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