

**Jawaharlal Institute of Postgraduate Medical
Education & Research
(JIPMER)
Puducherry**



BSc Dialysis Therapy Technology

CURRICULUM

2021

This curriculum was approved at the 16th meeting of the Standing Academic Committee held on September 21, 2021 and will be applicable for students joining BSc (Allied Health Sciences) – Dialysis therapy Technology from the academic year 2021-22. The curriculum document was prepared based on the model curricula for allied health sciences courses issued by the Ministry of Health and Family Welfare, Government of India.

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About JIPMER

Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry (JIPMER) under Government of India since the year 1956, is one of the leading Medical Institutions of India. Spread over a sprawling 195-acre campus in an urban locale of Puducherry (formerly Pondicherry), JIPMER is 170 km by road from Chennai.

JIPMER has been declared as an “Institution of National Importance” by an Act of Parliament, JIPMER, Puducherry, Act, 2008. A copy of the Act was Gazette notified on 14-7-2008 to enforce this Act. Prior to this, the Institute was functioning under the administrative control of Directorate General of Health Services, Ministry of Health and Family Welfare, New Delhi. The Institution is now empowered to award Medical Degrees under the clauses 23 & 24 of the said Act. Such Degrees shall be deemed to be included in the schedules to the respective Acts governing Medical Council of India/National Medical Commission, Indian Nursing Council, and Dental Council of India, entitling the holders to the same privileges as those attached to the equivalent awards from the recognized Universities of India.

JIPMER imparts Undergraduate (UG), Postgraduate (PG) and Super Specialty Medical Training through a large hospital complex (JIPMER Hospital) and a Nursing College. Some of the courses offered are MBBS, BSc, MSc, MD, MS, DM, and MCh courses. Full-time Ph.D. programs are available in several disciplines.

About the Department of Nephrology

The Department of Nephrology at JIPMER was established in January 2010 with state-of-art facilities for peritoneal dialysis, hemodialysis, deceased donor kidney transplantation program and special clinical set up for glomerular diseases. The department seeks to be a model for academic nephrology services in India. It offers evidence-based, ethical, socially mindful patient care with an emphasis on quality and safety. The department formulate innovations that will serve as a model for training in Nephrology. It engages in socially accountable original research relevant to regional and national health priorities. The department runs a DM (Nephrology) course in addition to the contribution to graduate and postgraduate medical and allied health sciences program.

COURSE DETAILS

Nomenclature: BSc (Allied Health Sciences) – Dialysis Therapy Technology (DTT)

Introduction:

Dialysis treatment is a life-sustaining therapy that extends survival and restores quality of life to patients with kidney failure. Dialysis Therapy Technologists work as an integral part of a multi-disciplinary team, including Nephrologists, nurses, and other auxiliary staff to plan implementation of the dialysis prescription, perform hemodialysis, manage various intra-dialytic complications, and document patient data. The BSc Allied Health Sciences Dialysis Therapy Technology (BSc AHS DTT) training program at JIPMER, Puducherry, is designed to provide the dialysis therapy technologist trainee with a scientific theoretical foundation of the profession and enable them, as practitioners, to be able to synthesize, evaluate and apply their knowledge in a clinical setting.

Learning Objectives of the course: At the completion of this course, the student should be able to

1. Understand and apply the principles of dialysis and skills necessary to give safe and effective care to the individual undergoing hemodialysis treatments.
2. Demonstrate the use of hemodialysis equipment with an understanding of the process of operating dialysis equipment and alternate dialysis procedures.
3. Function as a dialysis professional under the supervision of the physician or nephrologist in a dialysis facility that provides dialysis treatment to the individuals diagnosed with acute or chronic kidney disease.
4. Assess the patient for any complications with an understanding of the problem and recognize the need to report the complications to the physician or nephrologist.
5. Respond effectively to the physical and emotional needs of the patient undergoing dialysis treatment.
6. Develop the ability to understand operation, routine maintenance, identification of malfunction in equipment, troubleshooting and minor repair in equipment used in dialysis unit such hemodialysis machine, water treatment plant, dialyzer reprocessing machine, etc.

Course overview:

BSc (AHS) – Dialysis therapy technology is a four-year course with three-year academic program divided into three phases of one year each and one-year compulsory internship period.

First phase: one year

In addition to the subjects of foundation course, Anatomy, and Physiology, students will learn the basic concepts in areas such as Biochemistry, and introductory concepts about dialysis therapy technology

Second phase: one year

In the Second phase, the students will learn in detail about the applied concepts of the basic sciences subject relevant to dialysis therapy. Students will be introduced to various pathological renal diseases, dialysis, and the nutrition aspects. Students will get an hand-on experience in handling various haemodialysis equipment and will learn the standard operating procedure of each equipment, their maintenance and necessary quality checks.

Third phase: one year

In the Third phase, the students will learn peritoneal dialysis, medical management of dialysis patients, dialysis in special clinical situations. Students will learn to run the dialysis equipment under supervision. They will also learn extracorporeal therapies and recent advances in dialysis in addition to the procedures involved in renal transplantation.

Internship: one year

Internship of one year is compulsory. The interns will be given hands-on training in peritoneal dialysis and hemodialysis. They will be trained in the maintenance and troubleshooting of hemodialysis machine. They will also coordinate activities related to kidney transplantation program.

Expectation from the future graduate:

1. The primary goal of the Degree in Dialysis Therapy Technology program is to prepare accomplished professionals in Dialysis Therapy Technology with a specific emphasis on clinical skills and technical knowledge.
2. Trainees acquire the knowledge and procedural skills necessary to deliver a high standard of care to the patients with chronic kidney disease requiring renal replacement therapy.
3. They will also receive training to conduct research in the field of dialysis.
4. This course involves all aspects of care for patients undergoing acute and chronic hemodialysis, continuous renal replacement therapies (CRRT), other extracorporeal therapies like therapeutic plasma exchange & Haemoperfusion and peritoneal dialysis.
5. Overall goal of this training is to foster the trainee's development into an independent care provider in the field of dialysis.
6. The program intends for its graduates to contribute to a new generation of academic dialysis professional equipped to address the challenging problems in renal replacement therapy.

Available postgraduate programs in India

Postgraduate Programs in Dialysis Technology (MSc) is available at the following centers in India at present (alphabetical order):

1. D Y Patil University, Navi Mumbai
2. Manipal University – School of Allied Health Sciences, Manipal
3. NIMS University, Jaipur
4. OM sterling Global University, Hisar
5. Rajiv Gandhi Paramedical Institute, New Delhi
6. Sri Ramachandra Medical College & Research Institute, Chennai

Eligibility for the course:

- The Applicant should be an **Indian National**.
- He/she should have completed **17 years** at the time of application cut-off date.
- There is **no upper age limit**.

The applicants should have passed the qualifying examinations in the manner mentioned below:

- The Higher / Senior Secondary Examination or the Indian School Certificate Examination which is equivalent to 10+2 Higher/Senior Secondary Examination after a period of 12 years study, the last two years of such study comprising Physics, Chemistry, Biology/ Botany & Zoology (which shall include practical tests in these subjects) and with English as a subject.
- The applicant must have passed in the subjects of Physics, Chemistry, Biology/Botany & Zoology and English individually and must have obtained a minimum of 50% marks taken together in Physics, Chemistry, Biology/Botany & Zoology at the qualifying examination
- Candidates belonging to the Scheduled Castes/Scheduled Tribe or Other Backward Classes must have obtained a minimum of 40% marks in the subjects of Physics, Chemistry, Biology / Botany & Zoology taken together in the qualifying examination.
- For PwD candidates in general and EWS categories, the minimum marks in Physics, Chemistry, Biology/ Botany & Zoology taken together in the qualifying examination is 45%.

Candidates intake per year:

Five candidates will be admitted to the course every year. There is no provision for sponsored / nominated candidates.

Duration of the course

4 years (48 months) duration including 3 years of classes and one year of compulsory internship.

Medium of instruction:

English

Vacation:

Students will be eligible for 4 weeks of vacation in summer and 2 weeks in winter.

Subject details:

| Phase | Paper | Title of the paper |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------|
| I | I | Foundation course (T & P) |
| | II | Anatomy and Physiology (T & P) |
| | III | Pathology and Microbiology (T) |
| | IV | Introduction to Dialysis therapy Technology & Biochemistry (T & P) |
| II | I | Applied Basic Sciences (T & P) |
| | II | Basic Concepts of Kidney Disease, Dialysis & Nutrition (T & P) |
| | III | Applied Dialysis Therapy Technology - Haemodialysis Instrumentation & protocols (T & P) |
| III | I | Applied Dialysis Therapy Technology - Medical management of dialysis patients and dialysis in special situations. (T & P) |
| | II | Applied Dialysis Therapy Technology – Peritoneal Dialysis and extracorporeal therapies other than haemodialysis.(T & P) |
| | III | Applied Dialysis Therapy Technology-recent advances in dialysis and kidney transplantation (T & P) |
| IV | Internship period | |

T- Theory, P- Practical

Teaching hours:

| Phase | Subject | Theory | Practical | Others |
|--------------|-------------------------------------------------------------------------------------------------------------------|---------------|------------------|---------------|
| I | Foundation course | 80 | 40 | |
| | Anatomy | 60 | 180 | |
| | Physiology | 60 | 180 | |
| | Pathology | 40 | | |
| | Microbiology | 40 | | |
| | Introduction to Dialysis therapy Technology | 30 | 280 | |
| | Biochemistry | 30 | | |
| | Self-study/Library | | | 60 |
| Total | | | | 1080 |
| II | Applied Basic Sciences | 60 | 280 | |
| | Basic Concepts of Kidney Disease, Dialysis & Nutrition | 60 | 280 | |
| | Applied Dialysis Therapy Technology - Haemodialysis Instrumentation & protocols | 60 | 280 | |
| | Self-study/Library | | | 60 |
| | Total | | | |
| III | Applied Dialysis Therapy Technology - Medical management of dialysis patients and dialysis in special situations. | 60 | 280 | |
| | Applied Dialysis Therapy Technology – Peritoneal | 60 | 280 | |
| | Applied Dialysis Therapy Technology-recent advances in dialysis and kidney transplantation | 60 | 280 | |
| | Self-study/Library | | | 60 |
| | Total | | | |
| IV | Internship | | | |

SYLLABUS

Phase I

Paper I: Foundation course

Theory:

Introduction to National Healthcare System

The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world. Topics to be covered under the subject are as follows:

1. Introduction to healthcare delivery system
 - a. Healthcare delivery system in India at primary, secondary and tertiary care
 - b. Community participation in healthcare delivery system
 - c. Health system in developed countries.
 - d. Private Sector
 - e. National Health Mission
 - f. National Health Policy
 - g. Issues in Health Care Delivery System in India
2. National Health Programme- Background objectives, action plan, targets, operations, achievements, and constraints in various National Health Programme.
3. Introduction to AYUSH system of medicine
 - a. Introduction to Ayurveda.
 - b. Yoga and Naturopathy
 - c. Unani
 - d. Siddha
 - e. Homeopathy
 - f. Need for integration of various system of medicine
4. Health scenario of India- past, present, and future
5. Demography & Vital Statistics-
 - a. Demography – its concept
 - b. Vital events of life & its impact on demography
 - c. Significance and recording of vital statistics
 - d. Census & its impact on health policy
6. Epidemiology
 - a. Principles of Epidemiology
 - b. Natural History of disease
 - c. Methods of Epidemiological studies

d. Epidemiology of communicable & non-communicable diseases, disease transmission, host defence immunizing agents, cold chain, immunization, disease monitoring and surveillance.

