SYLLABUS AND CURRICULUM OF DIPLOMA IN DIALYSIS TECHNICIAN COURSE

DIPLOMA IN DIALYSIS TECHNICIAN (DDT)

The Diploma in Dialysis Technician (DDT) is a Diploma course that trains students to operate dialysis machines, assist nephrologists, manage patients with renal failure, and ensure proper care before, during, and after dialysis.

Dialysis Technicians play a key role in treating kidney failure patients, as they require regular dialysis until kidney transplant or lifelong treatment.

Course Overview

- **Full Form**: DIPLOMA IN DIALYSIS TECHNICIAN (DDT)
- **Duration**: 2 Years + 6 Months (Internship)
- **Eligibility**:
    - 10+2 pass (Science stream – PCB or PCM usually preferred)
    - Minimum 45–50% marks
    - On the basis of 10th (Only Certificate Courses)
    - On the basis of certificate – diploma in same course (lateral entry)

Career Opportunities after D D T

- **Government & Private Hospitals**
- **Dialysis Centers & Clinics**
- **Multispecialty Hospitals**
- **Kidney Care / Nephrology Centers**
- **NGOs and Health Missions**
- **Home Dialysis Care Services**

SEMESTER – I

PAPER CODE	SUBJECT NAME	THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PRACTICAL MARKS
DDT101	ANATOMY & PHYSIOLOGY	45 Min	1 Hrs.	50	50
DDT102	BASICS OF DIALYSIS TECHNICS	45 Min	1 Hrs.	50	50
DDT103	BIOCHEMISTRY	45 Min	1 Hrs.	50	50
DDT104	PATHOLOGY	45 Min	1 Hrs.	50	50

ANATOMY & PHYSIOLOGY

THEORY

1. Introduction

- Definition and scope of Anatomy and Physiology
- Anatomical terms, planes, positions, and movements
- Levels of structural organization of the human body
- Overview of cells and tissues (epithelial, connective, muscular, nervous)

2. Skeletal System

- Structure and functions of bones
- Classification of bones and joints
- Axial and appendicular skeleton
- Major bones of the body
- Types of joints and movements
- Disorders: arthritis, osteoporosis, fractures

3. Muscular System

- Types of muscles (skeletal, smooth, cardiac)
- Structure and functions of skeletal muscle
- Muscle contraction (sliding filament theory in brief)
- Major muscles of the body
- Disorders: myopathy, muscular dystrophy, cramps

4. Circulatory System

- Structure and functions of the heart
- Blood circulation: systemic, pulmonary, portal circulation
- Structure and function of blood vessels (arteries, veins, capillaries)
- Blood composition, functions, blood groups, coagulation

- Lymphatic system: lymph nodes, spleen, thymus, tonsils
- Disorders: hypertension, anemia, heart failure

5. Respiratory System

- Organs of respiration (nose, pharynx, larynx, trachea, lungs)
- Mechanism of breathing and gas exchange
- Control of respiration
- Disorders: asthma, pneumonia, tuberculosis, COPD

6. Digestive System

- Structure and functions of mouth, pharynx, esophagus, stomach, intestines, liver, pancreas, gallbladder
- Digestion and absorption of food
- Metabolism (overview)
- Disorders: ulcer, hepatitis, cirrhosis, constipation

7. Excretory System (Important for Dialysis Technician)

- Structure and functions of kidney, ureter, urinary bladder, urethra
- Nephron structure and urine formation (filtration, reabsorption, secretion)
- Water and electrolyte balance
- Acid-base balance
- Disorders: renal failure, kidney stones, UTI

8. Nervous System

- Structure and function of neuron
- Central nervous system: brain and spinal cord
- Peripheral nervous system: cranial and spinal nerves
- Autonomic nervous system: sympathetic and parasympathetic
- Reflex action and reflex arc
- Disorders: epilepsy, stroke, neuropathy

9. Endocrine System

- Endocrine glands: pituitary, thyroid, parathyroid, adrenal, pancreas, gonads
- Hormones and their functions
- Disorders: diabetes mellitus, hypothyroidism, hyperthyroidism, Addison's disease

10. Reproductive System

- Male reproductive organs and functions
- Female reproductive organs and functions
- Menstrual cycle, fertilization, pregnancy (basic)
- Disorders: infertility, PCOD, prostate enlargement

11. Integumentary System

- Structure of skin, hair, nails
- Functions of skin
- Disorders: dermatitis, skin infections, burns

12. Special Senses

- Structure and function of eye, ear, nose, tongue, skin receptors
- Vision, hearing, taste, smell, touch
- Disorders: cataract, glaucoma, deafness

PRACTICAL

➢ General Practical Skills

- Familiarization with laboratory instruments (microscope, slides, charts, models).
- Handling and preparation of biological specimens.
- Safety measures in anatomy & physiology laboratory.

➢ Cell & Tissue Study

- Microscopic observation of:
  - Epithelial tissues (squamous, columnar, ciliated, stratified).
  - Connective tissues (areolar, adipose, cartilage, bone).
  - Muscle tissues (skeletal, smooth, cardiac).
  - Nervous tissue (neuron).
- Drawing and labeling observed structures.

➢ Skeletal System

- Study of human skeleton model.
- Identification of major bones (skull, vertebrae, ribs, sternum, pelvic bone, long bones).
- Demonstration of types of joints (ball and socket, hinge, pivot, etc.).

➢ Muscular System

- Identification of major muscles on charts/models.
- Demonstration of muscle movements (flexion, extension, abduction, rotation).
- Palpation of selected superficial muscles.

➢ Circulatory System

- Demonstration of heart models and blood vessels.
- Study of systemic, pulmonary, and portal circulation using charts.
- Measurement of **pulse rate** in radial artery.
- Measurement of **blood pressure** using sphygmomanometer.

- Estimation of hemoglobin, blood grouping & cross matching (demonstration/observation).

➢ **Respiratory System**

- Identification of organs on models/charts (lungs, trachea, diaphragm).
- Demonstration of mechanism of breathing using a bell-jar/lung model.
- Measurement of respiratory rate.
- Peak expiratory flow rate (PEFR) demonstration.

➢ **Digestive System**

- Identification of digestive organs on models/charts.
- Observation of permanent slides of stomach, intestine, liver, pancreas.
- Demonstration of digestion of starch by salivary amylase (simple experiment).

➢ **Excretory System (Most Relevant for Dialysis Technician)**

- Identification of kidney, ureter, urinary bladder on models/charts.
- Study of nephron structure (microscopic slide/model).
- Urine analysis (normal vs abnormal):
    - Physical examination (color, volume, odor, pH, specific gravity).
    - Chemical tests for sugar, protein, ketone bodies (demonstration).

➢ **Nervous System**

- Study of brain and spinal cord using models/charts.
- Identification of parts of brain: cerebrum, cerebellum, medulla, midbrain.
- Demonstration of reflex action (knee-jerk reflex).
- Study of cranial nerves (charts/models).

➢ **Endocrine System**

- Demonstration of endocrine glands on models/charts.
- Identification of thyroid, pituitary, adrenal, pancreas (islets of Langerhans).

➢ **Reproductive System**

- Identification of male & female reproductive organs using charts/models.
- Study of ovary & testis under microscope.

➢ **Special Senses**

- Demonstration of structure of eye & ear (charts/models).
- Testing of visual acuity (Snellen's chart).
- Color vision test (Ishihara chart).
- Hearing tests (tuning fork tests – Rinne's & Weber's, demonstration).
- Taste testing (basic taste sensations).

➢ **Integumentary System**

- Study of structure of skin with charts/slides.
- Identification of sweat glands, sebaceous glands, and hair follicles.

BASICS OF DIALYSIS TECHNICS

THEORY

1. Introduction to Dialysis

- Definition and scope of dialysis.
- History and evolution of dialysis.
- Basic principles of dialysis (diffusion, osmosis, ultrafiltration).
- Indications for dialysis (acute and chronic kidney failure).
- Types of dialysis (hemodialysis, peritoneal dialysis, hemofiltration).

2. Anatomy & Physiology Related to Dialysis

- Structure and function of kidney.
- Nephron and mechanism of urine formation.
- Renal function tests (serum creatinine, BUN, electrolytes).
- Fluid and electrolyte balance.
- Acid-base balance in the body.

3. Dialysis Membranes and Fluids

- Dialysis membranes: types (cellulose, synthetic), properties.
- Dialysate fluid: composition, preparation, and safety.
- Principles of solute clearance.
- Buffer systems in dialysis (bicarbonate, acetate).

4. Hemodialysis – Basics

- Vascular access: arteriovenous fistula, graft, central venous catheter.
- Hemodialysis machine – basic components and functions.
- Dialyzer (artificial kidney): structure, types (hollow fiber, flat plate).
- Anticoagulation in dialysis (heparin, citrate).
- Basic dialysis procedure steps (initiation, monitoring, termination).

5. Peritoneal Dialysis – Basics

- Peritoneal membrane as a natural dialyzer.
- Types of peritoneal dialysis: CAPD, APD.
- Catheter insertion and care.
- Advantages, disadvantages, and complications.

6. Patient Preparation for Dialysis

- Pre-dialysis patient assessment (vitals, weight, lab values).
- Infection control and aseptic techniques.
- Patient counseling and psychological support.
- Nutrition and fluid restrictions for dialysis patients.

7. Complications and Management (Introductory)

- Common complications during hemodialysis:
  - Hypotension
  - Cramps
  - Headache
  - Nausea & vomiting
  - Air embolism
- Complications of peritoneal dialysis: peritonitis, catheter infection, hernia.
- Basic emergency management protocols.

8. Dialysis Unit Setup

- Layout and environment of dialysis unit.
- Disinfection and sterilization of dialysis equipment.
- Water treatment system in dialysis unit (importance, basics).
- Safety measures for patients and staff.

9. Ethical and Professional Aspects

- Role and responsibilities of dialysis technician.
- Patient rights, confidentiality, and consent.
- Professional behavior and communication with patients.
- Ethical issues in long-term dialysis care.

PRACTICAL

➢ Introduction & Orientation

- Familiarization with dialysis unit layout and equipment.
- Identification of parts of hemodialysis machine, dialyzer, bloodlines.
- Demonstration of peritoneal dialysis (PD) setup and catheter.
- Safety protocols and infection control practices in dialysis unit.

➢ Vascular Access

- Identification of vascular access types (AV fistula, graft, central venous catheter).
- Demonstration of access site care and aseptic precautions.
- Observation of cannulation procedure (done by nurse/doctor).
- Hands-on training with models for AV fistula cannulation (where available).

➢ Dialysis Machine Handling (Basic)

- Parts of dialysis machine: blood pump, dialysate pump, monitor, alarms.
- Switching on/off and priming the dialysis machine (demonstration).
- Setting dialysate flow and blood flow rates.
- Checking and handling alarms (air detector, pressure monitors, temperature).

➢ Dialyzer & Dialysate Preparation

- Identification of types of dialyzers (hollow fiber, flat plate).
- Demonstration of dialyzer reprocessing (cleaning, rinsing, sterilization – introduction only).
- Preparation of dialysate fluid and checking composition.
- Demonstration of bicarbonate and acetate buffer system.

➢ Hemodialysis Procedure (Demonstration & Practice on Models)

- Pre-dialysis preparation: checking vitals, weight, and lab values.
- Priming of extracorporeal circuit (bloodlines & dialyzer).
- Connecting patient to machine (demonstration).
- Monitoring patient during dialysis: vitals, blood pressure, symptoms.
- Termination of dialysis: returning blood, disconnecting patient.

➢ Peritoneal Dialysis (PD)

- Identification of PD catheter and accessories.
- Demonstration of CAPD (Continuous Ambulatory Peritoneal Dialysis) exchange procedure.
- Maintaining aseptic technique during PD.
- Observation of APD (Automated Peritoneal Dialysis).

