	Time (Hrs)	Content
I	2	Multi-disciplinary nature of environmental studies <ul style="list-style-type: none"> • Definition • Scope and importance • Need for public awareness.
II	7	Natural Resources Renewable and non-renewable resources <ul style="list-style-type: none"> • Natural resources and associated problems. - Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. - Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources • Equitable use of resources for sustainable life styles
III	4	Ecosystems <ul style="list-style-type: none"> • 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:- <ul style="list-style-type: none"> - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit	Time (Hrs)	Content
IV	5	Biodiversity and its conservation <ul style="list-style-type: none"> • Introduction – Definition: genetic, species and ecosystem diversity. • Bio geographical 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-spots 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.
V	3	Environmental Pollution <ul style="list-style-type: none"> • Definition Cause, effects and control measures of :- <ul style="list-style-type: none"> - Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - 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.
VI	6	Social Issues and the Environment <ul style="list-style-type: none"> • 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

Unit	Time (Hrs)	Content
VII	3	Human Population and the Environment <ul style="list-style-type: none"> • 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

Reference Books:

1. Agarwal, R.K, Environmental Science, Krishna Prakashan, 1st Edition.2020.
2. Bharucha Erach, The Biodiversity of India, Mapin Publication, 1st edition, 2002.

11. Applied Dialysis Technology - I

Placement: III Year (V Semester)

Time: Theory: 60hrs

Clinical: 240 Hrs

Course Description:

The course is designed to enable the students to acquire knowledge on history of dialysis and nephrology, anatomy and physiology of dialysis, principles of dialysis, vascular access – temporary & permanent, procedure of venipuncture, maintenance of records and reports and demonstrate the procedure with emphasis on clinical application to practice.

Course Outline

Unit	Time (Hrs)	Content
I	15 Hrs	Introduction <ul style="list-style-type: none"> • History of Dialysis –Indian History of dialysis • History of Nephrology : Acute Kidney Injury, Renal angiogram , Biopsy and Transplant Anatomy & Physiology of dialysis: <ul style="list-style-type: none"> • Peritoneal Anatomy (Basic), The peritoneal membrane as a “dialyzer.”, The three-pore model. • Peritoneal Physiology, Diffusion Ultra diffusion, Absorption, Clinical Assessment. Principles of Dialysis, quantification of adequacy: <ul style="list-style-type: none"> • Principles of diffusion, filtration, ultrafiltration, convection, and osmosis. • Solute transport and fluid movement during dialysis. • Principles of fluid dynamics. Hemodialysis & Peritoneal Dialysis. Measuring dialysis adequately: <ul style="list-style-type: none"> • Urea reduction ratio - Urea Kinetic Modeling. Pre –dialysis and post dialysis - BUN Measurement. Measurement of KT/V
II	15 Hrs	Vascular Access – Temporary & Permanent: <ul style="list-style-type: none"> • Types of vascular access – Fistulae, Grafts, Catheters. • Pre- dialysis assessments for all types of vascular access. • Methods of needle insertion for AVFs and grafts. • Pre - dialysis assessment, accessing procedure, exit site care, and monitoring of catheters. Types of Dialysis: <ul style="list-style-type: none"> • Genesis of dialysis, invention and the process involved in the evolution of dialysis, indication of dialysis. • Types of dialysis and classification. • Dialysis for acute kidney injury, dialysis for chronic kidney disease. • Introduction to Continuous renal replacement therapy (CRRT).

Unit	Time (Hrs)	Content
III	15 Hrs	Equipment, Accessories& Function (hemodialysis machine, peritoneal dialysis machine) : <ul style="list-style-type: none"> • Types of equipment used in the dialysis process. • Parts of a dialysis machine, tubing's and the water supply for dialysis. • Overview of the various equipment, accessories and working of a dialysis machine-The technology, functioning, calibration, and sterilization of dialysis machine according to their: Type/ brand, Frequency and duration of use, Importance of Calibration and Sterilization , Recording (Calibration, Sterilization and set up details),Planning and Organizing Scheduled Maintenance, Various indicators, alarms and sensors of the dialysis machine. • Corrective steps to be taken when a particular alarm goes off
IV	15 Hrs	Infection control and sterilization: <ul style="list-style-type: none"> • Morphology of microorganisms, Sterilization and Disinfection, Microbiology of vascular access infection (femoral, jugular, subclavian catheters), Sampling methodologies for culture & sensitivity, Principles and Practice of Biomedical waste management Renal data maintenance: <ul style="list-style-type: none"> • Records and reports maintained in the dialysis unit. Need for maintenance of records and report. • The technologist's responsibility in maintenance of records and report. Medico legal aspects of maintenance of records