Medical terminologies and record keeping

This course introduces the elements of medical terminology. Emphasis is placed on building familiarity with medical words through knowledge of roots, prefixes, and suffixes. Topics include origin, word building, abbreviations and symbols, terminology related to the human anatomy, reading medical orders and reports, and terminology specific to the student's field of study. Spelling is critical and will be counted when grading tests.²⁵ Topics to be covered under the subject are as follows:

1. Derivation of medical terms.
2. Define word roots, prefixes, and suffixes.
3. Conventions for combined morphemes and the formation of plurals.
4. Basic medical terms.
5. Form medical terms utilizing roots, suffixes, prefixes, and combining roots.
6. Interpret basic medical abbreviations/symbols.
7. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
8. Interpret medical orders/reports.
9. Data entry and management on electronic health record system.

Basic computers and information science

The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation. Topics to be covered under the subject are as follows:

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. Input output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).
3. Processor and memory: The Central Processing Unit (CPU), main memory.
4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing, and maximizing, etc.).
6. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
8. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
9. Introduction of Operating System: introduction, operating system concepts, types of operating system.
10. Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
11. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
12. Application of Computers in clinical settings.

Medical law and ethics

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.²⁶

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analysing, and attempting to resolve the ethical problems that arise in practice".²⁶ Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum. Few of the important and relevant topics that need to focus on are as follows:

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia

7. Organ transplantation
8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

Communication and soft skills

Major topics to be covered under Communication course –

1. Basic Language Skills: Grammar and Usage.
2. Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.
3. Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization.
4. Basic concepts & principles of good communication
5. Special characteristics of health communication
6. Types & process of communication
7. Barriers of communication & how to overcome

Introduction to Quality and patient safety

1. Quality assurance and management - The objective of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.
 - a. Concepts of Quality of Care
 - b. Quality Improvement Approaches
 - c. Standards and Norms
 - d. Quality Improvement Tools
 - e. Introduction to NABH guidelines
2. Basics of emergency care and life support skills - Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental aspects of BLS include immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system, early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED). Initial recognition and response to heart attack and stroke are also

considered part of BLS. The student is also expected to learn about basic emergency care including first aid and triage. Topics to be covered under the subject are as follows:

- a. Vital signs and primary assessment
- b. Basic emergency care – first aid and triage
- c. Ventilations including use of bag-valve-masks (BVMs)
- d. Choking, rescue breathing methods
- e. One- and Two-rescuer CPR
- f. Using an AED (Automated external defibrillator).
- g. Managing an emergency including moving a patient

At the end of this topic, focus should be to teach the students to perform the manoeuvres in simulation lab and to test their skills with focus on airways management and chest compressions. At the end of the foundation course, each student should be able to perform and execute/operate on the above-mentioned modalities.

3. Bio medical waste management and environment safety- The aim of this section will be to help prevent harm to workers, property, the environment, and the general public. Topics to be covered under the subject are as follows:

- a. Definition of Biomedical Waste
- b. Waste minimization
- c. BMW – Segregation, collection, transportation, treatment, and disposal (including colour coding)
- d. Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
- e. BMW Management & methods of disinfection
- f. Modern technology for handling BMW
- g. Use of Personal protective equipment (PPE)
- h. Monitoring & controlling of cross infection (Protective devices)

4. Infection prevention and control - The objective of this section will be to provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections and improve health outcomes. Concepts taught should include –

- a. Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)],
- b. Prevention & control of common healthcare associated infections,
- c. Components of an effective infection control program, and
- d. Guidelines (NABH and JCI) for Hospital Infection Control

5. Antibiotic Resistance-
 - a. History of Antibiotics
 - b. How Resistance Happens and Spreads
 - c. Types of resistance- Intrinsic, Acquired, Passive
 - d. Trends in Drug Resistance
 - e. Actions to Fight Resistance
 - f. Bacterial persistence
 - g. Antibiotic sensitivity
 - h. Consequences of antibiotic resistance
 - i. Antimicrobial Stewardship- Barriers and opportunities, Tools and models in hospitals
6. Disaster preparedness and management- The objective of this section will be to provide knowledge on the principles of on-site disaster management. Concepts to be taught should include-
 - a. Fundamentals of emergency management,
 - b. Psychological impact management,
 - c. Resource management,
 - d. Preparedness and risk reduction,
 - e. Key response functions (including public health, logistics and governance, recovery, rehabilitation, and reconstruction), information management, incident command and institutional mechanisms.

Professionalism and values

The module on professionalism will deliver the concept of what it means to be a professional and how a specialized profession is different from a usual vocation. It also explains how relevant professionalism in terms of healthcare system is and how it affects the overall patient environment.

1. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
2. Personal values- ethical or moral values
3. Attitude and behaviour- professional behaviour, treating people equally
4. Code of conduct, professional accountability and responsibility, misconduct
5. Differences between professions and importance of team efforts
6. Cultural issues in the healthcare environment

Research Methodology and Biostatistics

The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Basic Concepts of Biostatistics
6. Types of Data
7. Research tools and Data collection methods
8. Sampling methods
9. Developing a research proposal

Principles of Management

The course is intended to provide a knowledge about the basic principles of Management.

1. Introduction to management
2. Strategic Management
3. Foundations of Planning
4. Planning Tools and Techniques
5. Decision Making, conflict and stress management
6. Managing Change and Innovation
7. Understanding Groups and Teams
8. Leadership
9. Time Management
10. Cost and efficiency

Community orientation and clinical visit

The objective of this section of the foundation course is to sensitize potential learners with essential knowledge; this will lay a sound foundation for their learning across the undergraduate program and across their career. Innovative teaching methods should be used to ensure the attention of a student and make them more receptive such as group activities, interactive fora, role plays, and clinical bed-side demonstrations.

1. The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system -Sub centre, PHC, CHC, SDH, DH and Medical College, private hospitals, dispensaries, and clinics.
2. The student will also be briefed regarding governance at village level including interaction and group discussion with village panchayat and front-line health workers.
3. Clinical visit to their respective professional department within the hospital.

Practical:

Fundamentals of computers

1. Learning to use MS office: MS word, MS PowerPoint, MS Excel
2. To install different software.
3. Data entry efficiency

Paper II: Anatomy and Physiology

Gross anatomy and Histology

Theory:

General Anatomy:

Introduction – Anatomical terms, position, movements; epithelium – classification, structure & examples; Tissues – classification and structure; skin – structure, thick and thin skin; cartilage – types, structure, hyaline, elastic, and white fibrocartilage; bones – classification, structure, growth; muscles - classification & structure; glands - classification & structure.

Musculoskeletal system:

Axial and appendicular skeleton – muscle groups and regions muscles with action.

Cardiovascular and lymphatic system:

Structure of pericardium, heart & major blood vessels – arteries, veins, and lymphatic system – classification and structure of lymphoid organs – thymus, spleen, lymph node, tonsil, and major lymphatic vessels.

Respiratory system:

Parts of respiratory system, structure of external nose, paranasal air sinuses, nasal cavity, nasopharynx, larynx, trachea, pleura, lungs & diaphragm.

Gastrointestinal system:

Parts of gastrointestinal system, salivary glands, oral cavity, oropharynx and laryngopharynx, esophagus, stomach, small intestine, large intestine, liver, gallbladder, extrahepatic biliary apparatus, and pancreas.

Excretory system:

Parts of excretory system – structure of kidney, ureter, urinary bladder & urethra.

Male and female reproductive systems:

Structure & parts of male reproductive system, external genitalia, testis, epididymis, vasdeferens, seminal vesicle and prostate.

Structure & parts of female reproductive system, uterus, ovary, fallopian tubes, and mammary gland

Endocrine system:

Location & structure of thyroid, parathyroid, pituitary, adrenal glands.

Special senses:

Structure of eyeball, external, middle & internal ear, and papillae of tongue.

Nervous system:

Neuron, neuroglia, classification, autonomic nervous system, meninges, parts of brain,

cerebrum, cerebellum, basal nuclei, limbic system, thalamus, hypothalamus, spinal cord, circulation of cerebrospinal fluid.

Histology:

General histology:

Microscopy – Types of microscopes, parts of microscope, cleaning, and maintenance of microscope.