➢ Complications & Management (Introductory Practical)

- Recognition of common hemodialysis complications:
  - Hypotension
  - Muscle cramps
  - Nausea/vomiting
  - Air embolism (demonstration with models/charts)
- Observation of management steps by dialysis staff.
- Demonstration of emergency protocols: CPR basics, emergency trolley setup.

➢ Water Treatment System (Introductory)

- Introduction to water purification system in dialysis (RO plant, filters).
- Demonstration of water quality testing (chlorine, hardness, conductivity – observation).
- Importance of safe water for dialysis.

➢ **Infection Control & Waste Disposal**

- Hand hygiene techniques (WHO method).
- Use of gloves, masks, gowns during dialysis procedures.
- Biomedical waste segregation and disposal in dialysis unit.
- Surface and equipment disinfection procedures.

➢ **Patient Care & Communication**

- Pre- and post-dialysis patient assessment (weight, vitals, symptoms).
- Counseling of patient regarding fluid restriction and diet (demonstration).
- Recording patient data in dialysis register/software.
- Maintaining confidentiality and ethical practices.

BIOCHEMISTRY

THEORY

1. Introduction to Biochemistry

- Definition, scope, and importance of biochemistry in healthcare.
- Structure and function of biomolecules.
- pH, buffer systems, and their role in the body.
- Clinical significance of biochemistry in renal disorders.

2. Carbohydrates

- Classification, structure, and functions of carbohydrates.
- Digestion and absorption of carbohydrates.
- Glycolysis, gluconeogenesis, glycogen metabolism (overview).
- Diabetes mellitus – biochemical basis and monitoring.
- Blood glucose estimation and significance.

3. Proteins & Amino Acids

- Structure, types, and functions of proteins.
- Essential and non-essential amino acids.
- Protein digestion and metabolism (overview).
- Plasma proteins and their role in health.
- Disorders: proteinuria, hypoalbuminemia (in renal disease).
- Clinical estimation of serum proteins and albumin.

4. Lipids

- Classification and functions of lipids.

- Digestion, absorption, and transport of lipids.
- Cholesterol and lipoproteins (HDL, LDL, VLDL).
- Role of lipids in atherosclerosis and cardiovascular disease.
- Lipid abnormalities in kidney patients.

5. Enzymes

- Definition, properties, and classification of enzymes.
- Factors affecting enzyme activity (temperature, pH, inhibitors).
- Diagnostic importance of enzymes (urease, creatine kinase, LDH, ALT, AST).
- Enzyme assays (principles).

6. Nucleic Acids

- Structure of DNA and RNA.
- Functions of nucleic acids.
- Basics of replication, transcription, translation (overview).
- Clinical importance: genetic disorders, cancers.

7. Vitamins & Minerals

- Classification: water-soluble and fat-soluble vitamins.
- Functions and deficiency disorders of vitamins (A, D, E, K, B-complex, C).
- Major minerals: calcium, sodium, potassium, magnesium, chloride, phosphorus.
- Trace elements: iron, zinc, iodine.
- Importance of electrolytes in dialysis patients.

8. Water & Electrolyte Balance

- Body water distribution and osmotic pressure.
- Mechanisms of fluid balance.
- Electrolyte regulation: sodium, potassium, calcium, bicarbonate.
- Acid-base balance and buffer systems in the body.
- Biochemical changes in renal failure and dialysis.

9. Renal Biochemistry (Most Relevant)

- Kidney function and biochemical aspects of urine formation.
- Non-protein nitrogenous substances: urea, creatinine, uric acid.
- Blood Urea Nitrogen (BUN), serum creatinine – importance in dialysis.
- Urine analysis: normal vs abnormal constituents.
- Biochemical markers of kidney disease.

10. Clinical Biochemistry Applications

- Liver function tests (bilirubin, liver enzymes, proteins).
- Blood lipid profile.
- Blood glucose and HbA1c.

- Biochemical investigations in chronic kidney disease (CKD).
- Dialysis adequacy assessment (Kt/V, URR – introduction).

PRACTICAL

➢ Laboratory Orientation & Safety

- Introduction to biochemistry laboratory equipment (pipettes, centrifuge, colorimeter, spectrophotometer, flame photometer).
- Preparation of reagents, buffers, and solutions.
- Units of measurement and normal laboratory values.
- Laboratory safety rules and biomedical waste disposal.

➢ Carbohydrate Analysis

- Qualitative tests for carbohydrates: Benedict's, Fehling's, Molisch's, Barfoed's, Iodine test.
- Quantitative estimation of blood glucose:
  - Glucose oxidase/peroxidase method (GOD-POD).
  - Folin-Wu / O-Toluidine method (demonstration/observation).
- Urine sugar testing (Benedict's test, dipstick method).

➢ Protein Analysis

- Qualitative tests for proteins: Biuret, Xanthoproteic, Millon's, Ninhydrin.
- Quantitative estimation of serum proteins (Biuret method).
- Estimation of serum albumin and A/G ratio.
- Urine protein test (heat coagulation, sulfosalicylic acid test).

➢ Lipid Analysis

- Tests for lipids: Sudan III staining, saponification, emulsification.
- Estimation of serum cholesterol (enzymatic method).
- Observation of lipid profile (HDL, LDL, triglycerides).

➢ Enzyme Activity

- Demonstration of enzyme activity (e.g., effect of temperature and pH on salivary amylase).
- Estimation of serum enzymes (SGPT, SGOT, alkaline phosphatase – demonstration/observation).

➢ Renal Function Tests (Most Relevant for Dialysis Technician)

- Estimation of blood urea (Diacetyl monoxime / Urease method).
- Estimation of serum creatinine (Jaffe's method).
- Estimation of uric acid (Caraway method / enzymatic method).
- Interpretation of BUN and creatinine clearance (theory + calculation practice).

➢ **Electrolyte & Acid-Base Balance**

- Demonstration of serum sodium, potassium, chloride estimation (flame photometer/ion-selective electrode).
- Determination of serum calcium and phosphorus (colorimetric methods).
- pH measurement of urine/blood samples.
- Buffer preparation and demonstration of buffering action.

➢ **Urine Analysis (Normal & Abnormal)**

- Physical examination: color, volume, odor, pH, specific gravity.
- Chemical tests:
  - Sugar, proteins, ketone bodies, bile salts, bile pigments, blood.
- Microscopic examination of urinary deposits (RBCs, WBCs, casts, crystals).

➢ **Clinical Case-Oriented Practicals**

- Interpretation of biochemical reports of kidney disease patients.
- Correlation of lab findings with dialysis requirement.
- Case discussions: CKD, AKI, diabetic nephropathy.

PATHOLOGY

THEORY

1. Introduction to Pathology

- Definition, scope, and branches of pathology (general, systemic, clinical).
- Basic terms: lesion, necrosis, degeneration, inflammation, neoplasia.
- Methods of studying pathology: biopsy, cytology, autopsy, histopathology.

2. Cell Injury & Adaptation

- Causes of cell injury (hypoxia, toxins, infections).
- Types of cell injury: reversible and irreversible.
- Cellular adaptation: hypertrophy, hyperplasia, atrophy, metaplasia.
- Necrosis and apoptosis – types and significance.

3. Inflammation & Repair

- Acute and chronic inflammation – causes, features, outcomes.
- Cells and chemical mediators of inflammation.
- Healing and repair: regeneration, fibrosis, scar formation.
- Wound healing and factors affecting healing.

4. Disorders of Circulation

- Edema – types, causes, and relevance in renal disease.
- Thrombosis, embolism, infarction.
- Shock – types and pathophysiology.
- Hemorrhage and hemostasis.

5. Immunopathology

- Basic concepts of immunity.
- Hypersensitivity reactions (Types I–IV).
- Autoimmune diseases (SLE, rheumatoid arthritis).
- Transplant rejection (basic).
- Relevance of immune reactions in dialysis and renal transplantation.

6. Hematology

- Composition and functions of blood.
- Anemia – classification, causes, features (iron deficiency, hemolytic, megaloblastic).
- Leukemia – basic types and features.
- Bleeding disorders (hemophilia, thrombocytopenia, DIC).
- Hematological changes in renal failure.

7. Systemic Pathology – Kidney & Urinary Tract (Most Relevant)

- Normal structure and function of kidney.
- Acute kidney injury (AKI) – causes, pathology.
- Chronic kidney disease (CKD) – stages, pathology, complications.
- Glomerular diseases (glomerulonephritis, nephrotic syndrome).
- Tubular and interstitial diseases (pyelonephritis).
- Polycystic kidney disease.
- Renal tumors (renal cell carcinoma, Wilms' tumor).
- Urinary tract infections (UTI).
- Obstructive uropathy, renal stones.

8. Systemic Pathology – Other Organs

(Brief overview, to understand comorbidities in dialysis patients)

- Cardiovascular system: atherosclerosis, myocardial infarction, hypertension.
- Respiratory system: pneumonia, tuberculosis.
- Liver: hepatitis, cirrhosis.
- Endocrine system: diabetes mellitus, thyroid disorders.

9. Clinical Pathology

- Collection and preservation of specimens: blood, urine, sputum.

- Urine examination (physical, chemical, microscopic).
- Hematology tests: Hb, PCV, ESR, TLC, DLC, blood grouping.
- Coagulation profile (PT, aPTT, bleeding time, clotting time – overview).
- Serological tests: Widal, HIV, HBsAg, VDRL (introduction).
- Biopsy and cytology – basics.

10. Pathology Related to Dialysis

- Complications of long-term dialysis (anemia, infections, amyloidosis).
- Pathology of renal osteodystrophy.
- Dialyzer-related reactions.
- Blood-borne infections in dialysis unit (Hepatitis B, Hepatitis C, HIV).

PRACTICAL

➢ Laboratory Orientation & Safety

- Familiarization with pathology laboratory equipment (microscope, centrifuge, hemocytometer, slides, stains).
- Collection, labeling, and preservation of clinical specimens (blood, urine, sputum).
- Universal precautions and biomedical waste disposal.

➢ Hematology Practicals

- Estimation of Hemoglobin (Sahli's / Cyanmethemoglobin method).
- Determination of Packed Cell Volume (PCV).
- Estimation of Erythrocyte Sedimentation Rate (ESR).
- Total Leukocyte Count (TLC) and Differential Leukocyte Count (DLC) using blood smear.
- Platelet count (manual method).
- Coagulation tests (bleeding time, clotting time – demonstration).
- Peripheral blood smear preparation and staining (Leishman's/Giemsa) with identification of normal RBCs, WBCs, and platelets.

➢ Urine Examination (Highly Relevant for Dialysis)

- Physical examination: color, odor, volume, pH, specific gravity.
- Chemical examination:
  - Albumin (heat test, sulfosalicylic acid test).
  - Sugar (Benedict's test, dipstick method).
  - Ketone bodies, bile salts, bile pigments, blood.
- Microscopic examination of urinary sediment: RBCs, WBCs, pus cells, casts, crystals, epithelial cells.

➢ Clinical Pathology Practicals

- Collection and preservation of blood, urine, sputum samples.
- Demonstration of bone marrow smear preparation (observation only).
- Examination of body fluids (CSF, pleural fluid – demonstration).
- Semen analysis (basic introduction).

➢ **Histopathology & Cytology (Demonstration / Observation)**

- Fixation and processing of tissues.
- Embedding, section cutting, and staining (H&E).
- Observation of prepared slides:
  - Kidney (normal, glomerulonephritis, chronic kidney disease).
  - Liver (hepatitis, cirrhosis).
  - Tumors (benign vs malignant features).
- Demonstration of fine needle aspiration cytology (FNAC).

➢ **Blood Grouping & Cross Matching**

- ABO and Rh blood grouping (slide and tube method).
- Cross-matching principle and demonstration (important for dialysis transfusion cases).