Practical's:

- A.V. Cannulation
- A.V. Fistula
- Initiation of dialysis through central venous catheters – Internal
- Jugular – Femoral – Subclavian vein, Packing and sterilization of dialysis trays
- Termination of Dialysis

Reference Books:

1. Bhagavan & Clement, Textbook on Renal Dialysis, EMMESS, 8th Edition, 2017.
2. Kasi Visweswaran, Handbook of Dialysis, Bhalani Publication 1st Edition, 2022.
3. Anjani Sharma & Faswal Pichan, Handbook of Dialysis Technician, Mount book, 2nd edi 2022.
4. Allen R Nissenson & Richard.N.Fine, Handbook of Dialysis Technology, Elsevier, 1st Edi, 2017.
5. Judith.Z.Kallenbach, Review of Hemodialysis, Elsevier Publication, 9th Edition, 2016.
6. John T Daugirdas & Peter G Blake, Hand book of Dialysis, Wolters Kluwer, 5th Edi, 2014.
7. Steven Guest Handbook of Peritoneal Dialysis, Sabu press Publication, 2nd edition,
8. Davison A.M., Oxford Textbook of Clinical Nephrology, Oxford University (Vol 3), 2016

Examination Pattern

Theory exam: (one paper)	80 marks
Practical exam	50 marks
Oral exam	20 marks
Internal assessment (Theory)	25 marks
Internal assessment (Practical)	25 marks

	200 marks

Duration

3 hours
3 hours

The practical examination will have the following components

Identification of Spotters	20 marks
Demonstration of initiation of dialysis	20 marks
Calibration and Sterilization of dialysis machine	10 marks

50 marks

Guidelines for setting Question Paper for Theory Examination:**Distribution of Course Content**

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Instruction to Question Paper Setter

1. Introduction, Anatomy and Physiology of Dialysis, Principles of Dialysis, Measures of Dialysis adequacy.
2. Equipment, Accessories, Infection control, sterilization and Renal data maintenance.

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	8 X 5 = 40 marks
Very Short answer	-	10 X 2 = 20 marks

12. Advance Dialysis Technology - I

Placement: III Year (V Semester)

**Time: Theory: 60hrs
Clinical : 180 Hrs**

Course Description:

The course is designed to enable the students to understand the types of dialysis and its implications, the various modalities of renal replacement therapy and differentiate between peritoneal dialysis, SLED, CRRT, High efficiency dialysis with emphasis on clinical application to practice.

Course Outline

Unit	Time (Hrs)	Content
I	15 Hrs	Hemodialysis: <ul style="list-style-type: none"> The process of Haemodialysis, vascular access, Starting Haemodialysis, priming of the dialyser, alarms and the settings of a dialyser, completion of Haemodialysis, closing the Haemodialysis. Cleaning of the tubing and dialyser and the dialysis machine. Complications of Haemodialysis Acute & chronic Complications of Haemodialysis: acute complications – monitoring, prevention for acute complications. Chronic complications – list, prevention strategies, monitoring for chronic complications.
II	15 Hrs	Preparation and positioning of patient for dialysis, Patient Assessment – Pre, intra & post dialysis & Machine and patient monitoring during Hemodialysis: <ul style="list-style-type: none"> Introduction to patient assessment, Understanding a treatment plan, Equipment preparation Dialysate - Dialyser and Blood lines, Decisions regarding the appropriate size and type of catheter/ IV tubing to be used Connecting patients to the machine- Initiation of dialysis Removing fluid Replacing fluid - Drawing blood samples Testing blood samples. Measuring dialysis adequacy: <ul style="list-style-type: none"> Urea reduction ratio - Urea Kinetic Modelling. Pre –dialysis and post dialysis - BUN Measurement. Factors affecting dialysis treatment, communicating and documenting the findings prior to the dialysis process. Starting the dialysis treatment: <ul style="list-style-type: none"> Monitoring during dialysis - Patient Monitoring (blood pressure, temperature, rate of blood flow, proper mixture of dialysate, presence of air bubbles)-Technical Monitoring