Microscopic features of

1. Cartilages
 - 1.1 Hyaline,
 - 1.2 Elastic
 - 1.3 White fibro cartilages
2. Bones
 - 2.1 Longitudinal section of compact bone
 - 2.2 Cross section of compact bone
3. Muscles
 - 3.1 Skeletal muscle
 - 3.2 Cardiac muscle
4. Glands
 - 4.1 Serous gland
 - 4.2 Mucous gland
 - 4.3 Mixed gland
5. Blood vessels
 - 5.1 Medium sized artery
 - 5.2 Large sized artery
 - 5.3 Medium sized vein
 - 5.4 Large sized vein
6. Nervous tissue
 - 6.1 Peripheral nerve H & E stain
 - 6.2 Peripheral nerve Osmic acid stain
 - 6.3 Dorsal root (spinal) ganglia
 - 6.4 Autonomic ganglia
7. Lymphoid organs
 - 7.1 Thymus
 - 7.2 Lymph node
 - 7.3 Spleen
 - 7.4 Tonsil
8. Skin
 - 8.1 Thick skin
 - 8.2 Thin skin

Practical: Anatomy (Gross anatomy and Histology)

1. Demonstration of bones

2. Demonstration of various parts of body
3. Demonstration of parts of digestive system
4. Demonstration of parts of respiratory system
5. Demonstration of parts of reproductive system
6. Demonstration of parts of excretory system
7. Demonstration of various parts of circulatory system
8. Demonstration of various parts of nervous system
9. General histology slides

Textbooks Recommended (Latest edition):

General anatomy:

1. Handbook of General Anatomy – B.D. Chaurasia - CBS Publishers

Systemic Anatomy:

1. Textbook of Anatomy – Vishram Singh – Elsevier
2. B.D. Chaurasia's Human Anatomy – CBS Publishers
3. Manipal Manual of Anatomy for Allied Health Science Courses

Histology:

1. Textbook of Human Histology: With Color Atlas 3D Illustrations – Dr. Yogesh Sontakke
2. Textbook of Histology - A Practical guide – Dr. J. P Gunasegaran
3. Di Fiore's Atlas of Histology – Eroschenko – Lippincott Williams & Wilkins

Reference textbook:

Gray's Anatomy: The Anatomical Basis of Clinical Practice – Susan Standring – Elsevier

Physiology

Theory:

1. General Physiology

- a. Principle of homeostasis
- b. Cell membrane, cell organelles, intercellular junctions
- c. Transport across cell membrane
- d. Body fluids: Classification of body fluid compartments, ionic composition, measurement
- e. Resting membrane potential

2. Blood

- a. Composition of blood
- b. Plasma proteins: classification and functions
- c. RBC: development, morphology, counts, functions and dysfunctions

- d. Hemoglobin: types, structure, synthesis, function, degradation, anemia
- e. WBC: development, classification, morphology, counts, functions and dysfunctions
- f. Immunity: definition, classification, Innate, Cellular and Humoral Immunity
- g. Platelets: morphology, counts, development, functions and dysfunctions
- h. Blood coagulation: clotting factors, mechanism, dysfunctions
- i. Anticoagulants
- j. Blood grouping: classification, cross matching, blood transfusion, Rh factor and incompatibility

3. Nerve

- a. Structure, function, classification of neurons
- b. Neuronal action potential: ionic basis and properties
- c. Conduction of nerve impulses
- d. Nerve Injuries
- e. Neuromuscular junction: structure, mechanism of transmission & applied aspects

4. Muscle

- a. Structure of skeletal muscle & sarcomere system
- b. Mechanism of contraction and relaxation of skeletal muscle
- c. Isotonic and isometric contraction
- d. Properties of skeletal muscle
- e. Smooth muscle: structure, properties, and mechanism of contraction
- f. Differences between skeletal, smooth, and cardiac muscles

5. Autonomic nervous system

- a. Divisions and functions

6. Gastrointestinal (GI) system

- a. Functional anatomy of GIT
- b. Gastrointestinal hormones
- c. Principles & Functions of GI secretions, applied aspects
- d. Movements of GIT, applied aspects

7. Endocrine system

Hormones, actions, and dysfunctions of various endocrine glands:

- a. Hypothalamus
- b. Pituitary
- c. Thyroid
- d. Parathyroid and hormones involved in calcium homeostasis
- e. Adrenal gland
- f. Endocrine pancreas

8. Reproductive System

- a. Male and female gametogenesis
- b. Structure and function of male reproductive system
- c. Structure of female reproductive system, menstrual cycle, pregnancy, parturition, lactation
- d. Contraceptives

9. Kidney

- a. Structure & function of kidney, structure of nephron, composition of urine
- b. Glomerular filtration rate: definition, values, regulation and measurement
- c. Mechanism of urine formation: tubular functions, concentration of urine, acidification of urine
- d. Micturition reflex
- e. Diuretics
- f. Dialysis

10. Cardiovascular system

- a. Functional anatomy of heart
- b. Circulatory system: arterial, venous, capillary circulation
- c. Structure and properties of cardiac muscle
- d. Electrophysiology of heart and conduction of impulse
- e. ECG: waveforms and physiological basis
- f. Cardiac cycle, heart sounds, Jugular venous pulse
- g. Stroke volume, heart rate, cardiac output – definition, normal values and their regulation
- h. Blood pressure and regulation
- i. Coronary circulation
- j. Lymphatic circulation
- k. Applied aspects: shock, hypertension, hypotension, tachycardia, bradycardia, heart failure

11. Respiratory system

- a. Functional anatomy of respiratory system
- b. Mechanics of breathing, lung volumes and capacities, compliance, surfactant
- c. Alveolar ventilation, dead space, pulmonary circulation, ventilation-perfusion ratio
- d. Diffusion and gas exchange
- e. Transport of oxygen and carbon dioxide
- f. Brief account of respiratory regulation
- g. Acclimatization, definition & types of hypoxia, oxygen therapy, cyanosis, asphyxia.
- h. Methods of artificial respiration

12. Central nervous system

- a. Parts and functions of brain and spinal cord
- b. Sensory system: receptors and ascending pathways
- c. Motor system: motor neurons, motor units, muscle spindle, stretch reflex, and descending tracts with emphasis on corticospinal tract
- d. Cerebellum- functional anatomy, functions, and dysfunctions
- e. Basal ganglia- functional anatomy, functions, and dysfunctions
- f. Functions of hypothalamus
- g. Functions of Thalamus
- h. Types of sleep and EEG

- i. Cerebrospinal fluid
- j. Higher functions: types of memory, centers of speech, types of aphasia in brief, Cerebral cortex-lobes and functions
- k. Blood-brain barrier

13. Special senses

- a. Vision: Components of visual apparatus, visual acuity, color vision, accommodation, errors of refraction, visual pathway, pupillary reflexes
- b. Hearing: External, middle ear, inner ear and their functions, auditory pathway, hearing tests.
- c. Taste – receptors and pathway
- d. smell: receptors and pathway

14. Integrative Physiology

- a. Structure and functions of skin
- b. Regulation of temperature

Practical: Physiology

1. Hematology

- a. Methods of collection of blood
- b. Microscopy
- c. Haemocytometry
- d. Total RBC count
- e. Estimation of haemoglobin
- f. Calculation of blood indices
- g. Demonstration of osmotic fragility of red blood cells
- h. Determination of ESR
- i. Total leucocyte count
- j. Absolute eosinophil count
- k. Peripheral blood smear
- l. Differential leukocyte count
- m. Arneht count
- n. Determination of blood group
- o. Bleeding time, Clotting time
- p. Demonstration of reticulocyte count
- q. Demonstration of platelet count
- r. Demonstration of PCV

2. Clinical

- a. General physical examination
- b. Clinical examination of Radial pulse
- c. Determination of blood pressure
- d. Recording of Electrocardiogram
- e. Examination of cardiovascular system

- f. Examination of respiratory system
- g. Demonstration of spirometry
- h. Determination of vital capacity and effect of posture of vital capacity
- i. Examination of sensory system
- j. Examination of motor system
- k. Visual acuity
- l. Color vision
- m. Pupillary reflexes
- n. Perimetry
- o. Tests of hearing
- p. Mosso's ergography

Textbooks recommended: (Latest edition)

- 1. Textbook of Medical Physiology by G.K. Pal (Theory)
- 2. Textbook of Practical Physiology by G.K. Pal & Pravati Pal (Practical)

Teaching learning methodology:

The course content in Physiology will be covered by:

- 1. Interactive Lectures
- 2. Group Discussions
- 3. Practical classes & demonstrations
- 4. Seminars
- 5. Assignments

Paper III: Pathology and Microbiology

Pathology

The Pathology syllabus introduces the principles of **Pathology** with emphasis on applied aspects of Pathology particularly in the following areas:

1. Collection and dispatch of specimens for routine pathological investigations
2. Common routine pathology tests
3. General concepts of Pathology
4. Laboratory diagnosis of common pathological conditions
5. Systemic Pathology
6. Applied Surgical Pathology, cytopathology, hematopathology, renal pathology and neuropathology

Theory:

1. Adaptations, cell injury and repair

- a. Hyperplasia,
- b. hypertrophy,
- c. atrophy,
- d. metaplasia,
- e. Necrosis and
- f. Apoptosis

2. Acute and chronic inflammation

- a. Cardinal signs of inflammation
- b. Outcomes of acute inflammation
- c. Chronic inflammation
- d. Granulomatous inflammation
- e. Acute phase proteins

3. Tissue repair, regeneration, and hemodynamic disorders

- a. Cutaneous wound healing
- b. Pathological aspects of repair
- c. Hyperaemia and congestion
- d. Thrombosis and Virchow triad
- e. Embolism, infarction, and shock

4. Disorders of immune system

- a. Types of hypersensitivity reactions
- b. Autoimmune diseases

5. Neoplasia

- a. Definition of neoplasia.
- b. Differences between benign and malignant tumours
- c. Metastasis

- d. Carcinogenesis – causes

6. Applied general pathology related to transfusion medicine

- a. ABO blood group & Rh system (terminologies)
- b. Principles of blood grouping and cross matching
- c. Shelf life of stored blood
- d. Anticoagulants used for storing blood and temperature for storage

7. RBC, WBC, and bleeding disorders

- a. Anaemia – definition and classification
- b. Iron deficiency anaemia and haemolytic anaemia
- c. Leukocytosis and leukaemia
- d. Causes of splenomegaly
- e. Thrombocytopenia and coagulation disorders
- f. Phlebotomy, haemoglobin estimation, peripheral smear examination, bleeding time, PT and APTT

8. Disorders of GI tract, liver, biliary tract, and pancreas

- a. Causes of peptic ulcer, carcinoma stomach, intestinal obstruction, acute appendicitis, and colonic carcinoma
- b. Jaundice – classification based on pathophysiology
- c. Cirrhosis – definition and causes
- d. Hepatitis – types and mode of transmission
- e. Portal hypertension and hepatic failure

9. Blood vessels, heart, and lung diseases

- a. Risk factors for atherosclerosis and their classification
- b. Hypertension – definition and causes
- c. Varicose veins, thrombophlebitis and phlebothrombosis
- d. Congenital heart disease and heart failure
- e. Myocardial infarction and cor-pulmonale
- f. Rheumatic heart disease
- g. Chronic obstructive airway disease
- h. Asthma, pneumonia, and lung carcinoma

10. The kidney and lower urinary tract, male and female genital tract

- a. Acute and chronic renal failure
- b. Nephrotic and nephritis syndrome
- c. Acute tubular necrosis and urolithiasis
- d. Carcinoma penis, testicular tumours, and prostatic hyperplasia
- e. Endometriosis, adenomyosis and leiomyoma

11. Endocrine and nervous system

- a. Diagnostic criteria, types, and complications of diabetic mellitus
- b. Intracerebral, subarachnoid, and subdural haemorrhage

- c. Meningitis and encephalitis
- d. Epilepsy and CNS tumours

12. Applied Surgical Pathology & Cytopathology, renal pathology, and neuropathology

- a. Histopathology techniques
- b. Fine needle aspiration cytology and imprint cytology
- c. Basic terminologies of surgical specimens
- d. Urine analysis and renal biopsy
- e. CSF cytology, nerve and muscle biopsy, squash cytology

Textbooks recommended (latest edition):

1. Illustrated Pathology – McFarlen
2. Essentials of Rubin's Pathology
3. Basic Pathology by Robbins
4. General and systemic Pathology – Underwood and Cross

Teaching and Learning methodology

Mostly will be didactic lectures with tutorials.