➢ **Infection Screening (Relevant for Dialysis Unit)**

- Rapid tests for HIV, HBsAg, HCV (demonstration).
- Screening methods for tuberculosis (sputum smear AFB – demonstration).
- Sterility testing in dialysis unit (demonstration).

➢ **Case Studies & Report Interpretation**

- Interpretation of complete blood count (CBC) reports.
- Interpretation of urine examination reports.
- Correlation of lab findings with kidney disease and dialysis requirement.
- Discussion of pathology case sheets of CKD, anemia, UTI, hepatitis in dialysis patients.

SEMESTER – II

PAPER CODE	SUBJECT NAME	THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PRACTICAL MARKS
DDT201	DIALYSIS PRINCIPLES AND TECHNIQUES	45 Min	1 Hrs.	50	50
DDT202	MICROBIOLOGY	45 Min	1 Hrs.	50	50
DDT203	DIALYSIS MANAGEMENT	45 Min	1 Hrs.	50	50
DDT204	GENERAL MEDICINE	45 Min	1 Hrs.	50	50

DIALYSIS PRINCIPLES AND TECHNIQUES

THEORY

1. Introduction to Dialysis

- Definition and history of dialysis.
- Need and scope of dialysis in kidney diseases.
- Renal replacement therapy: Hemodialysis, Peritoneal dialysis, Kidney transplantation (basic overview).
- Role of dialysis technician.

2. Physiology and Pathophysiology Related to Dialysis

- Review of renal anatomy & physiology.
- Kidney functions (filtration, secretion, reabsorption, endocrine).
- Pathophysiology of Acute Kidney Injury (AKI) & Chronic Kidney Disease (CKD).
- Fluid and electrolyte balance.
- Acid–base balance and its disturbances in renal failure.

3. Principles of Dialysis

- Concept of diffusion, osmosis, ultrafiltration, convection.
- Solute transport across membranes.
- Clearance and dialysis adequacy (Kt/V, URR – basics).
- Dialysate composition and its role.

4. Hemodialysis Techniques

- Hemodialysis machine: structure, components, functions.
- Types of dialyzers (hollow fiber, parallel plate, high flux vs low flux).
- Vascular access: arteriovenous fistula, grafts, central venous catheters.
- Steps in hemodialysis procedure.
- Anticoagulation in dialysis (Heparin, citrate – basics).
- Complications of hemodialysis (hypotension, cramps, clotting, air embolism, disequilibrium syndrome).
- Monitoring during dialysis: BP, pulse, weight, fluid removal.

5. Peritoneal Dialysis

- Principle and mechanism of peritoneal dialysis.
- Peritoneal membrane physiology.
- Types: Continuous Ambulatory Peritoneal Dialysis (CAPD), Automated Peritoneal Dialysis (APD).
- Equipment and dialysate used.

- Procedure of CAPD (steps).
- Complications: peritonitis, infection, catheter malfunction, fluid imbalance.

6. Water Treatment and Dialysis Fluids

- Importance of water quality in dialysis.
- Steps in water purification: filtration, softening, reverse osmosis.
- Standards for water and dialysate (AAMI / ISO basics).
- Composition and preparation of dialysate.

7. Dialysis Unit Setup and Management

- Layout of dialysis unit.
- Disinfection and sterilization procedures.
- Biomedical waste disposal in dialysis unit.
- Infection control practices (universal precautions, handling of blood-borne pathogens like HBV, HCV, HIV).
- Record keeping and patient data management.

8. Medications in Dialysis

- Common drugs used in dialysis patients:
  - Antihypertensives.
  - Erythropoietin.
  - Iron supplements.
  - Phosphate binders.
  - Vitamin D analogues.
- Anticoagulants in dialysis.

9. Dialysis Emergencies & Troubleshooting

- Recognition and management of complications:
  - Hypotension, arrhythmias.
  - Anaphylaxis, allergic reactions.
  - Blood loss, hemolysis.
- Troubleshooting dialysis machine alarms.
- Power failure and emergency preparedness.

10. Recent Advances in Dialysis

- High-flux hemodialysis.
- Hemodiafiltration.
- Sorbent dialysis systems.
- Wearable and portable dialysis devices.

11. Professional and Ethical Aspects

- Role of dialysis technician in patient care.

- Patient communication and counseling.
- Ethical issues in dialysis practice.
- Teamwork with nephrologists and nurses.

PRACTICAL

➢ Orientation & Safety

- Familiarization with dialysis unit layout and equipment.
- Universal precautions – hand hygiene, gloves, PPE use.
- Biomedical waste disposal in dialysis unit.
- Disinfection of dialysis machines and unit area.

➢ Hemodialysis Machine Handling

- Identification of machine parts and their functions.
- Switching on/off and priming of machine.
- Setting up bloodlines and dialyzer.
- Checking alarms and troubleshooting basics.
- Recording machine parameters.

➢ Water Treatment System

- Demonstration of water purification (sand filter, carbon filter, softener, RO system).
- Checking conductivity, hardness, and chlorine levels in water.
- Disinfection and maintenance of RO plant.

➢ Vascular Access

- Identification of different vascular access (AV fistula, graft, catheter).
- Preparation of patient and site for cannulation.
- Cannulation technique (demonstration + practice on dummy/under supervision).
- Care and maintenance of vascular access.

➢ Hemodialysis Procedure

- Pre-dialysis assessment: history, weight, BP, pulse, temperature.
- Priming of dialyzer and bloodline.
- Connection of patient to machine.
- Monitoring during dialysis (vital signs, UF, blood flow, dialysate flow).
- Termination of dialysis and reinfusion of blood.
- Post-dialysis assessment and recording.

➢ 6. Peritoneal Dialysis

- Identification of CAPD/APD equipment and dialysate.

- Demonstration of CAPD exchange procedure.
- Care of PD catheter and site dressing.
- Recognition of complications (peritonitis, leakage, blockage).

➢ **Patient Monitoring & Care**

- Measurement of dry weight and calculation of fluid removal.
- Monitoring electrolyte balance and symptoms of imbalance.
- Managing hypotension, cramps, nausea during dialysis.
- Recording and maintaining patient dialysis charts.

➢ **Infection Control**

- Screening procedures for HBV, HCV, HIV in dialysis patients.
- Cleaning and disinfection of machines after infected patient dialysis.
- Sterilization of equipment.

➢ **Emergency & Troubleshooting**

- Management of air embolism (demonstration).
- Handling machine alarms (air detector, venous pressure, arterial pressure).
- Power failure and emergency procedures.
- Basic life support (BLS) and CPR demonstration.

➢ **Case Studies & Report Interpretation**

- Interpretation of dialysis adequacy (Kt/V, URR – basics).
- Reading and understanding lab reports (urea, creatinine, electrolytes, HB).
- Correlation of patient condition with dialysis outcome.

MICROBIOLOGY

THEORY

1. Introduction to Microbiology

- History and scope of microbiology.
- Importance of microbiology in health sciences and dialysis practice.
- Structure and classification of microorganisms (bacteria, viruses, fungi, parasites).
- Microscopy – types (light, electron, phase contrast – basic).
- Sterilization and disinfection – principles and methods.

2. General Bacteriology

- Structure and morphology of bacteria.
- Growth and nutrition of bacteria.

- Bacterial spores, toxins, and enzymes.
- Culture media and culture techniques (aerobic & anaerobic).
- Staining techniques: Gram stain, Acid-fast stain.
- Bacterial genetics (plasmid, mutation, resistance – basics).

3. Immunology and Infection Control

- Innate and acquired immunity.
- Antigens, antibodies, and antigen–antibody reactions.
- Vaccines and immunization (importance in dialysis patients: Hepatitis B, Influenza, COVID, etc.).
- Infection transmission routes (airborne, bloodborne, waterborne).
- Universal precautions and bio-safety measures in dialysis unit.

4. Systemic Bacteriology

(Study of important bacteria relevant to dialysis/healthcare)

- *Staphylococcus aureus* (MRSA).
- *Streptococcus* spp.
- *Enterococcus*.
- *Escherichia coli*, *Klebsiella*, *Pseudomonas*, *Proteus*.
- *Mycobacterium tuberculosis*.
- *Salmonella*, *Shigella*.
- Pathogenic bacteria causing sepsis, pneumonia, urinary tract infections.

5. Virology

- General properties of viruses.
- Important human viruses:
  - Hepatitis viruses (A, B, C, D, E).
  - HIV.
  - Influenza virus.
  - SARS-CoV-2 (COVID-19).
- Viral infections relevant to dialysis patients (HBV, HCV, HIV screening).

6. Mycology (Fungal Infections)

- Classification of fungi.
- Superficial, subcutaneous, systemic mycoses.
- *Candida* infections (important in immunocompromised/dialysis patients).
- Laboratory diagnosis of fungal infections.

7. Parasitology

- Introduction and classification of parasites.
- Protozoa: *Entamoeba histolytica*, *Giardia*, *Plasmodium* (malaria).
- Helminths: *Ascaris*, *Hookworm*, *Filaria*.

- Opportunistic parasitic infections in immunocompromised patients.

8. Applied Microbiology in Dialysis

- Sources of infection in dialysis unit.
- Water-borne infections (importance of RO water in dialysis).
- Blood-borne pathogens (HBV, HCV, HIV).
- Nosocomial infections and their prevention.
- Sterilization and disinfection of dialysis equipment and environment.
- Hand hygiene and biomedical waste management.

9. Diagnostic Microbiology

- Collection, transport, and processing of clinical specimens (blood, urine, sputum, pus, swabs).
- Blood culture and sensitivity testing.
- Urine culture and sensitivity.
- Rapid diagnostic tests (HIV, HBV, HCV kits).
- Antibiotic susceptibility testing and importance of antimicrobial stewardship.

10. Recent Advances

- Molecular diagnostic techniques: PCR, ELISA (basic overview).
- Emerging infections relevant to dialysis (COVID-19, multidrug-resistant bacteria).
- Advances in infection control policies in dialysis units.

PRACTICAL

➢ Laboratory Orientation & Safety

- Introduction to microbiology laboratory equipment (microscope, autoclave, hot air oven, laminar air flow).
- Preparation, handling, and sterilization of glassware and media.
- Universal precautions and biosafety measures.
- Biomedical waste disposal (color coding, sharp disposal).

➢ Microscopy & Staining Techniques

- Use and handling of compound microscope.
- Preparation and observation of wet mount.
- Gram staining of bacteria (differentiation of Gram-positive & Gram-negative).
- Acid-fast staining (*Mycobacterium* demonstration).
- Simple and negative staining.

➢ Culture Techniques

- Preparation of culture media (nutrient agar, blood agar, MacConkey agar – demonstration).
- Inoculation methods: streak, spread, pour plate.
- Aerobic vs anaerobic culture demonstration.
- Observation of colony morphology.

➢ **Bacterial Identification**

- Motility test (hanging drop method – demonstration).
- Biochemical tests (demo/perform as feasible):
  - Catalase test.
  - Coagulase test.
  - Oxidase test.
  - Indole, MR, VP, Citrate tests.
  - Urease test, TSI test.

➢ **Applied Microbiology in Dialysis**

- Demonstration of swab culture from dialysis unit surfaces.
- Water sample testing for bacterial contamination (coliform count demo).
- Screening tests for HBV, HCV, HIV (rapid card/ELISA demo).
- Hand swab culture to demonstrate infection control importance.

➢ **Mycology (Fungal Studies)**

- Preparation of KOH mount for fungi.
- Observation of *Candida* spp. and molds (prepared slides).
- Culture demonstration on Sabouraud's agar.

➢ **Parasitology**

- Wet mount preparation of stool sample (demo).
- Identification of common parasites/ova/cysts using prepared slides (*Entamoeba*, *Giardia*, *Ascaris*, *Hookworm*).

➢ **Immunology Practicals**

- Demonstration of antigen–antibody reactions (slide agglutination, latex agglutination).
- Widal test (demonstration for *Salmonella*).
- VDRL test (demo).

