# MALLA REDDY VISHWAVIDYAPEETH

## SCHOOL OF ALLIED HEALTHCARE SCIENCES & TECHNOLOGY

**Suraram X Roads, Jeedimetla,**
**Hyderabad-500055**

**Website:** https://mrvv.edu.in/

## Program:

## Bachelor of Science (B.Sc.)

## Dialysis Therapy Technology

## 2025

# MALLA REDDY VISHWAVIDYAPEETH

## SCHOOL OF ALLIED HEALTHCARE SCIENCES & TECHNOLOGY

## Bachelors of Dialysis Therapy Technology

### Vision

- To develop skilled dialysis technologists with strong clinical competence.
- To promote patient-centred and ethical healthcare practices.
- To advance knowledge in renal care and dialysis technology.
- To contribute to quality healthcare delivery in nephrology services.

### Mission

- To provide comprehensive education in dialysis therapy and renal sciences.
- To train students in modern dialysis techniques and equipment handling.
- To encourage research, innovation, and lifelong learning.
- To instil professional ethics and effective communication skills.

### Program Educational Objectives (PEOs)

- Graduates will excel as competent dialysis technologists in healthcare settings.
- They will demonstrate ethical practices and responsibility in patient care.
- They will adapt to evolving technologies in dialysis and nephrology.
- They will pursue higher education, research, or professional development.

### Program Outcomes (POs)

- Apply knowledge of renal physiology and dialysis procedures effectively.
- Operate and maintain dialysis machines and related equipment safely.
- Demonstrate critical thinking and problem-solving in clinical situations.
- Communicate effectively with patients, families, and healthcare teams.

**Program Specific Outcomes (PSOs)**

- Perform haemodialysis and peritoneal dialysis procedures competently.
- Monitor patients before, during, and after dialysis sessions.
- Ensure infection control and patient safety in dialysis units.
- Handle dialysis emergencies and complications efficiently.

**Course Outcomes (COs)**

Understand fundamentals of kidney function and renal diseases.

- Demonstrate practical skills in dialysis techniques and procedures.
- Identify and troubleshoot dialysis machine issues.
- Apply safety protocols and patient care standards in clinical practice.

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## SCHOOL OF ALLIED HEALTHCARE SCIENCES & TECHNOLOGY

## Bachelors of Dialysis Therapy Technology (BDTT)

## COURSE STRUCTURE

### I year I semester

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Human Anatomy-1 | 4 | - | - | 4 | 30 | 70 | 100 |
| 2 | | Human Physiology-1 | 4 | - | - | 4 | 30 | 70 | 100 |
| 3 | | Medical Biochemistry-1 | 4 | - | - | 4 | 30 | 70 | 100 |
| 4 | | Sociology | 2 | - | - | 2 | 30 | 70 | 100 |
| 5 | | English and Communication Skills | 2 | - | - | 2 | 30 | 70 | 100 |
| 6 | | Basic Computers | 1 | - | 2 | 2 | 30 | 70 | 100 |
| 7 | | Human Anatomy (Practical)-1 | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | | Human Physiology (Practical)-1 | - | - | 4 | 2 | 30 | 70 | 100 |
| 9 | | Environmental Awareness | 1 | - | - | 1 | 100 | - | 100 |
| | | TOTAL | 18 | | 10 | 23 | 340 | 560 | 900 |

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## I year II Semester

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | MARKS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Human Anatomy – II | 4 | - | - | 4 | 30 | 70 | 100 |
| 2 | | Human Physiology - II | 4 | - | - | 4 | 30 | 70 | 100 |
| 3 | | Pathology (practical) | 2 | - | 2 | 3 | 30 | 70 | 100 |
| 4 | | Microbiology (practical) | 3 | - | 2 | 4 | 30 | 70 | 100 |
| 5 | | Introduction to Dialysis Therapy | 1 | - | 2 | 2 | 30 | 70 | 100 |
| 6 | | General Psychology | 3 | - | - | 3 | 30 | 70 | 100 |
| 7 | | Human Anatomy – II Practical | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | | Human Physiology – II Practical | - | - | 2 | 1 | 30 | 70 | 100 |
| 9 | | Clinical Postings I (CT) | - | - | 6 | 3 | 100 | - | 100 |
| 10 | | Stress management | 1 | - | - | 1 | 100 | - | 100 |
| | | TOTAL | 18 | - | 18 | 27 | 440 | 560 | 1000 |