Microbiology

The Microbiology syllabus introduces the principles of **Microbiology** with emphasis on applied aspects of Microbiology of infectious diseases particularly in the following areas

1. Universal and Standard precaution.
2. Collection and dispatch of specimens for routine microbiological investigations.
3. Common routine serological tests
4. General concept of infection
5. Common Bacteriological, Viral, Fungal, Parasitic infection and Laboratory diagnosis
6. Nosocomial infection
7. Biomedical waste management
8. Vaccine

Theory:

Introduction and Morphology

Introduction of microbiology, Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

Growth and Nutrition

Nutrition, Culture media, Types of medium with example and uses of culture media in diagnostic bacteriology, antimicrobial sensitivity test.

Sterilisation and Disinfection

Principles and use of equipment of sterilization namely Hot Air oven, Autoclave and serum inspissator. Pasteurization, Anti septic and disinfectants.

Immunology

Immunity, Types of Immunity, Vaccines, Types of Vaccine and immunization schedule. Principles and interpretation of commonly done serological tests namely Widal, VDRL, ASLO, ELISA, Rapid tests for HIV and HbsAg

Systematic Bacteriology

Morphology, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (the classification, antigenic structure and pathogenicity are not to be taught) Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacterium tuberculosis, Clostridium spp., Bacillus spp., Shigella spp., Salmonella spp., Escherichia coli, Klebsiella spp., Proteus spp., Vibrio cholera, Pseudomonas spp. & Spirochaetes

Parasitology

Morphology, life cycle, laboratory diagnosis of following parasites E. histolytica, Plasmodium spp., Tapeworms, Intestinal nematodes, Filariasis

Mycology

Morphology, diseases caused, laboratory diagnosis of following fungi. Candida, Cryptococcus, opportunistic fungi

Virology

General properties of viruses, diseases caused, lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis

Hospital Infection

Causative agents, transmission methods, investigation, prevention and control Hospital infection, Universal precaution, Standard precaution

Principles And Practice Biomedical Waste Management

Applied Microbiology

Causative agents, Sample collection and Laboratory diagnosis

Gastrointestinal infections, Nosocomial infections, Urinary tract infections, Respiratory tract infections, Pyogenic Meningitis, Food borne infections, Vector borne infections, Blood borne infections, Aerosol borne infections.

Textbooks recommended (latest editions):

1. CP. Baveja. Textbook of Microbiology for nurses. Arya Publishing Company.
2. RL Ichhpujani, Rajesh Bhatia. Essentials of Medical Microbiology. Jaypee Brothers Medical Pub (p) Ltd.
3. Seema Sood. Microbiology for Nursing Students & Nurses. Elsevier India Pvt.Ltd.
4. Satish Gupte. Short Textbook of Medical Microbiology. Jaypee Brothers Medical Pub (p) Ltd.
5. CK Jayaram Paniker, Ananthanarayan R. Textbook of Microbiology for nurses. Publisher Universities Press (India) Limited.
6. B.S.Nagoba. Clinical Microbiology. Bi Publications Pvt Ltd.
7. Clint E Carter, Burton J Bogitsh, Thomas N Oeltmann. Human Parasitology. Publisher Elsevier India Pvt. Ltd.

Section A: Introduction to Dialysis Therapy Technology

- History and Definition of dialysis.
- Acute Kidney disease
- Chronic Kidney disease (CKD)
- Indications for dialysis
- Types of dialysis.
- Principles of dialysis.
- Basic concepts of haemodialysis
- Basic concepts of peritoneal dialysis
- Haemodialysis apparatus - types of dialyzer & membranes.
- Types of vascular access for haemodialysis.
- Introduction to haemodialysis machine.
- Priming of dialysis apparatus.
- Dialyzer reuse.
- Common complications of haemodialysis.
- Monitoring of patients during dialysis.

Section B: General Biochemistry

- Carbohydrate chemistry: Monosaccharides, Disaccharides and Polysaccharides in health and disease
- Lipid chemistry: Simple, compound, and derived lipids, Lipoproteins in health and disease
- Protein chemistry: Amino acids, protein structure, protein denaturation
- Enzymes: Coenzymes, classification, Types of enzyme inhibition, Factors affecting enzyme activity; Clinical enzymology
- Nucleic acid chemistry: DNA, RNA
- Vitamins: Dietary sources, recommended dietary allowance, functions, and deficiency / toxicity of Vitamins
- Minerals: Dietary sources, recommended dietary allowance, functions, and deficiency / toxicity of Minerals
- Nutrition: basal metabolic rate, Protein Energy Malnutrition, Obesity, Food adulterants / additives
- Diabetes and Oral glucose tolerance test: Diagnosis and complications of diabetes,
- Renal and liver disease: RFT, LFT
- Myocardial infarction and Lipid profile: Cardiac markers

Text/Reference Books (Latest edition): Dialysis Therapy Technology

1. Handbook of Nutrition and the Kidney by William E. Mitch (Editor), T. Alp Ikizler
2. Handbook of dialysis by John T. Daugirdas
3. Core curriculum for the dialysis technician – a comprehensive review of hemodialysis by The Medical Education inc
4. Nolph and Gokal's Textbook of Peritoneal Dialysis by Khanna, Ramesh; Krediet, Raymond T.
5. www.kidney.org/professionals/kdoqi/guidelines
6. Primer on kidney disease by Arthur Greenburg (ed.), NKF
7. Textbook of basic nursing By Caroline Bunker Rosdahl
8. A Clinical Guide to Nutrition Care in Kidney Disease by Laura D. Byham-Gray
9. Manual of Nephrology by Robert W. Schrier

Text/Reference Books (Latest edition): General Biochemistry

1. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
2. Textbook of Medical Biochemistry by Ramakrishna
3. Textbook of Clinical chemistry by Norbert Teitz.
4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.

Phase II

Paper I: Applied Basic sciences (T & P)

Applied anatomy & Physiology related to Dialysis Therapy Technology:

Applied anatomy

- Basic anatomy of urinary system: structural anatomy of kidney, bladder, ureter, urethra,
- prostate.
- Histology of kidney.
- Blood supply of kidney.
- Development of kidney in brief.
- Anatomy of peritoneum including concept of abdominal hernias.
- Anatomy of vascular system:
 - a. Upper limb vessels: course, distribution, branches, origin & abnormalities.
 - b. Neck vessels: course, distribution, branches, origin & abnormalities.
 - c. Femoral vessels: course, distribution, branches, origin & abnormalities.

Applied Physiology

- Mechanism of urine formation.
- Glomerular filtration rate (GFR).
- Clearance studies.
- Physiological values of urea, creatinine, electrolytes, calcium, phosphorous, uric acid, magnesium, glucose; 24 hours urinary indices – urea, creatinine, electrolytes, calcium, magnesium.
- Physiology of renal circulation
 - a. Factors contributing & modifying renal circulation.
 - b. Auto regulation.
- Hormones produced by kidney & physiologic alterations in pregnancy.
- Haemostasis: coagulation cascade, coagulation factors, auto regulation, BT, CT, PT, PTT, thrombin time.
- Acid base balance: basic principles & common abnormalities like hypokalemia, hyponatremia, hyperkalemia, hypernatremia, hypocalcemia, hypercalcemia, pH, etc.
- Basic nutrition in renal diseases.

Applied Pathology & Microbiology related to Dialysis Therapy Technology

Applied Pathology

- Congenital abnormalities of urinary system.
- Classification of renal diseases.
- Glomerular diseases: causes, types & pathology.
- Tubulo-interstitial diseases.

- Renal vascular disorders.
- End stage renal diseases: causes & pathology.
- Pathology of kidney in hypertension, diabetes mellitus, pregnancy.
- Pathology of peritoneum, peritonitis, bacterial, tubular & sclerosing peritonitis, dialysis induced changes.
- Pathology of urinary tract infections
- Pyelonephritis & tuberculous pyelonephritis

Applied Microbiology

- Hepatotrophic viruses in detail: mode of transfusion, universal precautions vaccinations.
- Human immunodeficiency virus (HIV), mode of transfusion, universal precautions.
- Opportunistic infections.
- Microbiology of urinary tract infections.
- Microbiology of vascular access infection (femoral, jugular, subclavian catheters).
- Sampling methodologies for culture & sensitivity.

General Pharmacology

- Concepts of the interactions of chemical agents with living tissues, effect of drugs on the body, drugs and alteration of disease processes, toxicity effects. New drugs testing and development prior to use for patient care.
- Drug use in renal disease, drugs in special populations (the neonate and infant, the pregnant and elderly), pharmacokinetics, drug interactions, Definitions, routes of drug administration, Pharmacodynamics ,adverse drug reactions, therapeutic drug monitoring, pharmacogenomics and principles of individualization of drug therapy.

Pharmacology related to Dialysis Therapy Technology

- IV fluid therapy with special emphasis in renal diseases.
- Diuretics: classification, actions, dosage, side effects & contraindications.
- Anti-hypertensives: classification, actions, dosage, side effects & contraindications, special reference during dialysis, vasopressors, drugs used in hypotension.
- Drugs & dialysis: dose & duration of administration of drugs.
- Dialyzable drugs: phenobarbitone, lithium, methanol etc.
- Vitamin D & its analogues, phosphate binders, iron, folic acid & other vitamins of therapeutic value.
- Erythropoietin in detail.
- Heparin, low molecular weight heparin and heparin-induced thrombocytopenia
- Protamine sulphate as antidote and indication.
- Alternative anticoagulants.
- Formalin, citrate, sodium hypochlorite, hydrogen peroxide: role as disinfectants & adverse effects of residual particles applicable to formalin.

- Hemodialysis concentrates: composition & dilution (acetate & bicarbonates).
- Peritoneal dialysis fluid in particular hypertonic solutions: composition.
- Potassium exchange resins with special emphasis on mode of administration.

Paper II: Basic Concepts of Kidney Disease, Dialysis & Nutrition (T & P)

Basic Concepts of Kidney Diseases

- Acute Kidney Injury.
- Nephrotic syndrome – primary & secondary.
- Nephritic syndrome.
- UTI (urinary tract infections.)
- Asymptomatic urinary abnormalities.
- Chronic Kidney Disease.
- Renal stone diseases.
- Obstructive uropathies.
- Congenital & inherited renal diseases.
- Tumors of kidney.
- Kidney disease and pregnancy
- Renal vascular disorders & hypertension associated renal diseases.