➢ **Antibiotic Sensitivity Testing**

- Kirby-Bauer disc diffusion method demonstration.
- Interpretation of zones of inhibition.
- Understanding multidrug resistance (MRSA, ESBLs).

➢ **Disinfection & Sterilization**

- Demonstration of autoclaving and hot air oven.
- Filtration method (membrane filter demonstration).
- Chemical disinfectants used in dialysis unit (chlorine, formaldehyde, alcohol).
- Sterility testing methods (demo).

DIALYSIS MANAGEMENT

THEORY

1. Introduction to Dialysis Management

- Concept and scope of dialysis management.
- Role and responsibilities of dialysis technician.
- Importance of teamwork (technicians, nurses, nephrologists, support staff).

2. Dialysis Unit Organization

- Dialysis unit layout and infrastructure.
- Manpower requirement and duties.
- Patient scheduling and flow management.
- Patient education and counseling.
- Emergency preparedness in dialysis unit.

3. Patient Evaluation & Monitoring

- Pre-dialysis patient assessment (history, vitals, lab reports).
- Assessment of fluid status (weight, edema, BP).
- Monitoring during dialysis (vital signs, alarms, UF, complications).
- Post-dialysis evaluation (weight, symptoms, lab review).
- Patient record keeping and data management.

4. Vascular Access Care

- Types of vascular access (AV fistula, graft, central venous catheter).
- Pre- and post-cannulation care.
- Recognition and management of access complications (infection, thrombosis, poor flow).
- Access care education for patients.

5. Infection Control in Dialysis Unit

- Sources of infection in dialysis centers.
- Universal precautions and hand hygiene.
- Cleaning and disinfection of dialysis machines.
- Separation of Hepatitis B, C, HIV-positive patients.

- Biomedical waste management and disposal.
- Sterility and microbiological monitoring of water.

6. Water Treatment & Dialysate Management

- Water quality standards (AAMI/ISO).
- Dialysis water purification system (RO, filters, carbon).
- Regular monitoring and maintenance of water plant.
- Preparation, storage, and handling of dialysate concentrates.

7. Medication Management in Dialysis Patients

- Commonly used drugs in dialysis units (Erythropoietin, iron, phosphate binders, antihypertensives).
- Anticoagulation protocols (heparin, citrate).
- Drug administration routes during dialysis.
- Patient education regarding medicines.

8. Complications and Emergency Management

- Recognition and management of common complications:
  - Hypotension, cramps, nausea, vomiting.
  - Dialyzer reaction, allergic reactions.
  - Air embolism, hemolysis, clotting.
- Emergency protocols (BLS, CPR, anaphylaxis management).
- Fire safety and disaster preparedness in dialysis unit.

9. Quality Assurance & Audit

- Dialysis adequacy monitoring (Kt/V, URR – basics).
- Machine maintenance schedules.
- Record keeping and audit trails.
- Government guidelines and accreditation standards for dialysis units.

10. Counseling & Communication Skills

- Patient counseling on diet, fluids, lifestyle.
- Communication skills with patients and families.
- Handling anxious or uncooperative patients.
- Ethical and legal issues in dialysis care.

11. Recent Advances in Dialysis Management

- Tele-monitoring and e-record systems.
- Home dialysis (CAPD, home hemodialysis).
- Newer disinfectants and infection control protocols.
- Emerging global guidelines in dialysis care.

PRACTICAL

➢ Dialysis Unit Orientation & Safety

- Dialysis unit tour: patient waiting area, dialysis stations, isolation rooms.
- Familiarization with dialysis machine logbook and patient records.
- Demonstration of biomedical waste segregation and disposal.
- Fire safety, evacuation drills, and emergency preparedness.

➢ Patient Management Skills

- Pre-dialysis assessment: weight, BP, pulse, temperature, edema check.
- History taking and patient interview practice.
- Patient education: diet, fluid restriction, access care.
- Post-dialysis assessment and counseling.

➢ Vascular Access Care

- Observation and demonstration of AV fistula/graft site care.
- Steps of safe cannulation (on dummy or under supervision).
- Catheter care: dressing, flushing, infection prevention.
- Recognition of complications (swelling, redness, poor flow).

➢ Dialysis Session Management

- Preparing dialysis machine and patient records before procedure.
- Connecting patient safely to machine.
- Monitoring vital signs every 30–60 minutes.
- Documentation of UF (ultrafiltration), blood flow rate, dialysate flow rate.
- Disconnection and post-procedure care.

➢ Infection Control

- Demonstration of hand hygiene (WHO technique).
- Cleaning and disinfection of dialysis machine post-use.
- Surface swab collection for culture (demo).
- Handling HBV/HCV/HIV positive patient dialysis.
- Sterility testing of RO water (demonstration).

➢ Water Treatment & Dialysate Management

- Routine checks of RO system (conductivity, chlorine, hardness).
- Demonstration of RO water disinfection.
- Checking and preparing dialysate concentrate.
- Maintaining water quality logbook.

➢ Medication Handling in Dialysis

- Preparation and administration of heparin (demo).
- Iron and erythropoietin injection handling (demo).
- Recording medicines given during dialysis.

➢ **Complication & Emergency Handling**

- Recognition and immediate action for:
  - Hypotension, cramps, nausea, vomiting.
  - Blood leak alarm, air bubble alarm.
  - Anaphylactic reaction (demo with mannequin).
- BLS & CPR training on mannequin.
- Simulation: power failure during dialysis.

➢ **Records & Quality Assurance**

- Maintaining dialysis charts (daily).
- Preparing monthly patient dialysis summary.
- Machine maintenance checklist.
- Preparing infection audit and water quality reports.

➢ **Communication & Counseling**

- Role-play for patient counseling (diet, fluid, lifestyle).
- Handling an anxious/uncooperative patient (simulation).
- Ethical and legal case discussions.

GENERAL MEDICINE

THEORY

1. Introduction to General Medicine

- Scope and importance of General Medicine in dialysis.
- Role of dialysis technician in recognizing medical problems.
- Basic medical terminology.

2. History Taking & Clinical Examination

- Methods of history taking (chief complaints, past history, drug history).
- General physical examination (appearance, posture, hydration).
- Vital signs: temperature, pulse, respiration, blood pressure.
- Basic systemic examination (CVS, RS, CNS, GIT, urinary system).

3. Common Medical Disorders Relevant to Dialysis

a) Renal System

- Acute Kidney Injury (AKI): causes, symptoms, management overview.
- Chronic Kidney Disease (CKD): stages, symptoms, complications.
- End-Stage Renal Disease (ESRD).
- Nephrotic and nephritic syndrome.
- Urinary tract infections.

b) Cardiovascular System

- Hypertension (primary & secondary).
- Ischemic heart disease, myocardial infarction (basics).
- Heart failure and its relation to CKD.
- Arrhythmias (overview).

c) Respiratory System

- Chronic obstructive pulmonary disease (COPD).
- Bronchial asthma.
- Pulmonary edema (common in CKD).
- Pneumonia and respiratory infections.

d) Endocrine & Metabolic Disorders

- Diabetes mellitus: types, complications (especially diabetic nephropathy).
- Thyroid disorders (hypo/hyperthyroidism).
- Electrolyte imbalance: hyperkalemia, hypocalcemia, acidosis/alkalosis.

e) Hematology

- Anemia in CKD.
- Coagulation disorders (bleeding, clotting tendencies).

f) Gastrointestinal & Hepatic Disorders

- Viral hepatitis B & C (importance in dialysis patients).
- Liver cirrhosis.
- Peptic ulcer disease, gastritis.

g) Infections

- Sepsis.
- Tuberculosis.
- HIV/AIDS (overview and precautions in dialysis).

4. Neurology

- Stroke (CVA) basics.
- Peripheral neuropathy in diabetes & CKD.
- Seizure disorders (overview).

5. Musculoskeletal & Bone Disorders

- Renal osteodystrophy.
- Osteoporosis and fractures in CKD patients.
- Gout and arthritis (relation with uric acid levels).

6. Skin & Immune Disorders

- Pruritus in CKD patients.
- Allergic reactions.
- Autoimmune diseases (SLE, vasculitis – overview).

7. Medical Emergencies (Dialysis-Related)

- Hypotension during dialysis.
- Hypertensive crisis.
- Hypoglycemia and hyperglycemia.
- Anaphylaxis and allergic reactions.
- Fluid overload and pulmonary edema.
- Electrolyte emergencies (e.g., hyperkalemia).

8. Pharmacology in General Medicine

- Common drugs in CKD patients (antihypertensives, diuretics, erythropoietin, iron therapy, phosphate binders).
- Drug dose modification in renal failure.
- Nephrotoxic drugs (NSAIDs, aminoglycosides, contrast agents).

9. Nutrition in Medicine

- Dietary management in CKD patients.
- Low-salt, low-potassium, and fluid-restricted diets.
- Role of protein in dialysis patients.

10. Preventive Medicine & Patient Education

- Vaccination in CKD patients (Hepatitis B, Influenza).
- Lifestyle modification (diet, exercise, smoking/alcohol cessation).
- Patient counseling on compliance with medicines and dialysis.

PRACTICAL

- **General Examination Skills**

- Measurement of **vital signs**:
  - Temperature (oral, axillary, digital).
  - Pulse (rate, rhythm, volume).
  - Blood pressure (manual and digital sphygmomanometer).
  - Respiratory rate.
- Recording weight, BMI, hydration status.
- General physical inspection: pallor, cyanosis, edema, icterus, lymph nodes.

➢ **Systemic Examination (Demonstrations & Practice)**

- **Cardiovascular system**: pulse examination, BP recording, heart sounds (demo).
- **Respiratory system**: respiratory rate, chest expansion, use of stethoscope for breath sounds.
- **Abdomen**: inspection, palpation for liver, spleen enlargement.
- **Nervous system (basic)**: consciousness level (GCS), reflex demo.
- **Musculoskeletal system**: joint mobility, swelling, deformities.

➢ **Clinical Case Discussions**

- Case presentation of **CKD patient**.
- Case discussion of **Hypertension**.
- Case study on **Diabetes with nephropathy**.
- Case discussion of **Anemia in CKD**.
- Group discussion: **Infection control in hepatitis/HIV-positive patients**.

➢ **Laboratory Investigations (Observation & Interpretation)**

- Interpretation of **CBC** (anemia detection).
- Renal function tests (urea, creatinine).
- Electrolyte report interpretation (Na^+, K^+, Ca^{2+}).
- Blood sugar monitoring (glucometer demo).
- Urine routine (protein, sugar, microscopic demo).

➢ **Patient Care & Monitoring**

- Pre-dialysis assessment: vitals, edema check, breathlessness.
- Monitoring patients during dialysis (BP charting every 30–60 min).
- Post-dialysis assessment (weight, BP, symptoms).
- Documentation in dialysis chart.

➢ **Medical Emergency Handling (Simulation & Demo)**

- Recognition and management of:
  - Hypotension during dialysis.
  - Hypertensive crisis.
  - Hypoglycemia (glucometer check, giving glucose).
  - Shortness of breath / pulmonary edema (oxygen support demo).
  - Seizure management (positioning, airway care).

- Anaphylactic reaction (emergency protocol demo).
- **BLS & CPR** training on mannequin.

➢ **Pharmacology (Practical Exposure)**

- Demonstration of insulin injection technique (subcutaneous).
- Heparin handling (precautions, dosage, demo).
- Safe handling of erythropoietin, iron injections.
- Recording drug administration in patient file.

➢ **Nutrition & Counseling**

- Demonstration of fluid balance chart (intake vs output).
- Patient diet chart preparation (low salt, low potassium diet).
- Counseling practice:
  - Diabetic patient on diet & lifestyle.
  - CKD patient on fluid restriction.