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## II year/III Semester

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | General Pharmacology | 2 | - | - | 2 | 30 | 70 | 100 |
| 2 | | Fundamentals of Dialysis Therapy &(practicals) | 3 | - | 1 | 4 | 30 | 70 | 100 |
| 3 | | Instrumentation Specific to Dialysis Therapy &(practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 4 | | Pathophysiology of the kidney Diseases | 2 | - | - | 2 | 30 | 70 | 100 |
| 5 | | Basic Principles of Nursing Care | 2 | - | - | 2 | 30 | 70 | 100 |
| 6 | | Medical Law and Ethics, Medical Terminology and Record keeping(including anatomical terms) | 3 | - | - | 3 | 30 | 70 | 100 |
| 7 | | Clinical Postings II (CT) | - | - | 5 | 5 | 100 | - | 100 |
| 8 | | Health care delivery system in India | 2 | - | - | 2 | 30 | 70 | 100 |
| | | TOTAL | 16 | - | 7 | 23 | 310 | 490 | 800 |

## II year/IV Semester

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Pharmacology related to Dialysis therapy &(practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 2 | | Renal Nutrition | 2 | - | - | 2 | 30 | 70 | 100 |
| 3 | | Dialysis Therapies – Part I &(practicals) | 3 | - | 1 | 4 | 30 | 70 | 100 |
| 4 | | Medical Electronics for Health Sciences, | 3 | - | - | 3 | 30 | 70 | 100 |
| 5 | | Clinical Postings III (CT) | - | - | 8 | 8 | 100 | - | 100 |
| 6 | | Health and well- being | 1 | - | - | 1 | 100 | - | 100 |
| TOTAL | | | 11 | - | 10 | 21 | 320 | 280 | 600 |

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## III year/V Semester

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Dialysis Therapies – Part II & (practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 2 | | Renal Transplantation and Coordination & (practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 3 | | Clinical Problems and Evidenced Based Practice in Dialysis Therapy | 3 | - | - | 3 | 30 | 70 | 100 |
| 4 | | Advanced Extracorporeal Therapies & (practicals) | 3 | - | 1 | 4 | 30 | 70 | 100 |
| 5 | | Clinical Postings IV (CT) | - | - | 7 | 7 | 100 | - | 100 |
| 6 | | Interpersonal Communication | 1 | - | - | 1 | 100 | - | 100 |
| | | TOTAL | 11 | - | 10 | 21 | 320 | 280 | 600 |

## III year/VI Semester

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Recent Advancements in Renal replacement therapies & (practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 2 | | Principals of Management | 2 | - | - | 2 | 30 | 70 | 100 |
| 3 | | Introduction to Quality Assurance in dialysis and Patient safety | 1 | - | 1 | 2 | 30 | 70 | 100 |
| 4 | | Basic and Advanced Cardiac Life Support & (practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 5 | | Research Methodology and Biostatistics | 3 | - | - | 3 | 30 | 70 | 100 |
| 6 | | Clinical Postings V (CT) | - | - | 7 | 7 | 100 | - | 100 |
| 7 | | Art of Being a Better Person | 1 | - | - | 1 | 100 | - | 100 |
| TOTAL | | | 11 | - | 10 | 21 | 350 | 350 | 700 |