Basic Concepts of Dialysis Therapy Technology

- Definition.
- Indications of dialysis.
- Types of dialysis.
- Principles of dialysis.
- Haemodialysis apparatus - types of dialyzer & membranes.
- Types of vascular access for haemodialysis.
- Introduction to haemodialysis machine.
- Priming of dialysis apparatus.
- Dialyzer reuse.
- Common complications of haemodialysis.
- Monitoring of patients during dialysis.

Basic Concepts of Nutrition

- Introduction to science of nutrition.
 - a. Definition.
 - b. Food pattern and its relation to health.
 - c. Factors influencing food habits.
 - d. Food selection, storage and preservation.
 - e. Prevention of food adulteration.
 - f. Nutritional assessment
- Classification of nutrients.
 - a. Macronutrients and micronutrients.
 - b. Types, sources, requirements, and deficiency of proteins.
 - c. Sources, requirements, and deficiency of carbohydrates.
 - d. Types, sources, requirements, and deficiency of fats.
 - e. Sources, requirement, and storage of drinking water.

- f. Types, sources, requirements, and deficiency of minerals.
 - g. Types, sources, requirements, and deficiency of vitamins.
- Planning of diets.
 - a. Need for planning of diets.
 - b. Concepts of balanced diet.
 - c. Food groups and balanced diet.
 - d. Influence of age, sex, occupation & physiological state.
 - e. Recommended dietary intake.
 - f. Steps in planning balanced diet.
 - g. Concepts of balanced diet for dialysis patients.
 - h. Recommended dietary intake for dialysis patients.
 - i. Planning diet for dialysis patients.
- Steps in planning balanced diet for dialysis patients.

Paper III: Applied Dialysis Therapy Technology - Haemodialysis , Instrumentation & protocols (T & P)

Applied Dialysis Therapy Technology - Haemodialysis

- Indications of dialysis.
- History & types of dialysis.
- Theory of hemodialysis: diffusion, osmosis, ultra-filtration & solvent drag.
- Hemodialysis apparatus: types of dialyzer & membrane, dialysate.
 - a. Dialysis Membrane:
 - i. Structure,
 - ii. Characteristics [molecular weight cut off; Ultrafiltration coefficient (K_{uf}); Mass transfer coefficient (K_{oA}) and efficiency; Low and high flux; Clearance(K)]
 - iii. Biocompatibility
 - iv. Newer membranes.
 - v. High performance membranes.
- Dialysis machines:
 - a. Latest Hemodialysis machine:
 - i. Conventional and Portable Machines
 - ii. Wearable artificial Kidney
 - b. Mechanism of functioning & management:
 - iii. Hemodialysis machine.
- Biochemical investigations required for renal dialysis.
- Adequacy of dialysis:
 - a. Hemodialysis.
 - b. Anti-coagulation.
- Withdrawal of dialysis criteria:
 - a. Acute dialysis.
 - b. Chronic dialysis.
- Dialyzer reuse.
- Water treatment system.

Clinical Education / Practical Training

A competency-based framework shall be used for training and assessment of the students. Students shall observe and assist in clinical procedures, interaction with patients and professional personnel. Students shall apply knowledge from previous learning experience under the supervision of a nephrologist or dialysis therapy technologist, in the dialysis unit.

| ENTRUSTABLE PATIENT CARE ACTIVITIES | Competency 01 | Competency 02 | Competency 03 | Competency 04 | Competency 05 |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Verify indication for haemodialysis | Attend and verify the identification of the patient. | Ensure Documentation for Dialysis indication. | Ensure Dialysis orders. | Crosscheck appropriate lab values. | Contact the medical personnel if discrepancy |
| Preparation of patient for haemodialysis | Short history on previous cannulation and history necessary for anticoagulation dose. | Record weight, BP (standing and lying), new symptoms. | Examine the access and Plan Target UF. | Put the Patient in appropriate position and check the vitals. | |
| Assembling the extracorporeal circuit | Select the appropriate Dialyser, needles, and blood tubing. | Placing the components in the machine and making appropriate connections. | To ensure all points are connected in the respective arterial and venous ports. | Priming the circuit devoid of any visible air and keeping it ready for blood connection. | |
| Setting up dialysis machine for dialysis | To ensure all tests are completed. | Perform Hand hygiene and wear PPE. To check Dialyser labelling. | To place the tubing in the respective ports and points, start priming. | To look for audible alarm sounds and air bubble in the circuit. | |
| Packing & sterilization of dialysis trays | Checking contents of dialysis trays | Verification of sterilization | | | |
| Preparation of concentrates depending on the situations | Identification and selection of appropriate Part A and Part B. | Deciding the adequate quantity and mixing at right proportion with appropriate PPE. | Mixing based on the Dialysis Prescription specific to the Patient. | Proper filling and transportation in Aseptic way. | To avoid using concentrates beyond shelf life. |
| Reuse of dialysis apparatus | With appropriate PPE check the labelling of Dialyser and readiness of re-processing machine. | Ensure calibration is done already and connect to the machine. | Documentation of Tests of performance and discard or store Dialyser as per protocol. | Labelling and storage of reused Dialyser with all details. | Dis-infecting and sanitising of reprocessing system. |
| Closing of dialysis | Wear appropriate PPE and be watchful for air entry during the procedures | Ensure UF is reached, and desired hours completed. | Complete the re-infusion and close the circuit. Transport the Dialyser, if reused | Firm Digital pressure over AVF for 10 minutes and then sterile dressing. | Discard the waste in appropriate Bin and perform hand hygiene. |
| Monitoring of patient during haemodialysis | Monitor vitals and record every 30 to 60 minutes or even earlier in unstable patients. | Look for any complication and attend to it immediately. Closely watch sugars in Diabetic patients. | Look for any alarms from the machine and attend appropriately. | To monitor vitals, venous pressure, TMP and other necessary parameters on the machine. | |

Phase III

Paper I: Applied Dialysis Therapy Technology - Medical management of dialysis patients and dialysis in special situations. (T & P)

Applied Dialysis Therapy Technology

1. Medical management

- Management of anaemia in dialysis patients.
- Complications of haemodialysis – acute and long-term

2. Dialysis in special situations:

- Patients with congestive cardiac failure.
- Advanced liver disease.
- Patients positive for HIV, HBsAg & HCV.
- Failed transplant.
- Poisoning cases.
- Pregnancy.

3. Dialysis in infants & children.

4. Special problems in dialysis patients:

- Psychology & rehabilitation.
- Diabetes
- Hypertension.
- Infections.
- Bone diseases.
- Aluminum toxicity.

Clinical Education / Practical Training

A competency-based framework shall be used for training and assessment of the students. Students shall observe and assist in clinical procedures, interaction with patients and professional personnel. Students shall apply knowledge from previous learning experience under the supervision of a nephrologist or dialysis therapy technologist, in the dialysis unit.

| Entrustable patient care activities | Competency 01 | Competency 02 | Competency 03 | Competency 04 | Competency 05 |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Preparation of dialysis catheter for haemodialysis | Wear PPE and have Dialysis tray for cleaning the Catheter hub. | Remove the old dressing, change gloves, and sterilise catheter hub as per protocol. | Make sure the hub, the caps, and the limbs are completely disinfected, discarding the old locking solution & Check exit site. | Check for the flow in both the limbs and ensure patency. | Dress the catheter and get ready for making connections. |
| AVF & AVG cannulation | Hand hygiene in appropriate PPE with Dialysis Tray. | Examine the Access and look for the Visual cues on the access. | Cannulate Aseptically with appropriate technique and angle, ensure adequate blood flow. | Make the appropriate connections to the circuit. | |
| Preparation of concentrates | Identification of components of Part A and Part B. | Preparation of components based on the requirements aseptically. | Aseptic precautions and transportation to the desired station. | To avoid using concentrates beyond shelf life. | |
| Anticoagulation | History of any recent surgery /history suggesting anticoagulation titration | Preparing checking and administration of appropriate anticoagulant | Calculation of heparin , based on body weight-loading maintenance | Calibrating the machine to deliver required heparin. | Knowledge of anticoagulants and their clinical implications |
| Maintenance of water treatment plant | Make a log book of all the components with the monitoring parameters with maintenance at recommended frequency. | Identification of all the components of RO system and their maintenance. | Do chemical, endotoxin, microbial testing. | Cleaning and maintenance of the RO membranes at recommended frequency. | Cleaning and Disinfection of the Distribution system. |
| monitoring water quality | To achieve water quality of AAMI standards. | Regular sampling of water at different points and doing chemical, endotoxin, microbial testing. | Learn about the different water purity grades. | Ability to identify the errors reported in the testing and necessary rectifying measures. | Monitoring the source water for its hardness and necessary parameters. |
| Day to day care of dialysis machine | Disinfection of the HD machine (both internal and external) with different chemicals at suggested intervals | Check the default UF, Dialysate, Heparin parameters. | To run mandatory tests as suggested by the machine company protocol. | Keeping a log of all machines and doing service as recommended by the manufacturer. | Basic idea about different brands of machine and their maintenance. |
| Dialysis Adequacy | Determining the weekly session and monitoring residual renal output. | Using the measures of adequacy at regular intervals & trying methods to increase it. | Clinically assessing the patient along with lab values monthly, making necessary changes to prescription. | To know about the different variables affecting dialysis adequacy and nutrition's importance. | Modifying the variables to achieve adequacy. |
| Preparation of dialysis catheter for haemodialysis | Wear PPE and have Dialysis tray for cleaning the Catheter hub. | Remove the old dressing, change gloves and sterilise catheter hub as per protocol. | Make sure the hub, the caps, and the limbs are completely disinfected, discarding the old locking solution & Check exit site. | Check for the flow in both the limbs and ensure patency. | Dress the catheter and get ready for making connections. |

Paper II: Applied Dialysis Therapy Technology – Peritoneal Dialysis and extracorporeal therapies other than haemodialysis. (T & P)

1. Peritoneal Dialysis

- History & Physiology of peritoneal dialysis.
- Peritoneal dialysis apparatus
- Peritoneal access devices
- Peritoneal dialysis adequacy
- Peritoneal equilibration test (PET)
- Peritoneal Dialysis prescription
- Complications of peritoneal dialysis

2. Extracorporeal therapies other than Haemodialysis

- Basic and advanced apheresis techniques
- Charcoal hemoperfusion
- Slow continuous therapies - CVVHF, CVVHD, CVVHDF, SLEDD, and SCUF
- Sorbent dialysis
- Liver Dialysis systems

3. Vascular access for hemodialysis & associated complications.

4. Complications of dialysis:

- Hemodialysis: acute & long-term complications.