Unit	Time (Hrs)	Content
III	15 Hrs	<p>Importance of reporting, HD Complications during dialysis:</p> <ul style="list-style-type: none"> • Clinical complications • Technical Complications • Procedure to disconnect the patient procedure for removing the IVcannula • Post dialysis procedures, Post dialysis patient evaluation, Recording of the Treatment, recording changes in Patient's condition, Preparation of status and progress reports, Equipment clean up and Maintenance, Recording the dialysis procedure on the medical report/chart of the patient. <p>Dialysate delivery system:</p> <ul style="list-style-type: none"> • Definition of a delivery system, types of delivery systems. <p>Composition of dialysate:</p> <ul style="list-style-type: none"> • Various dialysate compositions, its uses and indications. Method for obtaining various compositions of dialysate <p>Anticoagulation</p> <ul style="list-style-type: none"> • Use of anticoagulation in the dialysis setting, various anticoagulants used, Monitoring during use of anticoagulants. Method of administration, Calculation of anticoagulants, use & complications. Heparin free dialysis - need and indication. Regional citrate anticoagulation. <p>High flux / high efficiency dialysis:</p> <ul style="list-style-type: none"> • Definition of high flux / high efficiency dialysis, differences between high flux dialysis and Haemodialysis, use and indications for high flux dialysis, complications of high flux dialysis, precautions and contraindications. Care during a high flux dialysis.
IV	15 Hrs	<p>Peritoneal Dialysis:</p> <ul style="list-style-type: none"> • Acute and Chronic Peritoneal Dialysis. PD. • Transport kinetics, ultra-filtration, Intermittent PD, Continuous Ambulatory Peritoneal Dialysis, Automated Peritoneal Dialysis, Dialysis Solutions, Novel uses of PD. Adequacy of peritoneal dialysis, chronic peritoneal Dialysis • KT/V Creatinine clearance. • PET - Peritoneal Equilibrium test and interpretation. <p>Infectious and non-infectious complications of PD Introduction to complications in peritoneal dialysis.</p> <ul style="list-style-type: none"> • List of complication: Catheter Infections, Peritonitis Inadequate flow or drainage of the dialysis fluid, Lesions, Ultrafiltration failure. • Management of exit site infection, Early Exit Site Care. • Chronic Care of the Healed Exit Site, Diagnosing Exit Site Infections, Treatment of exit-site infections. • Technique to culture exit site infection, Medical management of CAPD, peritonitis, Initiation of therapy based on gram stain results, Antibiotic selection.

Unit	Time (Hrs)	Content
		<ul style="list-style-type: none"> • Medications in dialysis, Nutrition management in dialysis patients. • Common drugs used for a patient on dialysis. • Use of antibiotics during and post dialysis, considerations to be taken. • Erythropoietin use in patients on dialysis - dosage and administration. • Antihypertensive use - considerations during dialysis. • Vaccines for patients on haemodialysis - need and the schedule. • Introduction to nutrition and RDA's. Renal diet, teaching for a patient on renal diet, Diet & method of cooking to be employed, Planning a renal diet for a patient with CRF.