➢ **Record Keeping & Documentation**

- Maintaining patient history sheet.
- Dialysis chart filling (BP, UF, complications).
- Preparing discharge summary under supervision

SEMESTER – III

PAPER CODE	SUBJECT NAME	THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PRACTICAL MARKS
DDT301	PATIENT CARE & EQUIPMENT OPERATION	45 Min	1 Hrs.	50	50
DDT302	PHARMACOLOGY RELATED TO DIALYSIS TECHNOLOGY	45 Min	1 Hrs.	50	50
DDT303	CLINICAL NEPHROLOGY	45 Min	1 Hrs.	50	50
DDT304	GENERAL SURGERY	45 Min	1 Hrs.	50	50

PATIENT CARE & EQUIPMENT OPERATION

THEORY

1. Basics of Patient Care

- Introduction to patient care in dialysis unit

- Role & responsibilities of dialysis technician in patient care
- Basic nursing skills: bed making, positioning, oral care, skin care
- Personal hygiene & grooming of patients
- Patient safety, comfort & psychological support
- Communication skills with patients & relatives

2. Infection Control & Safety

- Universal precautions in dialysis units
- Hand hygiene techniques & use of PPE
- Aseptic techniques in handling patients and equipment
- Biomedical waste management in dialysis units
- Prevention of cross infection in dialysis patients
- Disinfection & fumigation protocols in dialysis unit

3. Patient Care in Dialysis

- **Pre-dialysis care:**
  - Patient assessment (vital signs, weight, fluid balance)
  - Vascular access inspection
  - Preparation of patient for dialysis
- **Intra-dialysis care:**
  - Cannulation techniques (AV fistula, graft, catheter)
  - Monitoring BP, pulse, temperature, ultrafiltration, comfort
  - Recognition and management of complications: hypotension, cramps, fever, clotting, air embolism, cardiac arrest
- **Post-dialysis care:**
  - Needle/catheter removal, dressing and hemostasis
  - Recording post-dialysis weight and vitals
  - Patient instructions (rest, diet, follow-up)

4. Vascular Access Care

- Types of vascular access: AV fistula, AV graft, central venous catheter
- Care & maintenance of vascular access
- Complications of vascular access: infection, thrombosis, stenosis, bleeding
- Emergency management of vascular access complications

5. Dialysis Equipment Operation

- Introduction to dialysis machines: principles & working
- Parts & functions of hemodialysis machine
- Setting up the machine: priming, connecting dialyzer & lines
- Operation & monitoring of dialysis machine during treatment
- Water treatment system: RO plant, distribution system, disinfection & maintenance
- Common alarms & troubleshooting in dialysis machines
- Handling and disposal of dialyzers, tubing & consumables

6. Emergency & Critical Care in Dialysis

- Basic life support (BLS) & cardiopulmonary resuscitation (CPR)
- Recognition and management of dialysis-related emergencies
- Oxygen therapy, suctioning & airway management
- Fluid overload, shock & cardiac emergencies
- Referral & coordination with medical team during emergencies

7. Patient Education & Counseling

- Educating patients on diet & fluid restrictions
- Importance of compliance with dialysis schedule & medications
- Lifestyle modifications for dialysis patients
- Psychological counseling for patients & families
- Rehabilitation & quality of life improvement in chronic kidney disease

8. Documentation & Record Keeping

- Patient record maintenance: dialysis charts, progress notes, consent forms
- Recording machine parameters & dialysis outcomes
- Legal & ethical aspects of patient care in dialysis
- Reporting adverse events & incidents

PRACTICAL

➢ Basic Nursing & Patient Care Skills

- Bed making & patient positioning techniques
- Measurement of vital signs: temperature, pulse, respiration, BP
- Monitoring fluid balance: intake–output chart preparation
- Personal hygiene care: oral care, skin care, hair & nail care
- Assisting in patient mobility: shifting, lifting & positioning
- Recording patient case history

➢ Infection Control Practices

- Proper handwashing techniques (7 steps)
- Use of PPE: gloves, gown, mask, face shield
- Safe disposal of biomedical waste (color coding & segregation)
- Cleaning and disinfection of dialysis unit and surfaces
- Sterilization & aseptic handling of equipment

➢ Pre, Intra & Post Dialysis Care

- Pre-dialysis patient preparation (weight, BP, vascular access site check)
- Cannulation of AV fistula and AV graft (demonstration & practice)
- Handling and care of central venous catheters
- Patient monitoring during dialysis (vitals, ultrafiltration, alarms)

- Recognizing & managing complications during dialysis (hypotension, cramps, fever, chest pain, etc.)
- Post-dialysis care: needle/catheter removal, hemostasis, dressing, recording weight & vitals

➢ **Vascular Access Care**

- Routine care of AV fistula, AV graft & catheter sites
- Identifying infection, thrombosis, bleeding at access sites
- Dressing techniques for vascular access
- Emergency management (bleeding, air embolism, catheter block)

➢ **Dialysis Equipment Handling**

- Identification of machine parts & functions
- Dialysis machine setup & priming procedure
- Preparation of dialyzer & bloodline tubing
- Operation of dialysis machine during treatment
- Recording machine parameters & patient data
- Handling alarms & troubleshooting common errors
- Reprocessing & disposal of dialyzers and tubings

➢ **Water Treatment & Safety**

- RO plant components & working demonstration
- Water testing for dialysis (conductivity, chlorine, hardness)
- Disinfection & maintenance of RO system
- Safety checks before starting dialysis

➢ **Emergency & Critical Care**

- Practice of **Basic Life Support (BLS) & Cardiopulmonary Resuscitation (CPR)**
- Oxygen cylinder handling & oxygen therapy administration
- Suctioning and airway management
- Management of fluid overload & shock situations
- Mock drills for emergency handling in dialysis unit

➢ **Patient Education & Documentation**

- Counseling patients on diet, fluid intake & lifestyle
- Educating on vascular access care at home
- Maintaining dialysis chart, consent forms & progress notes
- Reporting adverse events/incidents
- Legal & ethical aspects in documentation

PHARMACOLOGY RELATED TO DIALYSIS TECHNOLOGY

THEORY

1. Introduction to Pharmacology

- Definition, scope and importance of pharmacology in dialysis technology
- Routes of drug administration (oral, IV, IM, subcutaneous, intradermal, topical, inhalational)
- Factors affecting drug absorption, distribution, metabolism, and excretion
- Concepts of half-life, bioavailability, and therapeutic index
- Adverse drug reactions and drug interactions in dialysis patients

2. Drugs Acting on Renal System

- Diuretics: loop diuretics, thiazides, potassium-sparing diuretics – uses, side effects, contraindications
- Drugs affecting fluid and electrolyte balance (sodium, potassium, calcium, phosphate)
- Drugs for management of hypertension in renal patients (ACE inhibitors, ARBs, calcium channel blockers, beta-blockers)
- Drugs for management of edema and fluid overload

3. Drugs Used in Dialysis Patients

- Anticoagulants in dialysis:
  - Heparin, low-molecular-weight heparin, citrate
  - Dosage, monitoring, side effects, reversal agents (protamine sulfate)
- Erythropoiesis-Stimulating Agents (ESAs): erythropoietin, darbepoetin
  - Indications, dosage, monitoring, side effects
- Iron therapy: oral & IV iron preparations, administration, adverse effects
- Vitamin D analogs and phosphate binders in CKD
- Antibiotics and antivirals in dialysis patients (dose adjustment in renal failure)

4. Dialyzability of Drugs

- Principles of drug removal during dialysis
- Factors affecting dialyzability of drugs (molecular weight, protein binding, water solubility)
- Common drugs affected by dialysis and dose adjustments (antibiotics, antiepileptics, antihypertensives, antidiabetics)
- Drugs contraindicated or used with caution in dialysis patients

5. Management of Complications with Drugs

- Drugs used in management of:
  - Hyperkalemia (calcium gluconate, insulin-glucose, sodium bicarbonate, beta-agonists, potassium binders)
  - Anemia in CKD
  - Mineral bone disease in CKD
  - Acid-base imbalance
- Use of sedatives, analgesics, and antihistamines in dialysis patients

- Emergency drugs in dialysis unit (adrenaline, atropine, dopamine, noradrenaline, hydrocortisone, nitroglycerin)

6. Drug Handling in Dialysis Units

- Safe storage and handling of drugs in dialysis unit
- Preparation and dilution of IV medications
- Compatibility and incompatibility of IV drugs
- Role of technician in assisting with drug administration under supervision
- Documentation of drugs used during dialysis

7. Recent Advances

- New anticoagulants and their relevance in dialysis patients
- Novel agents in anemia management
- Updates on drug dose adjustment guidelines in renal failure
- Patient education on safe drug use in CKD and dialysis

PRACTICAL

➢ Basics of Pharmacology

- Introduction, scope and importance of pharmacology in dialysis
- Routes of drug administration (oral, parenteral, inhalation, topical, etc.)
- Pharmacokinetics – absorption, distribution, metabolism, excretion
- Pharmacodynamics – mechanism of drug action
- Drug dosage forms and calculations
- Adverse drug reactions, drug interactions and toxicity
- Factors affecting drug action in renal failure

➢ Drugs Acting on Renal System

- Diuretics (loop, thiazide, potassium-sparing): mechanism, uses, side effects
- Drugs affecting fluid and electrolyte balance
- Drugs used in renal hypertension (ACE inhibitors, ARBs, beta-blockers, calcium channel blockers)
- Drugs used in edema and chronic kidney disease management

➢ Drugs Commonly Used in Dialysis

- **Anticoagulants in dialysis:**
  - Heparin, low molecular weight heparin, citrate
  - Dosage, monitoring, reversal agents (protamine)
- **Erythropoiesis-Stimulating Agents (ESAs):** erythropoietin, darbepoetin – use, side effects
- **Iron therapy:** oral and IV iron preparations, side effects, precautions
- **Phosphate binders:** calcium-based, sevelamer, lanthanum
- **Vitamin D analogs & calcimimetics** – role in mineral bone disease of CKD

- **Antibiotics & antivirals** – dose modification in renal failure and dialysis

➢ **Dialyzability of Drugs**

- Principles of drug removal during dialysis
- Factors affecting dialyzability (molecular weight, protein binding, solubility)
- Drugs significantly removed by dialysis
- Drugs not removed by dialysis
- Guidelines for dose adjustment before/after dialysis

➢ **Drugs for Complications in Dialysis Patients**

- **Hyperkalemia management drugs:** calcium gluconate, insulin + glucose, sodium bicarbonate, potassium binders
- **Acid–base imbalance management drugs**
- **Anemia in CKD:** ESA + iron therapy
- **Mineral bone disease drugs:** phosphate binders, vitamin D analogs
- **Antihistamines, analgesics, sedatives** – safe use in dialysis patients
- **Emergency drugs in dialysis unit:** adrenaline, atropine, dopamine, noradrenaline, nitroglycerin, hydrocortisone

➢ **Safe Drug Handling in Dialysis Units**

- Storage of medicines and emergency drugs
- Preparation of IV drugs and infusions
- Dilution, compatibility & incompatibility of IV medications
- Recording and documentation of drug administration
- Role of dialysis technician in assisting with medication (under supervision)

➢ **Recent Advances**

- New anticoagulants in dialysis patients
- Newer ESAs and iron formulations
- Advances in phosphate binders and vitamin D analogs
- Latest guidelines for drug dose adjustment in CKD/dialysis
- Patient education regarding drug use and compliance

CLINICAL NEPHROLOGY

THEORY

1. Introduction to Nephrology

- Definition, scope, and importance of nephrology
- Anatomy & physiology of kidneys and urinary system (review)
- Functions of kidney: excretory, endocrine, metabolic, regulatory
- Basics of fluid & electrolyte balance