Clinical Education / Practical Training

A competency-based framework shall be used for training and assessment of the students. Students shall observe and assist in clinical procedures, interaction with patients and professional personnel. Students shall apply knowledge from previous learning experience under the supervision of a nephrologist or dialysis therapy technologist, in the dialysis unit.

| Entrustable patient care activities | Competency 01 | Competency 02 | Competency 03 | Competency 04 |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Therapeutic Plasma Exchange (TPE) | Indication(s) for TPE, Contraindications, Vascular access | Selection of plasma filter, calculation of plasma volume, TPE prescription | Administration of replacement fluid, preventive strategies for hypocalcaemia, Hypotension. | Termination of TPE, checking patient status, TPE notes |
| Haemoperfusion (charcoal) | Indication for charcoal hemoperfusion, Selection of cartridge | Priming, verify patient status | Anticoagulation, monitoring of the patient | Termination, patient assessment, notes |
| Sustained Low Efficiency Daily Dialysis (SLEDD) | Indications for RRT and SLEDD, Prescription, Checking the status of the patient | Blood Flow & Dialysate flow Prescription, anticoagulation, ultrafiltration | Monitoring of the patient during treatment | Termination of SLEDD and notes |
| Continuous Renal Replacement Therapy (CRRT) | Indications for CRRT, contraindications. CRRT Modality (Site of Replacement Fluid) | Selection of CRRT modality, Prescription, Anticoagulation Prescription of CRRT | Preparing the patient, setting up the machine and the circuit, priming, Troubleshooting CRRT alarms. | Monitoring the patient on CRRT and assessment notes at termination |
| CAPD exchange | Check PD prescription for the patient, Identify and retrieve appropriate PD bags, appropriately position the patient. | Hand wash, Mask, proper handling of catheter, Proper PD connectology. | Troubleshooting – poor inflow / outflow, fibrin thread, hemoperitoneum, pain during exchange | Proper dressing of the catheter, instructing patient on appropriate handling of the catheter |
| Automated Peritoneal Dialysis | Check APD prescription, Check lab report, vitals. | Appropriate positioning of patient and APD machine. | Cartridge, setting prescription, monitoring. | Termination – check completion of treatment, UF, patient weight. |
| Peritoneal Equilibration Test (PET) | Scheduling PET, checking & optimising PD prescription, Instructions to the patient about the test | Stepwise PET procedure, collecting and labelling samples, submitting samples to the lab. | Calculating PET results and interpretation of the results. | Recommend modification of prescription, if any, to the Nephrologist |
| PD Adequacy | Scheduling the test, instructions to the patient | Sample collection, labelling, submitting to the lab | Calculation of dialysis dose and interpretation | Recommend modification of prescription, if any, to the Nephrologist |
| PD related peritonitis | Recognising symptoms and signs of peritonitis, checking whether PD effluent is turbid | Methods for confirmation of PD peritonitis diagnosis, identification of potential predisposing factors for peritonitis – exit site / tunnel infection, break in technique, GI diseases | Collecting and processing PD fluid sample for culture in a patient with suspected PD related peritonitis | IP administration of antibiotics – selection of antibiotics, dose, schedule, administration procedure, instructions to the patient – on treatment and follow up of the episode |

Paper III: Applied Dialysis Therapy Technology-recent advances in dialysis and kidney transplantation (T & P)

Applied Dialysis Therapy Technology-recent advances in dialysis and kidney transplantation

- Infection control practices in dialysis unit
- Hemodiafiltration
- Recent advances and research in hemodialysis.
 - a. Nocturnal dialysis.
 - b. Online dialysis.
 - c. Daily dialysis.
 - d. The Bioartificial Kidney
 - e. Home dialysis machines and patient training
- Telemedicine in dialysis practice.
- Introduction to kidney transplantation immunology, procedure, and Immunosuppressive medications.
- Live donor and cadaver transplantation; paired exchange transplantation and ABO incompatible transplantation; transplant in sensitized recipients.

Clinical Education / Practical Training

A competency-based framework shall be used for training and assessment of the students. Students shall observe and assist in clinical procedures, interaction with patients and professional personnel. Students shall apply knowledge from previous learning experience under the supervision of a nephrologist or dialysis therapy technologist, in the dialysis unit.

Recommended Reading:

10. Manual of Nephrology by Robert W. Schrier
11. Primer on kidney disease by Arthur Greenburg (ed.), NKF
12. Textbook of basic nursing By Caroline Bunker Rosdahl
13. A Clinical Guide to Nutrition Care in Kidney Disease by Laura D. Byham-Gray
14. Handbook of Nutrition and the Kidney by William E. Mitch (Editor), T. Alp Ikizler
15. Handbook of dialysis by John T. Daugirdas
16. Core curriculum for the dialysis technician – a comprehensive review of hemodialysis by The Medical Education inc
17. Nolph and Gokal's Textbook of Peritoneal Dialysis by Khanna, Ramesh; Krediet, Raymond T.
18. www.kidney.org/professionals/kdoqi/guidelines

Teaching techniques:

1. Interactive Lectures
2. Practical classes & demonstrations
3. Seminars
4. Assignments

Ongoing Summative Assessment:

1. Students shall be assessed periodically while they are performing entrustable patient care activities and feedback provided to improve their learning experience and to assist progress.

COURSE AND EXAMINATION REGULATIONS

Attendance:

- Students are required to attend 75% or more of all theory classes held, and 75% or more of practical in each subject to be eligible to appear in the final examination. Under no condition will a student with less than the prescribed attendance in any subject in theory and practical separately shall be allowed to appear in the Annual examination of that subject.
- Students with less than 75% attendance in theory and practical separately at the end of any year must start afresh by joining the junior batch of students. No extra classes will be arranged to make such students eligible for the final annual examinations. The attendance accrued in the previous academic year in those subject(s) will not be transferred. The student will need to secure 75% attendance afresh in theory and practical/laboratory postings after joining the junior batch to become eligible to appear in the final summative examination.
- The 25% leverage in attendance includes all types of leaves (including leave on medical grounds). For absence because of illness or any medical condition, a duly approved medical leave from Dean (Academic) with medical and fitness certificate issued/verified by authorized JIPMER clinical faculty member is mandatory. Certificate must be submitted before or within 10 days after availing medical leave.
- Students who are detained in all the subjects of a year due to lack of attendance should join the classes with junior batch within 7 days of declaration of the eligibility/detention list or when classes commence, whichever is earlier.
- Students who are detained in one or more subject(s) because of lack of attendance but are eligible to appear for final Annual examination in at least one subject of the year should join classes with junior batch within 7 days of completion of the last final theory/practical examination or when classes, whichever is earlier. Attendance will be calculated from the date of joining.
- A show cause notice will be issued to students on continuous unauthorized absence without prior permission for two weeks or more. If such absence extends to a period more than one month for any reason, the student is liable for termination for the course. The decision of the competent authority is final.
- There is **no condonation permissible** for shortage of attendance.

Internal Assessment (IA)

- A minimum of three notified internal assessments will be held periodically in each year (in a one-year period) and one model examination before the final annual examination.
- Each of the notified IA tests will carry 20% weightage and the model examination will carry 40% weightage. The sum of notified IA tests and model examination will decide the eligibility to appear in the examination and for contribution to aggregate marks.

- A student must secure at least 30% of the maximum marks fixed for internal assessment in theory and practical/clinical separately in a particular subject to be eligible to appear for the final annual examination in that subject.
- Of the final total aggregate marks in each subject, internal assessment marks will contribute 40% and annual examination marks will contribute the remaining 60%. This will apply to both theory and practical/clinical papers separately.
- If a student misses up to one notified test because of illness, marks of the remaining notified tests can be considered for calculating the internal assessment, ignoring the absence on medical grounds. To avail this concession, the student should submit a valid medical certificate signed by the treating clinical faculty member of JIPMER before or within 10 days after the missed test. This exemption will not apply to model examination. This is applicable only up to one missed notified internal assessment test.
- No repeat/additional notified internal assessment or model examination will be conducted.
- Students who are detained in all the subjects of a year because of lack of sufficient internal assessment marks should join the classes with junior batch within 7 days of declaration of the eligibility/detention list or when classes of the year commence, whichever is earlier.
- Students who are detained in one or more subject(s) due to lack of sufficient internal assessment marks but are eligible to appear in the annual examination in at least one subject of the year should join classes with junior batch within 7 days of completion of the last annual theory/practical examination or when classes of the year commence, whichever is earlier.
- The internal assessment marks accrued in the previous year will not be transferred to the next year.

Annual Examinations

Number and timing of examinations

- Annual examinations will be held at the end of each academic year. The Institute shall conduct not more than two annual examinations in an academic year, a regular annual and a supplementary examination in each subject. The supplementary examinations will be held within 6 weeks after publication of the result of the regular annual examination.
- Practical Examinations shall be jointly conducted by one internal and one external examiner duly appointed by the Professor of Examinations.
- Students should obtain a minimum of 40% in the annual examination and a minimum of 50% in the final total aggregate (total of internal assessment and annual examination marks) in a subject (theory and practical separately) to be declared as pass in that subject.

Marks scheme:

| | Maximum marks |
|--------------|---------------|
| Theory | 200 |
| Practical | 100 |
| Total | 300 |

Theory

| | Maximum marks |
|---------------------------------------|---------------|
| Internal Assessment test 1 (weighted) | 16 |
| Internal Assessment test 2 (weighted) | 16 |
| Internal Assessment test 3 (weighted) | 16 |
| Model Examination | 32 |
| Annual Theory Examination | 100 |
| Viva-voce Examination | 20 |
| Total Theory marks | 200 |

Practical

| | Maximum marks |
|---------------------------------------|---------------|
| Internal Assessment test 1 (weighted) | 7 |
| Internal Assessment test 2 (weighted) | 7 |
| Internal Assessment test 3 (weighted) | 7 |
| Model Examination | 14 |
| Record marks | 5 |
| Annual Practical Examination | 60 |
| Total Practical marks | 100 |

Question paper pattern

| | Maximum marks |
|--------------|---------------|
| Section A | 50 |
| Section B | 50 |
| Total | 100 |

Each section

| | | Marks |
|------------------|--------|-----------|
| Answer in detail | 1 X 10 | 10 |
| Short notes | 5 X 5 | 25 |
| Brief answers | 5 X 3 | 15 |
| | | 50 |

Number of attempts and Training Period

- The academic program of the BSc Allied Health Sciences courses must be completed within 6 years from the date of joining (excluding internship). Maximum permissible duration for each year shall be four years and a maximum four attempts (including the annual and supplementary examinations) in any subject will be permitted.
- If a student does not appear in both theory and practical final examination, it will NOT be considered as an attempt for the purpose of calculation of maximum number of attempts in a subject.
- If a student appears for theory in the Annual Examination but does not appear for Practical Examination or vice-versa, his/her theory or practical appearance shall be counted as an attempt. In the next attempt, the student will have to appear for both Theory and Practical Examinations. Mere submission of application form for examination will not be considered as an attempt.
- Passing in the exams of all the previous year subjects is compulsory before proceeding to the classes of next phase.
- A student who fails in theory and/or practical papers of one or more subjects in the regular annual examinations at the end of each year can appear in the supplementary examination (to be held within 6 weeks of announcement of the regular annual examination results) in those subjects.
- If he/she passes these subjects in the supplementary examination, he/she should join the regular batch within 7 days of declaration of supplementary examination results or when classes commence, whichever is earlier. Attendance calculation for students who join after passing supplementary examination will begin from their date of joining of that year.
- Students who fail in theory and/or practical in one or more subjects in the supplementary examination and those who do not appear in the supplementary examination should join classes with the junior batch within 7 days of declaration of supplementary examination results or when classes, whichever is earlier. These students should secure 75% attendance and 30% internal assessment afresh to be eligible to appear in the final regular annual examination of that year along with the junior batch. Attendance calculation for students who join after failing in supplementary examination will begin from their date of joining the year with junior batch.
- A maximum of four attempts in any subject is allowed. If a student fails even in the 4th attempt, no further chances will be given, and his/her name will be struck off the rolls of JIPMER.
- No grace marks will be awarded for either theory or practical examinations under any circumstances.