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## IV year/VII Semester

| Course Code | Course Title | Credits/Week | | | Hours/Semester | | | Assesments | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | P | C | L | T/P | Total | INT | EXT | |
| | Internship | 2 | 20 | 22 | 30 | 900 | 930 | - | 100 | 100 |
| | Project work | | 06 | 06 | | 270 | 270 | | 100 | 100 |
| **Total** | | **2** | **26** | **28** | **30** | **1170** | **1200** | **-** | **200** | **200** |

## IV year/VIII Semester

| Course Code | Course Title | Credits/Week | | | Hours/Semester | | | Assesments | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | P | C | L | T/P | Total | INT | EXT | |
| | Internship | 2 | 20 | 22 | 30 | 900 | 930 | - | 100 | 100 |
| | Project work | | 06 | 06 | | 270 | 270 | | 100 | 100 |
| **Total** | | **2** | **26** | **28** | **30** | **1170** | **1200** | **-** | **200** | **200** |

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Undergraduate program:

| S. No | Course | Duration | Eligibility for admission |
|---|---|---|---|
| 1 | Bachelor of Dialysis Therapy Technology | 4 years | Intermediate Bi.P.C (mathematics optional)/ Diploma (2yrs) holders (can directly be enrolled into 2nd year) /10+2 or equivalent/ |

**1.1 Medium of Instruction:**

English shall be the medium of instruction for all the subjects of study and for examination of the course.

**1.2 Duration of the course:**

- 4 years
- Total number of hours – 6000
- Total Credits: 216

**1.3 Examination Regulations:**

**1.3.1 Attendance:**

A candidate has to secure minimum 80% attendance in overall with at least-
1. 80% attendance in theoretical
2. 80% in Skills training (practical)

for qualifying to appear for the final examination. No relaxation, whatsoever, will be permissible to this rule under any ground including indisposition, etc.

**1.3.2 Assessment:**

- **Cognitive Assessment**
  1. Structured log book
  2. Viva-voce examination.
  3. Structured case presentation
  4. Formative assessment
  5. Summative assessment
  6. Case presentation

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- **Psychomotor Assessment**
    1. Objective Structured Clinical Examination (OSCE)
    2. Objective Structured Practical Examination (OSPE)
    3. Mini Clinical Evaluation Exercise (Mini-CEX)
    4. Direct Observation of Procedural Skills (DOPS)
    5. Simulation-based assessment

**Internal Assessments:**

a) Regular periodic assessment shall be conducted throughout the course. Each student in a semester is assessed internally twice by conducting one hour exam with maximum of 20 marks. Additionally, student also undergo a continuous assessment for maximum of 10 marks. The internal assessment shall carry a weightage of 50% and will contribute 50% to the final assessment at the end of the semester

b) Exam patterns for internal assessment in each semester will be

1. Each of two internal examinations shall include a section of ten very short answer questions each carrying one mark, totaling to ten marks. Two long answer questions each carrying 5 marks, totaling to 10 marks. Thus, a total of 20 marks for each internal examination with the duration of 1 hour time

2. Continuous assessment of the students shall be carried out throughout the semester. This will include evaluation of overall attendance, classroom performance, student behavior, participation in extracurricular activities, and other relevant aspects. Continuous assessment shall carry a weightage of 10 marks.

3. Thus, a total of 50 marks for the internal examination. (20+20+10=50 marks). A candidate should secure a minimum of 40% marks in the internal assessment in each subject to be eligible to appear for the University examination.

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4. Candidates should score a minimum of 40% marks in theory and practical internal assessment examination separately to be eligible to appear in the University exam in that subject.

5. For value added courses, only internal examination will be conducted. The assessment comprised of five assignments/presentations/case presentations each carrying 10 (i.e., 5x10=50 marks). Final written examination (1.5 h) will be for 50 marks with 5 questions each carrying 10 marks (5x10=50 marks). The minimum pass is 40% marks.