Practical's:

- Setting up a dialysis machine for dialysis
- Preparation of concentrates – depending on the situation
- Reuse of dialysis apparatus
- Isolated ultra-filtration.
- Performance of peritoneal dialysis exchange – manually
- Setting up of automated peritoneal dialysis equipment

Reference Books:

1. Bhagavan & Clement, Textbook on Renal Dialysis, EMMESS, 8th Edition, 2017.
2. Kasi Visweswaran, Handbook of Dialysis, Bhalani Publication 1st Edition, 2022.
3. Anjani Sharma & Faswal Pichan, Handbook of Dialysis Technician, Mount book, 2nd edi 2022.
4. Allen R Nissenson & Richard.N.Fine, Handbook of Dialysis Technology, Elsevier, 1st Edi, 2017.
5. Judith.Z.Kallenbach, Review of Hemodialysis, Elsevier Publication, 9th Edition, 2016.
6. John T Daugirdas & Peter G Blake, Hand book of Dialysis, Wolters Kluwer, 5th Edi, 2014.
7. Steven Guest Handbook of Peritoneal Dialysis, Sabu press Publication, 2nd edition,
8. Davison A.M., Oxford Textbook of Clinical Nephrology, Oxford University (Vol 3), 2016.

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
 2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.
-

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

C 7. Medical Ethics

Placement: III Year (V Semester)

Time: Theory: 30 Hours

Course Description:

The Course is designed to understand the basics of Medical Law and Ethics in relation to clinical science.

Course Outline

Unit	Time (Hrs)	Content
I	5 Hrs	Introduction to Ethics- <ul style="list-style-type: none">• what is ethics• what are values and norms• Hippocratic oath
II	15 Hrs	Ethics of individual <ul style="list-style-type: none">• Doctor patient relationship.• right to be respected.• Truth and confidentiality• Autonomy of decision• The patient as a person
III	10 Hrs	Professional Ethics <ul style="list-style-type: none">• Code of conduct• malpractice and negligence.• contract and confidentiality.

Reference Books:

1. Erich H Loewy, Text book of Medical Ethics, Springer publications, 1st edition, 2014.
2. Shaun.D.Pattinson, Medical Laws and Ethics, Sweet and Maxwell, 5th Edition, 2015.
3. Princy Louis Palatty et.al - A Textbook of Bioethics for Healthcare Professionals, 1st Edi, 2018

13. Applied Dialysis Technology - II

Placement: III Year (VI Semester)

**Time: Theory: 60 hrs
Clinical : 180 Hrs**

Course Description:

The course is designed to help the students to develop and understand the various complications of hemodialysis in terms of the technologist's responsibility in prevention and worsening of the complications, dialysis in special cases, various conditions and their association in dialysis and skills in follow up care and quality maintenance in terms of renal dialysis treatment modalities and procedures.

Course Outline

Unit	Time (Hrs)	Content
I	10	Acute and chronic dialysis prescription/ consideration: <ul style="list-style-type: none"> Common drugs for patients with ARF & CRF, Actions, side effects Special considerations: Patients with Renal anemia, Congestive cardiac failure (CCF), advanced liver disease, Positive with HIV, HBsAG & HCV. Failed Transplant, Poisoning cases & pregnancy.
II	15	Dialysis in Neonates, infants, children & adolescents: <ul style="list-style-type: none"> Dialysis for infants and neonates, vascular access in this special group, dialysis settings, Monitoring for complications and management of complications. Role of technician in nosocomial infection & infection control. Special Problems in dialysis patients: <ul style="list-style-type: none"> Cardiovascular diseases, Diabetes, Hypertension, Infections (HBV, HCV, HIV), Bone diseases, Aluminum toxicity. Role of technician in nosocomial infection & infection control.
III	15	Psychosocial aspects & patient education, psychological impact of a chronic disease: <ul style="list-style-type: none"> Psychology of patient with disease prognosis, the financial implications of the disease, the family and its role in the care of the patient with CRF. Patient education on diet, prevention of complications, drug compliance. Rehabilitation for acute and chronic CKD or dialysis patient.