- Acid–base balance and its regulation

2. Renal Diseases Overview

- Classification of renal diseases: acute, chronic, congenital, acquired
- Common signs and symptoms of renal disorders: edema, proteinuria, hematuria, oliguria, anuria
- Clinical assessment of kidney function: history taking, physical examination
- Laboratory investigations:
  - Urinalysis (albumin, sugar, microscopy)
  - Blood urea, serum creatinine, electrolytes
  - GFR estimation
- Imaging in nephrology: USG, CT, MRI, IVP, renal biopsy (basic concepts)

3. Acute Kidney Conditions

- Acute Kidney Injury (AKI): causes, stages, clinical features
- Acute glomerulonephritis
- Acute pyelonephritis
- Obstructive uropathy
- Management principles of AKI
- Dialysis indications in AKI

4. Chronic Kidney Disease (CKD)

- Definition, causes and stages of CKD
- Clinical manifestations: anemia, bone disease, fluid overload, hypertension
- Complications: cardiovascular disease, electrolyte imbalance, acidosis
- Investigations for CKD
- Management of CKD:
  - Conservative treatment
  - Dialysis (hemodialysis, peritoneal dialysis)
  - Renal transplantation (overview)

5. Glomerular & Tubulointerstitial Disorders

- Nephrotic syndrome – causes, features, management
- Glomerulonephritis – acute & chronic
- Tubulointerstitial nephritis
- Polycystic kidney disease
- Renal calculi (kidney stones): causes, symptoms, treatment overview

6. Hypertension & Systemic Diseases Affecting Kidney

- Hypertension in kidney disease
- Diabetic nephropathy – pathophysiology, stages, management overview
- Hypertensive nephropathy
- Systemic lupus erythematosus (SLE) and kidney involvement

- Other systemic diseases affecting kidneys

7. Pediatric & Geriatric Nephrology (Basics)

- Congenital anomalies of kidney & urinary tract (CAKUT)
- Pediatric nephrotic syndrome
- Pediatric dialysis overview
- Kidney disease in elderly – special considerations

8. Dialysis & Renal Replacement Therapies (Clinical Aspects)

- Indications for starting dialysis
- Clinical evaluation before dialysis
- Hemodialysis: principles, patient selection, outcomes
- Peritoneal dialysis: indications, advantages, limitations
- Complications of dialysis (acute & chronic)
- Kidney transplantation – basics of donor selection, rejection, immunosuppression

9. Emergencies in Nephrology

- Hyperkalemia – recognition & management
- Fluid overload & pulmonary edema
- Hypertensive emergencies in renal patients
- Uremic complications: encephalopathy, pericarditis, bleeding tendency
- Acute poisoning & role of dialysis (barbiturates, lithium, methanol, etc.)

10. Patient Care & Counseling in Nephrology

- Nutrition in CKD & dialysis patients (low sodium, potassium, phosphate diets)
- Fluid restriction & salt intake
- Lifestyle modifications
- Psychosocial aspects of kidney disease
- Patient & family counseling

PRACTICAL

➢ Patient History & Examination

- Recording detailed patient history (symptoms: swelling, urine output, hypertension, diabetes, pain, etc.)
- General physical examination (edema, pallor, dehydration, jaundice, cyanosis)
- Vital signs measurement: BP, pulse, temperature, respiratory rate
- Clinical examination of kidney & urinary system (palpation, percussion, auscultation – observation only)
- Identification of common signs in renal failure patients (anemia, bone pain, pruritus, uremic breath)

➢ Laboratory Investigations (Observation & Practice)

- Collection of urine samples for routine & microscopic examination
- Interpretation of urinalysis reports (albumin, sugar, pus cells, RBCs, casts)
- Collection of blood samples for renal function tests (BUN, creatinine, electrolytes) – *under supervision*
- Interpretation of renal function tests (RFT) reports
- Estimation of GFR (using formulas like Cockcroft-Gault, MDRD – demonstration)

➢ Diagnostic Procedures (Observation/Assistance)

- Assisting in ultrasound KUB (kidney, ureter, bladder)
- Observation of CT/MRI reports related to kidney disease
- Observation of renal biopsy procedure (done by nephrologist)
- Recording findings in clinical cases

➢ Case Studies of Renal Diseases

- Acute Kidney Injury (AKI) – case observation and reporting
- Chronic Kidney Disease (CKD) – stages, symptoms, patient monitoring
- Nephrotic syndrome – identifying signs (edema, proteinuria)
- Glomerulonephritis – case discussion
- Renal calculi (kidney stones) – observation of clinical features & reports
- Diabetic nephropathy & hypertensive nephropathy – case-based learning

➢ Dialysis & Renal Replacement Therapy (Clinical Practice)

- Indications for initiating dialysis – identifying clinical scenarios
- Pre-dialysis patient evaluation (weight, BP, access site, lab values)
- Observation of hemodialysis & peritoneal dialysis procedures
- Identification & management of dialysis complications (hypotension, cramps, fever, clotting, etc.)
- Documentation of dialysis sessions in patient records

➢ Nephrology Emergencies (Simulation/Clinical Practice)

- Recognition of hyperkalemia on ECG & clinical signs
- Fluid overload & pulmonary edema – observation of management
- Hypertensive emergencies – role of dialysis & medications
- Uremic complications (encephalopathy, pericarditis, bleeding) – observation and reporting
- Poisoning cases requiring dialysis – clinical exposure (methanol, barbiturates, lithium, etc.)

➢ Patient Care & Counseling (Practical Training)

- Educating patients about renal diet (low sodium, low potassium, phosphate-restricted diet)

- Fluid restriction counseling
- Patient education on importance of compliance with dialysis schedules and medicines
- Counseling families regarding CKD, dialysis, and transplantation
- Observation of patient rehabilitation programs

➢ **Documentation & Record Keeping**

- Preparing case sheets and patient records
- Maintaining dialysis charts and treatment notes
- Reporting adverse events & complications in clinical practice
- Ethical and legal aspects in documentation

GENERAL SURGERY

THEORY

1. Introduction to General Surgery

- Definition, scope and importance of surgery in patient care
- Operation theatre (OT) setup, aseptic techniques, sterilization & disinfection
- Role and responsibilities of paramedical staff in surgical care
- Pre-operative, intra-operative and post-operative care of patients

2. Basic Surgical Principles

- Principles of wound healing
- Types of surgical wounds (clean, contaminated, infected)
- Hemorrhage: types, control, blood transfusion basics
- Shock: types, recognition, and management
- Inflammation, infection, abscess, ulcer, sinus and fistula – basics

3. Sterilization, Infection Control & Safety

- Methods of sterilization: autoclaving, chemical sterilization, fumigation
- Disinfection techniques for instruments & environment
- Universal precautions in surgical practice
- Surgical site infection – causes, prevention, management

4. Surgical Instruments & Procedures

- Identification and handling of common surgical instruments
- Sutures and ligatures – types and uses
- Basic surgical dressings and bandaging techniques
- Principles of minor surgical procedures (incision & drainage, biopsy, catheterization)
- Handling of drains and tubes

5. Vascular Access Surgery (Relevant to Dialysis)

- Arteriovenous (AV) fistula: creation, care, and complications
- AV graft: indications and care
- Central venous catheter placement for dialysis (temporary & tunneled catheters)
- Post-operative care and complications of vascular access
- Technician's role in assisting vascular access surgeries

6. Common Surgical Conditions

- Hernia: types, clinical features, management overview
- Hydrocele, varicose veins, piles, fissure, fistula in ano – basics
- Breast disorders: abscess, fibroadenoma, carcinoma (overview)
- Thyroid swellings (goiter, carcinoma) – basics
- Gastrointestinal surgical conditions (appendicitis, intestinal obstruction, perforation – overview)

7. Trauma & Emergency Surgery

- Types of injuries (blunt, penetrating, burns)
- First aid & emergency management of trauma patients
- Head injury, chest injury, abdominal injury – recognition & basic care
- Fractures: types, immobilization & first aid
- Burns: classification, fluid therapy, wound care

8. Pre- & Post-Operative Care

- Pre-operative preparation: consent, investigations, bowel preparation, fasting
- Intra-operative monitoring & technician's role
- Post-operative care: fluid balance, wound care, pain management, monitoring complications
- Recognition of post-operative complications: infection, bleeding, shock, thromboembolism

9. Anesthesia (Basics for Technicians)

- Types of anesthesia: local, regional, general
- Common anesthetic agents – overview
- Monitoring during anesthesia (pulse, BP, oxygen saturation)
- Recovery from anesthesia and technician's responsibilities
- Recognition of anesthesia-related complications

10. Recent Advances & Ethics in Surgery

- Minimal invasive surgery: laparoscopy, robotic surgery (overview)
- Day-care surgery
- Organ transplantation basics (renal transplantation – relevance to dialysis)
- Ethical issues: informed consent, patient rights, medico-legal aspects

PRACTICAL

➢ Basic Patient Care & Pre/Post-Operative Skills

- Recording vital signs (BP, pulse, respiration, temperature) in surgical patients
- Pre-operative preparation: consent, shaving, skin preparation, bowel preparation, fasting instructions
- Assisting in shifting patients to OT / recovery room
- Post-operative monitoring: fluid balance, drain output, wound observation
- Recording intake–output chart

➢ Infection Control & Sterilization

- Hand washing techniques & PPE use
- Preparation of surgical site with aseptic precautions
- Methods of sterilization (autoclave, chemical) – demonstration
- Disinfection of instruments, dressing sets & OT environment
- Biomedical waste segregation and disposal in OT

➢ Surgical Instruments & Dressing Techniques

- Identification & handling of common surgical instruments (scalpels, forceps, scissors, clamps, needle holders)
- Identification of sutures & ligatures (silk, catgut, prolene, etc.)
- Preparation of surgical tray and instrument sets
- Dressing of wounds (aseptic technique)
- Bandaging techniques (roller bandage, crepe bandage, triangular bandage)

➢ Minor Surgical Procedures (Assistance/Observation)

- Incision & drainage of abscess – assistance
- Biopsy procedures – preparation & aftercare
- Catheterization (male & female) – demonstration & supervised practice
- Assisting in insertion of drains & tubes (Ryle's tube, chest tube – observation)
- Handling surgical specimens for histopathology

➢ Vascular Access Surgery (Relevant to Dialysis)

- Observation of **AV fistula creation** surgery
- Observation of **AV graft placement**
- Observation of **central venous catheter insertion** (temporary & tunneled)
- Post-operative care of vascular access sites (wound care, dressing, monitoring for bleeding/infection)
- Recognition & reporting of vascular access complications

➢ Trauma & Emergency Skills

- First aid for bleeding wounds (pressure, elevation, bandaging)

- Application of tourniquet (emergency use only)
- Splinting and immobilization of fractures (observation & practice on mannequins)
- Burn wound dressing – observation and practice
- Transporting injured patients with spinal precautions

➢ **Operation Theatre (OT) Skills**

- Familiarization with OT environment and protocols
- Assisting in preparation of OT table, lights, suction, cautery, monitors
- Scrubbing, gowning, and gloving techniques
- Assisting surgical team during procedures (under supervision)
- Post-surgery cleaning & sterilization of instruments

➢ **Anesthesia (Basics – Observation/Assistance)**

- Preparation of patient for local, spinal & general anesthesia
- Monitoring vitals during anesthesia (BP, pulse, SpO_2 – under supervision)
- Assisting in oxygen cylinder handling and mask application
- Observation of recovery from anesthesia
- Reporting anesthesia-related complications

➢ **Case Studies & Documentation**

- Preparing case sheets for surgical patients
- Documentation of surgical procedures observed
- Recording post-op care & follow-up notes
- Legal & ethical aspects of documentation

SEMESTER – IV

PAPER CODE	SUBJECT NAME	THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PRACTICAL MARKS
DDT401	NATIONAL HEALTH PROGRAMMES	45 Min	1 Hrs.	50	50
DDT402	HEALTHCARE DELIVERY SYSTEM	45 Min	1 Hrs.	50	50
DDT403	CONCEPTS OF RENAL DISEASE, DIALYSIS & NUTRITION	45 Min	1 Hrs.	50	50
DDT404	APPLIED DIALYSIS THERAPY TECHNOLOGY	45 Min	1 Hrs.	50	50