Model Question paper

Phase I - Paper I: Foundation course

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A

1. Answer the following question in detail: 1 x 10 = 10

- a. Describe in detail healthcare delivery system in India at the primary, secondary, and tertiary levels.

2. Write short notes on the following: 5 x 5 = 25

- a. What is the role of processor and RAM in a computer?
- b. Describe the types of networks in computing.
- c. Write a short note on right to healthcare.
- d. What is medical negligence? What are the laws governing medical negligence in India?
- e. Write in brief about the importance of informed consent and the process.

3. Answer the following questions briefly: 5 x 3 = 15

- a. What are the components of a medical term?
- b. What are the input and output devices of a computer?
- c. What is paralanguage? What are its implications?
- d. Describe the characteristics of good communicator.
- e. What are the alternative medicine systems recognised by the Government of India?

Section B

4. Answer the following question in detail: 1 x 10 = 10

- a. Explain the concepts of quality of care. Describe various approaches to quality improvement.

5. Write short notes on the following: 5 x 5 = 25

- a. Describe the principles of management with suitable examples.
- b. Describe the methods of disinfection in biomedical waste management.
- c. Describe the methods of prevention & control of common healthcare associated infections.
- d. Classify the types of antibiotic resistance and describe each of them.
- e. Write a short note on research study designs.

6. Answer the following questions briefly: 5 x 3 = 15

- a. What are the components of cardiopulmonary resuscitation?
- b. What is integrity and what is its importance of integrity in healthcare practice?
- c. What are the qualities of a good leader?
- d. What are the different types of data?
- e. Describe the concept of ethics and its relevance in healthcare practice.

Model Question paper

Phase I - Paper II: Anatomy and Physiology

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A - Anatomy

1. Answer the following question in detail: 1 x 10 = 10

- a. Describe the position, parts, structure, blood supply and supports of uterus.

2. Write short notes on the following: 5 x 5 = 25

- a. Parts and blood supply of stomach
b. Simple epithelium
c. Histology of lymph node
d. Chambers and valves of heart
e. Surfaces and lobes of lung

3. Answer the following questions briefly: 5 x 3 = 15

- a. Name three major salivary glands.
b. Mention two contents of spermatic cord
c. Name two paranasal air sinuses
d. Name the parts of small intestine
e. Name two upper limb muscles

Section – B - Physiology

4. Write essay answer on the following: 1 x 10 = 10

- a. Define immunity. Mention the different types of immunity. Write briefly about the different types of immunity. (2+2+6)

5. Write short notes on the following: 5 x 5 = 25

- a. Active transport
b. Movements of small intestine
c. Factors affecting glomerular filtration rate
d. Oxygen haemoglobin (Oxy-Hb) dissociation curve
e. Factors regulating cardiac output

6. Answer the following questions briefly: 5 x 3 = 15

- a. Name the hormones secreted from Adrenal gland
b. Mention the Indicators of ovulation
c. Define tidal volume. Mention its normal value.
d. Draw a labelled diagram of lead II ECG.
e. List four functions of hypothalamus.

Model Question paper

Phase I - Paper III: Pathology and Microbiology

Maximum marks: 100 Maximum duration: 3 hours
Answer all the questions. Draw suitable diagrams where necessary

Section A - Pathology

1. Answer the following question in detail: 1 x 10 = 10

- a. What is inflammation? What are the cardinal signs of inflammation? Mention the difference between acute and chronic inflammation. Add a note on granuloma with example. (1+2+4+3)

2. Write short notes on the following: 5 x 5 = 25

- a. Define necrosis. Give examples of different types of necrosis. Differences between necrosis and apoptosis.
b. What is thrombosis? Explain Virchow's triad.
c. Define neoplasia. What are the differences between benign and malignant tumours? List the different routes of metastasis.
d. Mention the differences between wound healing by primary and secondary intention.
e. Principles and procedures of blood grouping and cross-matching.

3. Answer the following questions briefly: 5 x 3 = 15

- a. Define anaemia. Give any two causes of anaemia.
b. What is jaundice? Give the classification based on pathophysiology.
c. What is atherosclerosis? Give some of its risk factors.
d. What is nephrotic syndrome? Give any two examples.
e. How will you do urine analysis?

Section – B - Microbiology

4. Write essay answer on the following: 1 x 10 = 10

- a. Define sterilization. Draw a labelled diagram of autoclave. Write principle of autoclave and its application in hospital. (1+3+3+3)

5. Write short notes on the following: 5 x 5 = 25

- a. Enumerate vector borne diseases. Add a note on the laboratory diagnosis of malaria
b. What do you understand by segregation of biomedical waste? How is it done in your hospital?
c. Describe in detail about various method of urine sample collection
d. Enumerate sexually transmitted microorganisms. Write laboratory diagnosis of HIV
e. Describe laboratory diagnosis of Mucormycosis.

6. Answer the following questions briefly: 5 x 3 = 15

- a. Name two transport media
b. Name two foodborne pathogens
c. Enumerate four Personal Protective Equipment (PPE)
d. Name two nosocomial pathogens
e. List two opportunistic fungal infection

Model Question paper

Phase I - Paper IV: Introduction to Dialysis therapy technology & Biochemistry

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A

1. Answer the following question in detail: 1 x 10 = 10

- a. Describe in detail the basic principle of continuous ambulatory peritoneal dialysis (CAPD)

2. Write short notes on the following: 5 x 5 = 25

- a. Various modalities of dialysis
- b. Complications of haemodialysis
- c. Vascular access for haemodialysis
- d. Components of Haemodialysis machine
- e. Absolute indications for dialysis

3. Answer the following questions briefly: 5 x 3 = 15

- a. Adequacy of haemodialysis
- b. Osmotic agents used in peritoneal dialysis
- c. Layers of peritoneum
- d. Parameters to be monitored during haemodialysis
- e. Haemodiafiltration

Section B

4. Write essay answer on the following: 1 x 10 = 10

- a. Describe in detail the sources, biochemical functions, and deficiency manifestation of calcium.

5. Write short notes on the following: 5 x 5 = 25

- a. Explain the working principle of gel filtration chromatography.
- b. Mention the biochemical tests for assessment of iron status and briefly describe them.
- c. Describe the mechanisms of action of enzymes.
- d. Describe the biochemical functions of Vitamin K.
- e. What is basal metabolic rate and what is its significance?

6. Answer the following questions briefly: 5 x 3 = 15

- a. How is 1M of NaCl prepared?
- b. What is Bohr effect?
- c. Name and briefly describe a test to detect protein in urine.
- d. Name any two richest sources of vitamin C and describe its role in the human body.
- e. Describe various types of pipettes and their applications.

Model Question paper

Phase II - Paper I: Applied Basic sciences

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A

1. Answer the following question in detail:

1 x 10 = 10

- Briefly describe the venous system in the upper limb of human beings with the help of a labeled diagram (4 marks). Name the two main arteries supplying the forearm (2 marks). Name the common sites in the upper limb used for creation of Arterio-Venous Fistulae (AVF) for dialysis vascular access (2 marks). Mention the different type of anastomoses used for creating AVFs (2 marks).

2. Write short notes on the following:

5 x 5 = 25

- Define shock. What are 3 major types of shock with clinical examples and mechanisms.
- Name the major types of blood groups by Landsteiner's system.
- Nosocomial infection.
- Define thrombosis. Describe in brief Virchow triad.
- Segregation of biomedical waste.

3. Answer the following questions briefly:

5 x 3 = 15

- What is normal whole blood clotting time? Name any two conditions where it may be prolonged.
- Define Nephrotic syndrome. Name any two primary glomerular diseases causing Nephrotic syndrome.
- Name some common blood brine infections in dialysis patients
- What are the commonly used disinfecting agents?
- What are the different types of vaccines?

Section B

4. Write essay answer on the following:

1 x 10 = 10

- Describe the mechanism of action of heparin and low molecular weight heparin. Describe the various strategies of anticoagulation used in haemodialysis.

5. Write short notes on the following:

5 x 5 = 25

- Erythropoiesis stimulating agents (ESAs)
- Non-calcium-based phosphate binders
- What are aminoglycosides? What is their mechanism of action? What are the common adverse effects?
- Calcium channel blockers
- Innervation of urinary bladder and functional abnormalities of the bladder

6. Answer the following questions briefly:

5 x 3 = 15

- Name the main branches of Aorta.
- Name any two direct thrombin inhibitors.
- What is protamine sulphate? What is its dose?
- What are the drugs useful in the treatment of hyperkalemia?
- What are the common transfusion reactions?

Model Question paper

Phase II - Paper II: Basic Concepts of Kidney Disease, Dialysis & Nutrition

Maximum marks: 100 Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A

- 1. Answer the following question in detail:** 1 x 10 = 10
- a. Describe the various renal syndromes? Briefly discuss the characteristics of nephrotic and nephritic syndrome? Mention a few diseases which presents as nephrotic syndrome?
- 2. Write short notes on the following:** 5 x 5 = 25
- a. Causes and management of hyperkalaemia.
b. Renal manifestations of myeloma.
c. Diabetes and kidney.
d. What are the common causes of obstructive uropathy? What are the risk factors for renal stone disease? What are the strategies useful in prevention of renal stone formation?
e. Vitamin supplementation for patient on dialysis.
- 3. Answer the following questions briefly:** 5 x 3 = 15
- a. What is subjective global assessment?
b. What is Gitelman's syndrome?
c. Name a few heavy metals which can cause kidney disease?
d. What is meant by post obstructive diuresis?
e. What is trans cellular fluid?