Unit	Time (Hrs)	Content
IV	20 Hrs	<p>Instruct patients about in-house treatment and precaution:</p> <ul style="list-style-type: none"> • Identification of the type of patient for whom in house treatment is possible and in line with doctor's advice, procedure of inhouse treatment options, pros and cons of in-house treatment options, the relevant protocol and procedures to be followed to carry out the process. <p>General principles of hospital:</p> <ul style="list-style-type: none"> • Hospital structure and organization, Care of Patient, Basic Assessment Skills, First aid & Basic Life Support, Maintenance of Hygiene & Infection Control Practices, Principles of asepsis, Maintenance of Medications in the department, Specialized Investigations - Care of Patients, Medico - Legal Issues. <p>Quality assurance in dialysis:</p> <ul style="list-style-type: none"> • Standards of practice, Various risks to quality and safety, JCI recommendations, NABH recommendations. Infection control policies and procedures in the dialysis unit.

Practical's:

- Train in performing peritoneal dialysis, and personal care.
- Practice personal safety & standard precautions.
- Handling complications during dialysis procedures.
- Maintain quality and safety
- Unit priming (Setting)
- A.V. Cannulation & Termination
- A.V. Fistula / A.V. Grafting
- Dialysis catheterization (Internal Jugular – Femoral – Subclavian vein)
- Packing including sterilization

References Books:

1. Bhagavan & Clement, Textbook on Renal Dialysis, EMMESS, 8th Edition, 2017.
2. Kasi Visweswaran, Handbook of Dialysis, Bhalani Publication 1st Edition, 2022.
3. Anjani Sharma & Faswal Pichan, Handbook of Dialysis Technician, Mount book, 2nd edi 2022.
4. Allen R Nissenson & Richard.N.Fine, Handbook of Dialysis Technology, Elsevier, 1st Edi, 2017.
5. Judith.Z.Kallenbach, Review of Hemodialysis, Elsevier Publication, 9th Edition, 2016.
6. John T Daugirdas & Peter G Blake, Hand book of Dialysis, Wolters Kluwer, 5th Edi, 2014.
7. Steven Guest Handbook of Peritoneal Dialysis, Sabu press Publication, 2nd edition,
8. Davison A.M., Oxford Textbook of Clinical Nephrology, Oxford University (Vol 3), 2016.

Examination Pattern

Theory exam:	75 marks
Internal assessment (Theory)	25 marks

	100 marks

Duration

3 hours

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
 2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.
-

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

14. Advance Dialysis Technology - II

Placement: III Year (VI Semester)

Time: Theory: 60 hrs

Clinical : 240 Hrs

Course Description:

The course is designed to help the students to develop an understanding regarding advancement in dialysis, Practice independently SLED, CRRT, high efficiency dialysis and different Advanced Renal therapies.

Course Outline

Unit	Time (Hrs)	Content
I	15	New generation dialysis: <ul style="list-style-type: none"> Recent advances in hemodialysis, Nocturnal dialysis, online dialysis, Daily dialysis, Telemedicine in dialysis practices. Water treatment-pretreatment, deionizer, Reverse Osmosis: Purpose of water treatment for dialysis. Components of a dialysis center water treatment system. Advantages and disadvantages of water softeners, carbon tanks, reverse osmosis, de ionization, and ultraviolet irradiation in the treatment of water for dialysis. Monitoring of water treatment systems - disinfection, microbiological testing, water sampling and chemical monitoring. Method for microbiological testing of the water treatment system
II	15	Typical water treatment monitoring schedule, reverse osmosis process and system: <ul style="list-style-type: none"> Definition of RO, cartridge pre-filter, reverse osmosis pump and monitor assembly, RO membranes, Quality assessment mechanisms, JCI requirements, ISO requirements, checklists and tools used for optimal compliance.
III	10	Dialysis reuse: <ul style="list-style-type: none"> History of dialyzer reprocessing. Reason for dialysis reprocessing. Steps involved in dialyzer reprocessing. Hazards of dialyzer reprocessing. Documentation for dialyzer reprocessing.
IV	15	Dialyzer Membranes: <ul style="list-style-type: none"> Introduction to dialyzer membranes. Composition of the dialyzer membranes, types its use and sizes of the various membranes. Principles on which the dialyzer membranes work. Renal Therapies (continuous): <ul style="list-style-type: none"> Definition, indications, uses, method of initiation of dialysis, contraindications of therapy. Complications of therapy and ways to prevent complications.