NATIONAL HEALTH PROGRAMMES

THEORY

1. Introduction to National Health Programmes

- Definition, objectives, and importance of National Health Programmes in India
- Evolution of health programmes in India (Bhore Committee to National Health Policy)
- Role of health workers and paramedical staff in implementing programmes
- National Health Mission (NHM) – overview

2. Communicable Disease Control Programmes

- National Tuberculosis Elimination Programme (NTEP)
  - DOTS strategy, diagnosis & treatment basics
- National AIDS Control Programme (NACP)
  - HIV transmission, dialysis precautions, ART centres
- National Viral Hepatitis Control Programme (NVHCP)
  - Hepatitis B & C prevention, vaccination, relevance in dialysis units
- National Leprosy Eradication Programme (NLEP)
- National Vector Borne Disease Control Programme (NVBDCP)
  - Malaria, dengue, chikungunya, filariasis – prevention & control

3. Non-Communicable Disease Control Programmes

- National Programme for Prevention & Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS)
  - Screening, prevention, dialysis relevance in diabetes & hypertension
- National Programme for Prevention & Control of Fluorosis (NPPCF)
- National Tobacco Control Programme (NTCP)
- National Programme for Health Care of the Elderly (NPHCE) – geriatric care relevance

4. Maternal & Child Health Programmes

- Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A)
- Janani Suraksha Yojana (JSY)
- Janani Shishu Suraksha Karyakram (JSSK)
- Integrated Child Development Services (ICDS)
- Universal Immunization Programme (UIP) – vaccines schedule

5. Nutrition & Public Health Programmes

- Mid-Day Meal Programme
- National Iodine Deficiency Disorders Control Programme (NIDDCP)

- National Anaemia Control Programme (NACP)
- National Nutrition Mission (POSHAN Abhiyaan)

6. Occupational & Environmental Health Programmes

- National Programme for Control & Treatment of Occupational Diseases
- National Programme on Climate Change & Human Health (NPCCHH)
- National Mental Health Programme (NMHP)

7. Health Insurance & Supportive Schemes

- Ayushman Bharat – Pradhan Mantri Jan Arogya Yojana (PM-JAY)
- Pradhan Mantri National Dialysis Programme (PMNDP) – free dialysis scheme
- Rashtriya Swasthya Bima Yojana (RSBY)
- State-level health insurance schemes (overview)

8. Role of Dialysis Technician in National Health Programmes

- Infection control in dialysis centres (HIV, Hepatitis B & C, TB prevention)
- Educating patients about government schemes (PMNDP, health insurance)
- Assisting in patient registration and reporting for notifiable diseases
- Participation in screening programs for diabetes, hypertension, kidney disease
- Maintaining dialysis records for public health reporting

PRACTICAL

➢ Awareness & Patient Education

- Educating patients/families about:
  - **Pradhan Mantri National Dialysis Programme (PMNDP)** – free dialysis scheme
  - HIV/AIDS awareness (safe practices in dialysis units)
  - Hepatitis B & C prevention & vaccination
  - Diabetes & hypertension control for kidney health
- Conducting **patient awareness talks** on nutrition, hygiene, and infection prevention

➢ Infection Control & Communicable Diseases

- Practical training in **universal precautions** (hand hygiene, PPE use)
- Demonstration of **disinfection procedures** in dialysis units
- Screening & reporting protocols for **HIV, Hepatitis, TB** in dialysis patients
- Waste segregation & disposal as per **Biomedical Waste Rules**
- Observing vaccination drives (Hepatitis B, BCG, Polio, etc.) in health centres

➢ Non-Communicable Disease Programmes (NPCDCS & NPHCE)

- Measuring & recording **BP, weight, BMI** of patients (screening for hypertension, obesity, diabetes)
- Recording **blood sugar levels** with glucometer (under supervision)
- Preparing case reports of dialysis patients with diabetes & hypertension
- Participating in community health camps for **screening kidney disease**

➢ **Maternal & Child Health (RMNCH+A, UIP)**

- Observation of immunization sessions in health centres
- Assisting in health education about **antenatal care, nutrition, anaemia prevention**
- Demonstration of **Iron & Folic Acid supplementation programme**
- Case study preparation on **pregnant women with chronic kidney disease**

➢ **Nutrition & Public Health**

- Patient counselling on **renal diet** (low salt, potassium, phosphate) in line with nutrition programmes
- Demonstration of balanced diet chart for dialysis patients
- Participation in **National Nutrition Mission / Poshan Abhiyaan** awareness activities

➢ **Occupational & Environmental Health**

- Educating dialysis patients about **mental health support & counselling** (NMHP)
- Awareness activities about tobacco cessation (NTCP)
- Preparing posters/charts on **environmental sanitation & clean water** (important for dialysis patients)

➢ **Health Insurance & Government Schemes**

- Practical training in **registration of patients** under Ayushman Bharat / PMNDP
- Filling health records & online reporting formats (if available)
- Preparing a case study on a dialysis patient benefitting from **government health insurance**
- Role play exercise: Explaining PMNDP benefits to a new dialysis patient

➢ **Documentation & Reporting**

- Maintaining dialysis patient registers as per programme guidelines
- Preparing monthly reports of dialysis patients with co-morbidities (diabetes, hypertension, TB, hepatitis)
- Submitting case studies / project work on awareness campaigns conducted
- Familiarization with **National Health Mission (NHM) reporting system**

HEALTHCARE DELIVERY SYSTEM

THEORY

1. Introduction to Healthcare Delivery System

- Concept of health and disease
- Determinants of health (biological, social, environmental, economic)
- Healthcare system: definition, goals, and objectives
- Levels of healthcare delivery: **primary, secondary, tertiary care**
- Role of dialysis technician in healthcare delivery

2. Healthcare Delivery in India

- Structure of healthcare system in India (rural & urban)
- Sub-centres, Primary Health Centres (PHC), Community Health Centres (CHC)
- District hospitals, specialty & super-specialty hospitals
- Private sector & NGOs in healthcare delivery
- Role of AYUSH systems in healthcare

3. National & International Health Organizations

- Ministry of Health & Family Welfare (MoHFW) – functions & schemes
- Indian Council of Medical Research (ICMR)
- National Health Mission (NHM)
- World Health Organization (WHO) – structure & functions
- UNICEF, Red Cross, and other international agencies

4. Health Policies & Programmes in India

- National Health Policy (1983, 2002, 2017 – overview)
- Pradhan Mantri Jan Arogya Yojana (PM-JAY) under Ayushman Bharat
- Pradhan Mantri National Dialysis Programme (PMNDP)
- Public-private partnerships in healthcare delivery
- Telemedicine & e-health initiatives in India

5. Organization of Hospital Services

- Types of hospitals (teaching, non-teaching, corporate, specialty, superspecialty)
- Organization of hospital departments: OPD, IPD, ICU, dialysis unit, OT
- Hospital support services: pharmacy, laboratory, radiology, dietary, housekeeping
- Patient admission & discharge procedures
- Role of paramedical staff in hospital management

6. Primary Healthcare & Preventive Services

- Principles of Primary Health Care (Alma-Ata Declaration)
- Health promotion, disease prevention, curative and rehabilitative services
- National Health Programmes and their integration at primary level

- Community participation in healthcare delivery
- Family planning & maternal-child health services

7. Referral System & Continuum of Care

- Concept and need for referral
- Referral from sub-centre → PHC → CHC → district hospital → tertiary hospital
- Role of dialysis technician in referral for CKD patients
- Home-based care & palliative care support for dialysis patients

8. Health Information System & Records

- Importance of health records in healthcare delivery
- Types of health records (manual & electronic)
- Electronic Medical Records (EMR) in dialysis units
- Medical ethics, confidentiality, and legal aspects in patient data management

9. Healthcare Financing & Insurance

- Sources of healthcare financing (public, private, health insurance)
- Central & state government funding in health
- Rashtriya Swasthya Bima Yojana (RSBY)
- Ayushman Bharat & other state health insurance schemes
- Free dialysis services under government programmes

10. Challenges & Recent Advances in Healthcare Delivery

- Urban–rural disparities in healthcare delivery
- Shortage of human resources in health sector
- Role of technology: telemedicine, AI, digital health records
- Public health emergencies (COVID-19, epidemics) and response systems
- Future trends in healthcare delivery in India

PRACTICAL

➢ **Orientation & Observation**

- Visit and orientation to:
  - Sub-centre, PHC, CHC, district hospital, tertiary hospital
  - Dialysis unit in secondary & tertiary care hospitals
  - Private hospitals & charitable healthcare centres
- Observation of workflow in dialysis unit, OPD, ICU, and lab services

➢ **Patient Admission & Hospital Services**

- Demonstration of **patient admission and discharge procedures**
- Preparing a **patient case sheet** (demographics, diagnosis, treatment)

- Visit to **pharmacy, laboratory, radiology, dietary, and biomedical waste units**
- Observation of hospital referral system (patient flow from PHC → higher centre)

➢ **Role of Dialysis Technician in Health Delivery**

- Practical exposure to **dialysis patient registration** under Pradhan Mantri National Dialysis Programme (PMNDP)
- Assisting in counselling of CKD patients about **government health schemes (PMJAY, RSBY, state insurance)**
- Preparation of **awareness material** (posters/pamphlets) on kidney health & dialysis services

➢ **Infection Control & Quality Practices**

- Hand hygiene and PPE demonstration in dialysis units
- Disinfection and sterilization procedures in dialysis setup
- Biomedical waste segregation and disposal methods (as per BMW rules)
- Maintaining infection control checklist in dialysis centre

➢ **Health Information System & Records**

- Practical training in **manual dialysis registers** (patient details, sessions, outcomes)
- Exposure to **Electronic Medical Records (EMR)** and online reporting (if available)
- Preparation of sample **monthly dialysis unit report** for submission to health authority
- Case study on patient confidentiality & ethics in record-keeping

➢ **Community & Preventive Health Activities**

- Observation of **health awareness camps** (diabetes, hypertension, CKD screening)
- Participation in **blood pressure & blood sugar screening** of community members (under supervision)
- Assisting in **health education sessions** on hygiene, renal diet, and lifestyle modification
- Preparing a report on **referral of CKD patients** from PHC/CHC to higher centres

➢ **Health Insurance & Financing (Applied Training)**

- Demonstration of **Ayushman Bharat / PMJAY patient registration process**
- Hands-on practice in filling **insurance claim forms** (dialysis package)
- Case presentation of a dialysis patient benefitting from **PMNDP / insurance schemes**

➢ **Project Work & Evaluation**

- Each student to prepare a **project/report** on:
  - Structure of healthcare delivery in their district
  - Functioning of a dialysis centre under PMNDP
  - Comparison of dialysis services in public vs private hospitals
- Viva-voce based on case reports and practical exposure

CONCEPTS OF RENAL DISEASE, DIALYSIS & NUTRITION

THEORY

1. Basics of Kidney & Renal Physiology

- Anatomy of kidney and urinary system
- Physiology of urine formation (filtration, reabsorption, secretion)
- Regulation of fluid, electrolyte, and acid-base balance
- Hormonal functions of kidney (erythropoietin, renin, vitamin D activation)

2. Introduction to Renal Diseases

- Definition and classification of renal diseases
- Acute Kidney Injury (AKI) – causes, symptoms, stages, management overview
- Chronic Kidney Disease (CKD) – stages, clinical features, complications
- End Stage Renal Disease (ESRD)
- Nephrotic syndrome, glomerulonephritis, polycystic kidney disease (overview)
- Common comorbidities: Diabetes & Hypertension leading to CKD