### 1.3.2 University Examinations (External):

a) University Examination shall be conducted at the end of every semester.

b) A candidate who meets the requirement of attendance and internal assessment marks, as stipulated by the University shall be eligible to appear for the University Examination.

c) Examination will be of 3 hours duration (for theory). The exam pattern for those subjects (100 marks) will be

1. Very short answer questions – 15 each carrying 2 marks (15 x 2 M = 30 marks)
2. Short answer questions, 5 questions each carrying 8 marks (5 x 8 M = 40 marks)
3. Three Essay questions ,out of which two questions need to be answered, each carrying 15 marks (2 x 15 M=30 marks). Thus, a total of 100 marks.

### 1.3.3. The question pattern for the practical examination

(a) Spotters/major practical /minor practical / Viva / practical record.

### 1.3.4. Pass Criteria

The minimum pass marks for internal assessment are 40% and for the University Examination is 50% i.e. a student should score a total of 50% (adding the internal and external examination) to pass in each subject.

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## SEMESTER - 1

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Human Anatomy-1 | 4 | - | - | 4 | 30 | 70 | 100 |
| 2 | | Human Physiology-1 | 4 | - | - | 4 | 30 | 70 | 100 |
| 3 | | Medical Biochemistry-1 | 4 | - | - | 4 | 30 | 70 | 100 |
| 4 | | Sociology | 2 | - | - | 2 | 30 | 70 | 100 |
| 5 | | English and Communication Skills | 2 | - | - | 2 | 30 | 70 | 100 |
| 6 | | Basic Computers | 1 | - | 2 | 2 | 30 | 70 | 100 |
| 7 | | Human Anatomy (Practical)-1 | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | | Human Physiology (Practical)-1 | - | - | 4 | 2 | 30 | 70 | 100 |
| 9 | | Environmental Awareness | 1 | - | - | 1 | 100 | - | 100 |
| TOTAL | | | 18 | | 10 | 23 | 340 | 560 | 900 |

## HUMAN ANATOMY-1 L/T/P/C 4/-/-/4

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**Learning Objectives:**

- Develop a clear understanding of basic human anatomy and Histology, including structure and organization of tissues, organs, and systems.
- Identify and describe anatomical structures of the upper extremity, thorax, and major body systems, along with their functions and relationships.
- Apply anatomical knowledge to clinical contexts, especially in understanding organ systems relevant to patient care and dialysis practice.

**Learning Outcomes:**

- Demonstrate the ability to recognize and explain the structure and function of major organs and systems such as the Cardiovascular System and Urinary System.
- Correlate anatomical and histological knowledge with clinical procedures and patient management in healthcare settings.
- Exhibit competency in identifying anatomical landmarks and understanding their relevance in diagnostic and therapeutic procedures.

**UNIT-I (12 hours)**

## GENERAL ANATOMY AND HISTOLOGY

**General Anatomy:**

- Fascia
- Muscles
- Bones
- Joints
- Vessels
- Nerve

**General Histology:**

- Epithelial
- Connective tissue
- Muscle
- Bone and cartilage
- Nerves and vessels
- Embryology

**UNIT-1I (12 hours)**

**UPPER EXTREMITY :**

- Osteology: Clavicle, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges.
- Muscles: Origin, insertion, nerve supply, and actions.

**UNIT-3 (12 hours)**

**UPPER EXTREMITY :**

- Joints: Shoulder girdle, shoulder joint, elbow joints, radioulnar joint, wrist joint, and joints of the hand.
- Breast, pectoral region, axilla, cubital fossa, arch of the hand
- Brachial plexus, nerves of the upper extremity
- Blood vessels and lymphatic drainage

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**UNIT – 4 (12 hours)**

**CARDIOVASCULAR&RESPIRATORYANATOMY**

- Thoracic wall
- Mediastinum
- Heart: Anatomy of heart, blood supply, nerve supply, conducting system, conducting System and major blood vessels
- Lungs: Anatomy of lungs, bronchial tree, pleura, bronchopulmonary segments, blood Supply, and nerve supply
- Diaphragm: Origin, insertion, nerve supply, and action, openings in the diaphragm.
- Intercostal muscles and accessory muscles of respiration: Origin, insertion, nerve supply, and action