Unit	Time (Hrs)	Content
		<ul style="list-style-type: none"> • Monitoring during MARS dialysis, SLED and CRRT. • Nocturnal hemodialysis/ short daily dialysis -advantages • Online Hemodiafiltration (HDF) • Home Hemodialysis • Technologist's roles and responsibilities during MARS dialysis CRRT & SLED. Continuous therapies in hemodialysis, Hemo perfusion, Plasmapheresis. <p>Basic and advanced cardiac Life Support</p>
IV	5	<p>Dialysis In Pediatric Populations</p> <ul style="list-style-type: none"> • Indications • Circuit setup • Vascular Access • Apparatus & Procedure • Complications

Practical's:

- Demonstrate Knowledge about Advancements in Renal Dialysis and in renal therapies.
- Demonstrate peritoneal dialysis, and its self-care.
- Involves family centered approach while providing patient care.
- Handling complications during dialysis procedure
- First assistant in minor procedures
- Dialysis Reuse
- CPR Demonstrations
- Prepare Presentations based on various kinds of data collection

References Books:

1. Bhagavan & Clement, Textbook on Renal Dialysis, EMMESS, 8th Edition, 2017.
2. Kasi Visweswaran, Handbook of Dialysis, Bhalani Publication 1st Edition, 2022.
3. Anjani Sharma & Faswal Pichan, Handbook of Dialysis Technician, Mount book, 2nd edi 2022.
4. Allen R Nissenson & Richard.N.Fine, Handbook of Dialysis Technology, Elsevier, 1st Edi, 2017.
5. Judith.Z.Kallenbach, Review of Hemodialysis, Elsevier Publication, 9th Edition, 2016.
6. John T Daugirdas & Peter G Blake, Hand book of Dialysis, Wolters Kluwer, 5th Edi, 2014.
7. Steven Guest Handbook of Peritoneal Dialysis, Sabu press Publication, 2nd edition,
8. Davison A.M., Oxford Textbook of Clinical Nephrology, Oxford University (Vol 3), 2016.

Examination Pattern

Theory exam: (one paper)	80 marks
Practical exam	50 marks
Oral exam	20 marks
Internal assessment (Theory)	25 marks
Internal assessment (Practical)	25 marks

200 marks

Duration

3 hours
3 hours

The practical examination will have the following components

Case presentation	20 marks
Identification of Spotters	15 marks
Identification of advance renal dialysis therapies	15 marks

50 marks

Guidelines for setting Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Instruction to Question Paper Setter

1. New Generation dialysis, Typical water treatment monitoring schedule, reverse osmosis, dialysis re use and dialysis membrane.
2. Advanced renal therapies and Dialysis in Paediatrics

Pattern of Question Paper:

Long answer question	-	2 X 10 = 20 marks
Short answer question	-	7 X 5 = 35 marks
Very Short answer	-	10 X 2 = 20 marks

C 8. Bio-Statistics & Research Methodology

Placement: III Year (VI Semester)

Time: Theory: 30 Hours

Course Description:

At the end of the course, the students will be able to develop an understanding of the statistical methods and apply them in conducting research studies.

Course Outline

Unit	Time (Hrs)	Content
I	3	Introduction: <ul style="list-style-type: none"> • Concepts, types, significance and scope of statistics, Meaning of data, Sample, parameter • Type and levels of data and their measurement • Organization and presentation of data – Tabulation of data; Frequency distribution – Graphical and tabular presentations
II	2	Measures of central tendency: <ul style="list-style-type: none"> • Mean, Median, Mode Measures of variability: <ul style="list-style-type: none"> • Range, Percentiles, average deviation, quartile deviation, standard deviation
III	2	Normal Distribution: <ul style="list-style-type: none"> • Probability, • Characteristics and application of normal probability curve; • Sampling
IV	4	Measures of relationship: <ul style="list-style-type: none"> • Correlation – need and meaning • Rank order correlation • Scatter diagram method • Product moment correlation • Simple linear regression analysis and prediction.
V	4	Significance of Statistic and Significance of difference between two statistics (Testing hypothesis) <ul style="list-style-type: none"> • Non parametric test – Chi-square test, Sign, median test, Mann Whitney test. • Parametric test – ‘t’ test, ANOVA, MANOVA, ANCOVA
VI	7	Research Methods: <ul style="list-style-type: none"> • Research Meaning- • Scope and Objectives • .Research methods vs. Methodology. Types of research <ul style="list-style-type: none"> • Descriptive vs. Analytical, • Applied vs. Fundamental, • Quantitative vs. Qualitative, • Conceptual vs. Empirical,