3. Diagnostic Approaches in Renal Diseases

- Clinical examination of renal patients
- Laboratory investigations: urine analysis, blood urea, serum creatinine, electrolytes
- Imaging techniques: USG, CT, MRI (basic understanding)
- Renal biopsy (overview – technician's role in specimen handling)

4. Principles of Dialysis

- Concept of dialysis: definition & purpose
- Principles of diffusion, osmosis & ultrafiltration
- Hemodialysis: mechanism, dialyzer function, blood & dialysate flow
- Peritoneal dialysis: mechanism & comparison with hemodialysis
- Indications for dialysis (AKI, CKD, poisoning, electrolyte imbalance)

5. Hemodialysis Procedures & Care

- Vascular access: AV fistula, AV graft, central venous catheters
- Dialysis machine components & circuit overview
- Dialysis session steps – preparation, initiation, monitoring, termination
- Complications during dialysis (hypotension, cramps, infection, clotting)

- Post-dialysis care & patient education

6. Peritoneal Dialysis (Basics)

- Types of peritoneal dialysis (CAPD, APD)
- Catheter insertion & care
- Indications, advantages & limitations
- Complications (peritonitis, catheter blockage)

7. Nutrition in Kidney Diseases

- Role of diet in renal disease & dialysis
- Energy, protein, carbohydrate, fat requirements in CKD
- Protein restriction in pre-dialysis CKD; protein requirement in dialysis patients
- Electrolyte management: sodium, potassium, calcium, phosphate restrictions
- Fluid restriction & monitoring
- Renal diet charts (veg & non-veg examples)
- Nutritional supplements in dialysis patients

8. Anemia & Bone Disease in CKD

- Pathophysiology of anemia in CKD
- Role of erythropoietin & iron therapy
- Renal osteodystrophy: causes, prevention & management
- Nutritional support in anemia & bone disease

9. Patient Education & Counselling

- Educating patients about dialysis schedule & compliance
- Lifestyle modifications in CKD (diet, exercise, smoking/alcohol cessation)
- Importance of vaccination in dialysis patients (Hepatitis B, Influenza, Pneumococcal)
- Psychological aspects & counselling support for CKD patients

10. Recent Advances & Future Trends

- High-flux dialysis & hemodiafiltration (overview)
- Wearable & portable dialysis machines
- Advances in renal transplantation
- Role of nutrition & supplements in improving dialysis outcomes

PRACTICAL

➢ Clinical Examination & Case Study

- Recording vital signs (BP, pulse, respiration, temperature) in renal patients
- Clinical observation of edema, pallor, dehydration in kidney disease patients
- Preparation of case sheets for CKD/AKI patients

- Documentation of patient history: comorbidities (diabetes, hypertension)

➢ **Laboratory Investigations (Observation & Practice)**

- Urine routine & microscopy (albumin, sugar, microscopy findings)
- Blood tests relevant to renal disease: urea, creatinine, electrolytes
- Interpretation of lab reports (high/low potassium, calcium, phosphate)
- Recording & maintaining investigation reports of dialysis patients

➢ **Dialysis Principles (Demonstration & Hands-On)**

- Demonstration of **dialysis machine components** (blood pump, dialyzer, dialysate system)
- Practice on **priming the dialysis circuit** under supervision
- Observation of **initiation, monitoring, and termination** of hemodialysis
- Identification of dialysis complications during sessions (hypotension, cramps, clotting)
- Observation of **peritoneal dialysis procedure** (CAPD exchanges)

➢ **Vascular Access Care (Applied Skills)**

- Observation of AV fistula examination (thrill, bruit)
- Assisting in AV fistula/AV graft dressing
- Central venous catheter care (dressing, infection prevention)
- Reporting access-related complications (bleeding, infection, clotting)

➢ **Nutrition in CKD & Dialysis (Practical Applications)**

- Preparation of **renal diet charts** (pre-dialysis CKD vs dialysis patients)
- Calculating daily protein, sodium, potassium, and fluid allowances
- Role play exercise: **counselling a dialysis patient** about fluid & diet restrictions
- Identifying foods **high/low in potassium, phosphate, sodium**
- Case study on **malnourished dialysis patient** & diet modification

➢ **Anemia & Bone Disease Management (Observation/Practice)**

- Demonstration of **erythropoietin injection administration** (observation only)
- Recording Hb levels & correlating with CKD anemia
- Identifying clinical signs of renal bone disease (bone pain, fractures)
- Dietary counselling for phosphate restriction & calcium supplementation

➢ **Patient Education & Counselling**

- Educating patients on importance of **dialysis schedule adherence**
- Counselling on **fluid intake & output monitoring**

- Awareness session on **vaccination for dialysis patients** (Hepatitis B, Influenza, Pneumococcal)
- Psychological support role play: handling anxiety/depression in dialysis patients

➢ **Project Work & Documentation**

- Each student to prepare a **dialysis patient case study report** (history, lab results, treatment, diet plan)
- Maintaining **dialysis records & diet counselling charts**
- Presentation on **recent advances in dialysis & nutrition**

APPLIED DIALYSIS THERAPY TECHNOLOGY

THEORY

1. Principles of Dialysis Technology

- Review of hemodialysis principles: diffusion, osmosis, ultrafiltration
- Dialysis adequacy concepts: Kt/V, URR (Urea Reduction Ratio)
- Dialysis prescriptions: duration, frequency, blood flow rate, dialysate flow rate
- Water treatment in dialysis: stages of purification (softener, carbon filter, RO, UV)

2. Hemodialysis Machines & Components

- Types of dialysis machines (single pump, double pump, portable, home dialysis units)
- Blood pump, dialysate delivery system, heparin pump, ultrafiltration control
- Alarm systems in hemodialysis machines (air, blood leak, conductivity, temperature)
- Dialyzers: hollow fiber, high flux, reuse methods (pros & cons)

3. Vascular Access in Dialysis

- AV fistula, AV graft, central venous catheters (temporary & permanent)
- Complications of access (infection, thrombosis, stenosis)
- Care & monitoring of vascular access during dialysis
- Nursing & technician role in vascular access management

4. Dialysis Procedures (Applied)

- Patient preparation before dialysis (assessment, weight, BP, lab tests)
- Steps of initiating hemodialysis
- Monitoring patient during dialysis (vital signs, symptoms, machine parameters)
- Termination of dialysis & post-dialysis care
- Peritoneal dialysis: CAPD, CCPD – procedure, indications, complications
- CRRT (Continuous Renal Replacement Therapy): basics & ICU role

5. Dialysis Complications & Emergency Management

- Intra-dialytic complications: hypotension, muscle cramps, air embolism, arrhythmia, seizures
- Long-term complications: anemia, bone disease, malnutrition, infections
- Emergency protocols in dialysis units (cardiac arrest, anaphylaxis, power failure)
- Handling accidental blood spills & infection exposure

6. Infection Control in Dialysis Units

- Standard precautions (hand hygiene, PPE, safe injection practices)
- Disinfection & sterilization of dialysis machines, dialyzers, and water system
- Biomedical waste management specific to dialysis centres
- Vaccination protocols for patients & staff (Hepatitis B, Influenza, Pneumococcal)

7. Special Dialysis Therapies

- Pediatric dialysis – differences & challenges
- Dialysis in pregnancy – monitoring & modifications
- Home dialysis – training patients & caregivers
- High-flux dialysis & hemodiafiltration (HDF) – concepts & advantages

8. Nutrition & Lifestyle in Dialysis

- Dietary restrictions in dialysis patients (protein, sodium, potassium, phosphate, fluid)
- Role of erythropoietin & iron in anemia management
- Lifestyle modifications: exercise, infection prevention, psychological support
- Counselling patients & families about compliance

9. Documentation & Record-Keeping

- Dialysis session records: pre, intra, and post-dialysis charts
- Machine maintenance logs & dialyzer reuse records
- Incident reporting system (complications, accidents, errors)
- Importance of patient confidentiality in dialysis documentation

10. Advances in Dialysis Technology

- Wearable dialysis devices
- Portable/home hemodialysis units
- Online hemodiafiltration (HDF)
- Artificial kidney & renal replacement research

PRACTICAL

- **Dialysis Machine Operation**

- Identification of dialysis machine components (blood pump, heparin pump, UF control, alarms)
- Demonstration & practice of **priming and rinsing dialysis machine**
- Calibration & checking conductivity, temperature, and alarm functions
- Preparing dialyzer & bloodlines for use

➢ **Water Treatment & Quality Testing**

- Demonstration of **water treatment system** (sand filter, carbon filter, RO, UV, storage tank)
- Hands-on training in checking:
  - Water hardness
  - Chlorine & chloramine levels
  - Conductivity & pH
- Documentation of water testing records as per dialysis guidelines

➢ **Patient Preparation for Dialysis**

- Recording pre-dialysis weight, BP, pulse, and temperature
- Preparing dialysis case sheet
- Cannulation site observation (AV fistula thrill/bruit, catheter dressing)
- Preparing patient psychologically for procedure

➢ **Hemodialysis Procedure (Hands-On Training)**

- Priming blood circuit & connecting dialyzer
- Safe cannulation techniques (observational and under supervision)
- Initiating dialysis: connecting patient to extracorporeal circuit
- Monitoring during dialysis:
  - Vital signs (every 30–60 mins)
  - Ultrafiltration control & fluid balance
  - Patient comfort and safety checks
- Termination of dialysis: returning blood, disconnection, and post-dialysis care

➢ **Peritoneal Dialysis (PD) Practice**

- Demonstration of CAPD bag exchange procedure
- Hands-on training in preparing PD fluid setup
- Observation of CCPD procedure in hospital
- Recording complications (peritonitis, leaks, catheter site infections)

➢ **Complication Management & Emergency Drills**

- Recognition & immediate response to:
  - Hypotension, cramps, nausea/vomiting
  - Air embolism, blood leak alarm, hemolysis
  - Arrhythmias, seizures, anaphylaxis
- Simulation of **cardiac arrest management** in dialysis unit (CPR, crash cart use)

- Emergency power failure drill during dialysis

➢ **Infection Control Practices**

- Hand hygiene & PPE demonstration
- Preparation of disinfectant solutions (hypochlorite, formalin, citric acid)
- Disinfection of dialysis machines & dialyzers (single-use vs reuse protocol)
- Biomedical waste segregation and disposal (needles, bloodlines, dialyzers)
- Hepatitis B/C & HIV patient isolation practices

➢ **Special Dialysis Procedures**

- Observation of pediatric dialysis sessions
- Demonstration of dialysis in ICU/critical care settings
- Training in **CRRT machine setup** (if available)
- Demonstration of online hemodiafiltration (HDF) procedure

➢ **Documentation & Record Keeping**

- Filling dialysis flow sheets (pre, intra, post dialysis data)
- Dialyzer reuse logbook maintenance
- Water quality logbook & infection control records
- Incident reporting of complications & equipment failure

➢ **Project Work & Case Presentation**

- Each student to prepare **two dialysis case studies** (with clinical details, dialysis prescription, complications, outcome)
- Presentation of one **complication management case** (e.g., hypotension or air embolism)
- Report on **infection control audit** in dialysis unit

LIST OF HOLIDAYS

TOTAL DAY IN 1 YEAR	**365/366**
SUNDAY	52 DAYS
SUMMER VACATION	10 DAYS
WINTER VACATION	10 DAYS
GAZETTED HOLIDAYS	23 DAYS
OTHER HOLIDAYS	20 DAYS
TOTAL HOLIDAYS	115 DAYS
TOTAL WORKING DAYS	365-115=250

TOTAL HOURS

THEORY CLASS PER DAY	**3 HOURS**
PRACTICAL CLASS PER DAY	4 HOURS
TOTAL HOURS PER DAY	7 HOURS
TOTAL HOURS IN 1 YEAR	250*7=1750
TOTAL HOURS IN 6 MONTHS	875 HOURS

Chairman

Paramedical Education & Training Council