Section B

- 4. Write essay answer on the following:** 1 x 10 = 10
- a. What is meant by balanced diet (3 marks)? What is meant by reference man and women (2 marks)? What are the methods used to assess malnutrition in patients with chronic kidney disease (CKD) (5 marks)?
- 5. Write short notes on the following:** 5 x 5 = 25
- a. Define chronic kidney disease (CKD) and describe its stages. What are the common causes of CKD in India?
b. Define metabolic acidosis. What are the different types? Briefly discuss causes of metabolic acidosis.
c. What are the risk factors for urinary tract infection (UTI)? Name the common organisms causing UTI. Briefly describe 'complicated UTI'.
d. What is acute kidney injury (AKI)? What are the common causes? Discuss the difference between AKI and CKD.
e. Briefly describe the physiological changes related to the kidney during pregnancy.
- 6. Answer the following questions briefly:** 5 x 3 = 15
- a. Name any four nephrotoxic drugs causing AKI
b. Mention any two endogenous markers used for calculating eGFR
c. Name any two tests used in the diagnosis of urinary tract infection
d. Enumerate the strategies found useful in prevention of progression of CKD
e. Name some common food items rich in potassium content

Model Question paper
Phase II - Paper III: Applied Dialysis Therapy Technology - Haemodialysis
Instrumentation & protocols

Maximum marks: 100 Maximum duration: 3 hours
Answer all the questions. Draw suitable diagrams where necessary

Section A

1. Answer the following question in detail: 1 x 10 = 10

- a. Briefly describe the basic physiologic principles of solute transport during haemodialysis.
Briefly describe the various factors affecting solute transfer during haemodialysis procedure.

2. Write short notes on the following: 5 x 5 = 25

- a. How do you choose an appropriate dialyzer for a patient?
b. How will you evaluate an ESRD patient for creation of AV fistula for haemodialysis?
c. Describe the parts of a tunnelled haemodialysis catheter with the help of a labelled diagram.
d. Describe the substances used to make dialysis membranes.
e. What is KOA? Describe its importance in Hemodialysis.

3. Answer the following questions briefly: 5 x 3 = 15

- a. What are the various alarms available in a standard haemodialysis machine?
b. What are the advantages of AV Graft over AV Fistula?
c. Name the various techniques used for sterilising dialyzers
d. What are the common sites in the upper limb used for creation of AV fistula?
e. What are the advantages and disadvantages of placing haemodialysis catheter in the femoral vein, compared to Internal jugular vein?

Section B

4. Write essay answer on the following: 1 x 10 = 10

- a. What are the components of a water treatment plant for haemodialysis and what are the steps in water purification (3 marks)? Draw a labelled diagram of components of a water treatment plant (2 marks). Briefly describe the AAMI standards recommended for dialysis water (5 marks).

5. Write short notes on the following: 5 x 5 = 25

- a. Briefly discuss biocompatibility of dialysis membranes and its importance.
b. What is the procedure for reprocessing a dialyzer? What are the advantages and disadvantages of dialyzer reuse?
c. What is online clearance monitoring in haemodialysis? What is its principle? What are its advantages and disadvantages?
d. What is regional anticoagulation? What are the different techniques?
e. What is 'dry weight'? What are the different ways to determine whether the patient has attained dry weight?

6. Answer the following questions briefly: 5 x 3 = 15

- a. What is 'ultrapure water'? What are its advantages?
b. Name two materials used to make AV graft for dialysis access.
c. How is a high flux dialyzer different from low flux dialyzer?
d. Name any two non-renal indications for haemodialysis.
e. What is a 'middle molecule'?

Model Question paper
Phase III - Paper I: Applied Dialysis Therapy Technology - Medical management of dialysis patients and dialysis in special situations

Maximum marks: 100 Maximum duration: 3 hours
Answer all the questions. Draw suitable diagrams where necessary

Section A

- 1. Answer the following question in detail:** 1 x 10 = 10
- a. Describe the functions and regulation of erythropoietin. Discuss in brief the various erythropoiesis stimulating agents available.
- 2. Write short notes on the following:** 5 x 5 = 25
- a. Discuss briefly on the assessment of efficacy of Haemodialysis?
b. Discuss briefly on the management of bone disease in CKD.
c. Long term complications of AV Fistula
d. Vascular steal in haemodialysis.
e. Briefly discuss the technique for static venous pressure monitoring in a patient with AVF.
- 3. Answer the following questions briefly:** 5 x 3 = 15
- a. What is kt / V ?
b. What is dialysis disequilibrium syndrome?
c. What are the recommended haemoglobin levels in dialysis patients?
d. What is rule of 6 for AVF?
e. How much is the normal flow rates across AVF?

Section B

- 4. Write essay answer on the following:** 1 x 10 = 10
- a. Discuss briefly on the different types of proteinuria. What are the methods used to assess protein in urine?
- 5. Write short notes on the following:** 5 x 5 = 25
- a. What are the common problems encountered during dialysis treatment of patients with diabetes mellitus and how will you manage them?
b. Dialysis in a failed renal transplant patient
c. What are the precautions you will adopt while providing haemodialysis treatment for a patient with hepatic failure?
d. Briefly describe the strategies adopted in dialysis unit to prevent transmission of hepatitis B infection.
e. Dialysis in poisoning cases
- 6. Answer the following questions briefly:** 5 x 3 = 15
- a. Name any two drugs used in the treatment of severe secondary hyperparathyroidism in dialysis patients.
b. What are the common causes for muscle cramps during dialysis?
c. Name any two antibiotics commonly used in the treatment of dialysis catheter related blood stream infection (CRBSI).
d. What are the vaccines recommended in dialysis patients?
e. Describe the strategies useful in improving blood pressure control in dialysis patients.

Model Question paper
Phase III - Paper II: Applied Dialysis Therapy Technology – Peritoneal Dialysis and extracorporeal therapies other than haemodialysis.

Maximum marks: 100 Maximum duration: 3 hours
Answer all the questions. Draw suitable diagrams where necessary

Section A

- 1. Answer the following question in detail:** 1 x 10 = 10
- a. Describe the parts of a Tenckhoff catheter with the help of a labelled diagram. Describe the other designs of peritoneal dialysis (PD) catheters available. What are the different ways by which a PD catheter is placed in a patient?
- 2. Write short notes on the following:** 5 x 5 = 25
- a. Describe the technique and interpretation of modified Peritoneal Equilibration Test (PET).
b. Describe the advantages of intermittent (acute) PD using a rigid catheter, compared to CAPD.
c. What is 'sieving' in the context of Peritoneal Dialysis? What is the mechanism and what is its clinical significance?
d. Describe the metabolic complications of PD.
e. Describe the recommended practice for routine exit site care in a patient on PD. What are the possible complications that can affect the catheter exit site?
- 3. Answer the following questions briefly:** 5 x 3 = 15
- a. What are various types of buffers used in PD fluids?
b. What is tidal peritoneal dialysis?
c. Enumerate the common non-infective causes for turbid PD effluent.
d. Name the various antiseptics which may be used for exit site care of PD catheter.
e. What are the common causes of haemoperitoneum in patients in PD?

Section B

- 4. Write essay answer on the following:** 1 x 10 = 10
- a. What is ultrafiltration failure? What are the types and what are the common causes for ultrafiltration failure in PD?
- 5. Write short notes on the following:** 5 x 5 = 25
- a. Describe the composition of the commonly used PD fluid in your hospital. What are its advantages and disadvantages?
b. What is Automated PD? Write a model prescription of APD. What are its advantages and disadvantages?
c. Describe the three-pore model of Peritoneal Dialysis.
d. Describe the advantages of PD over haemodialysis as a modality of renal replacement therapy.
e. Describe the mechanical complications of PD.
- 6. Answer the following questions briefly:** 5 x 3 = 15
- a. What are the common causes of hypoalbuminemia in patients on PD?
b. How do you recognise an exit site infection of PD catheter?
c. What are the common reasons why a patient on PD may develop oedema?
d. What are Twardowski curves in the context of PD?
e. Enumerate the newer peritoneal dialysis solutions available.

Model Question paper
Phase III - Paper III: Applied Dialysis Therapy Technology-recent advances in dialysis and kidney transplantation

Maximum marks: 100 Maximum duration: 3 hours
Answer all the questions. Draw suitable diagrams where necessary

Section A

1. Answer the following question in detail: 1 x 10 = 10

- a. What is 'Liver dialysis'? Describe the principals involved and components of a standard liver dialysis system.

2. Write short notes on the following: 5 x 5 = 25

- a. What is 'regional anticoagulation' for dialysis? What are the various techniques of regional anticoagulation?
- b. What is a 'catheter lock' in the context of haemodialysis catheters? What are the various preparations and what are its uses?
- c. What is online clearance monitoring in haemodialysis? How is it done? What are its advantages and disadvantages?
- d. Briefly describe the newer peritoneal dialysis solutions and their advantages over the traditional solutions
- e. Briefly discuss the contraindications for a living person to donate a kidney.

3. Answer the following questions briefly: 5 x 3 = 15

- a. Name any four long term complications from haemodialysis catheters
- b. Name any four agents used for 'induction immunosuppression' in kidney transplantation
- c. What are the dialysis adequacy targets recommended in Peritoneal Dialysis patients?
- d. Name any two antibiotics used for treatment of CRBSI from gram negative organisms
- e. Discuss the advantages of tunnelled catheters over AV fistula for dialysis access.

Section B

4. Write essay answer on the following: 1 x 10 = 10

- a. What is a 'wearable artificial Kidney'? Briefly describe the various models and their advantages and disadvantages.

5. Write short notes on the following: 5 x 5 = 25

- a. Briefly discuss the principles and the technique of online hemodiafiltration.
- b. What are 'hybrid therapies'? What are its advantages and disadvantages?
- c. What is Sorbent dialysis? Briefly describe the principles and the apparatus used.
- d. What are the common complications associated with CRRT?
- e. What are the novel techniques available to reduce the risk of hypotension during dialysis?

6. Answer the following questions briefly: 5 x 3 = 15

- a. Name any four common complications encountered after kidney transplantation.
- b. According to the provisions of the transplantation of human organs act (THOA), who all are acceptable as living donors?
- c. Briefly discuss the advantages of Automated Peritoneal Dialysis (APD) over CAPD.
- d. What is single pass dialysis?
- e. What is pre-emptive transplantation?