Unit	Time (Hrs)	Content
		Concept of applied and basic research process, <ul style="list-style-type: none"> Defining and formulating the research problem Selecting the problem, necessity of defining the problem, Importance of literature review in defining a problem, criteria of good research. Literature review <ul style="list-style-type: none"> Primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis
VII	8	Data Collection And Sampling: <ul style="list-style-type: none"> Data collection Classification of data Class intervals Continuous and discrete measurements Drawing frequency polygon types of frequency polygon Histogram Accepts of method validation, observation and collection of data, methods of data collection Sampling methods, Data processing and analysis strategies and tools, data analysis with statistical package <ul style="list-style-type: none"> Sigma STAT, SPSS for student t-test, ANOVA, etc. hypothesis testing. Correlation <ul style="list-style-type: none"> historical contribution meaning of correlation types: Product, moment, content correlation, variation of product, movement correlation, rank correlation, Regression analysis. <ul style="list-style-type: none"> Tests of significance- need for sampling error significance of the mean significance of differences between means interpretation of probability levels – small samples – large samples.

Research Project Description:

This project study shall be done by individuals or by group of individual students of the same class during internship. The student should identify a problem area of relevance to the theory and / or practice of Dialysis Technology to carry out an investigation of one aspect of that problem area, and to present a clear report on the process and result of the project work done.

The students are encouraged to identify problems of special interest to them that fall within the interest areas of Dialysis Technology services, and to aim towards knowledge on the topic in the specified problem area.

Desirable:

- A Research study to be done and submit the report before the one year of Internship.
- One or more value added courses (like Swayam) during final year or Internship.

Reference Books:

1. Mahajan B.K., Methods in Biostatistics for Medical Students and Research Workers, Jaypee, 9th Edi, 2018.
2. Sundar Rao & Richard, Introduction to Biostatistics & Research Methods, Prentice Hall of India, New Delhi, 5th edition, 2012.
3. Negi K.S., Biostatistics, A.I.I.B.S, 1st Edi, 2013.
4. Rao & Murthy, Applied Statistics in Health Sciences, J.B. Brothers, New Delhi 2010.
5. Visweswara Rao, Biostatistics & Manual of Statistical Methods for use in Health, Nutrition and Anthropology, J.B. Brothers Publishers Pvt. Ltd., 2009.

VIII. Question Paper Pattern

(Subject with Theory and Practical Exam)

Guidelines for setting a Question Paper for Theory Examination:

1. Prepare the question papers for 80 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper

Time: 3 hours

Max Marks: 80

2x 10 =20 marks

I. Write essay on any TWO

- 1.
- 2.
- 3.

II. Write short notes on any EIGHT

8 x 5 =40 marks

- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.

III. Very Short Answer – Answer all questions:

10 x 2 = 20 marks

- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
- 21.
- 22.
- 23.

VIII. Question Paper Pattern

(Subject with Theory Exam and no Practical)

Guidelines for setting a Question Paper for Theory Examination:

1. Prepare the question papers for 75 marks.
2. Set questions within the course syllabus covering entire syllabus with equal distribution from all topics in each section.

Pattern of Question Paper

Time – 3 Hours

Maximum Marks – 75 Marks

2x 10 =20 marks

I. Write essay on **any TWO**

- 1.
- 2.
- 3.

II. Write short notes on **any SEVEN**

7 x 5 =35 marks

- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

III. Very Short Answer – **Answer all questions:**

10 x 2 = 20 marks

- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20.
- 21.
- 22.