- Ribs and sternum

**UNIT-V (12 hours)**

**SYSTEMICANATOMY**

1. Digestive system:
   **List the parts of the digestive system**
   **Anatomy of the stomach, liver, gallbladder, spleen, pancreas, and intestines.**
2. Urinary system:
   **Anatomy of the kidney, urinary bladder**
3. Endocrine system:
   **Position and hormones secreted by each organ**
4. Genital system:
   **Male organs and female organs**

**RECOMMENDED TEXT BOOKS**

1. Human Anatomy-Snell
2. Anatomy- Chaurasia, Volume, and III
3. Neuroanatomy-Inderbir Singh
4. Human Anatomy- Kadasne, Volume, and III
5. Neuroanatomy— Vishrsam Singh
6. Human Anatomy- Datta

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# HUMANPHYSIOLOGY–I

**L/T/P/C**
**4/-/-/4**

**Learning Objectives:**

- Understand the fundamental principles of human physiology, including Homeostasis, cell function, and mechanisms of transport across cell membranes.
- Describe the structure and functions of major systems such as the Cardiovascular System, Respiratory System, and blood physiology.
- Explain physiological processes related to nerve conduction, muscle contraction, and exercise, and their role in maintaining normal body function.

**Learning Outcomes:**

- Demonstrate the ability to explain normal physiological mechanisms of the body, including circulation, respiration, and neuromuscular activity.
- Apply knowledge of physiological principles to interpret basic clinical conditions such as Anemia, blood pressure variations, and respiratory changes.
- Correlate physiological responses during rest and exercise, enabling understanding of patient monitoring and care in clinical settings.

## UNIT-I (12 hours)

**GENERALPHYSIOLOGY**

**Cell:**

- Structure of the cell membrane
- Fluid Mosaic Model
- Lipid bilayer
- Functions of the cell membrane

a) **Transport across the cell membrane**

- Basic mechanism of transport
- Channel proteins
- Carrier proteins
- Methods of transport
- Passive transport
- Active transport

**b) Body fluids**

- Intracellular fluid
- Extracellular fluid
- Body electrolytes
- Regulation of body fluid volume

**Homeostasis**

- Regulation of body function
- Homeostatic regulatory mechanism

**BLOOD**

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- Composition of blood & its volume
- Plasma
- Hemopoietin
- Composition
- Plasma protein
- Erythrocytes
- Normal count
- Structure of RBC (shape & size)
- Functions of RBC
- Hemoglobin (Normal Value, Fate, Function)
- Anemia & polycythemia
- ESR & PCV
- Leukocytes
- Classification
- Functions of leukocytes
- Platelets
- Normal count
- Functions of thrombocytes
- Blood Coagulation
- Bleeding time & clotting time
- Blood group
- ABO system
- Landsteiner's law
- ABO incompatibility
- Rh system
- Rhincompatibility & erythroblastosis fatalist
- Blood transfusion
- Collection & storage of blood
- Precautions
- Cross-matching
- Hazards of blood transfusion

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**NERVE:**

- Structure of a neuron
- Classification of neurons
- Electrical activity of a neuron
- Resting membrane potential
- Action potential
- Propagation of nerve impulse
- Properties of nerve fibres
- Neuroglia-Types & functions
- Nerve Injury
- Types of Nerve Injury
- Effect of Nerve Injury

- Regeneration of damaged nerve fibre

**UNIT-II (12 hours)**

**MUSCLE PHYSIOLOGY**

- Classification
- Properties of skeletal muscle
- Structure of skeletal muscle
- Sarcomere
- Sarcotubular system
- Neuromuscular junction &disease affecting it
- Excitation-Contraction coupling
- Mechanism of muscle contraction
- Functions of skeletal muscle
- Types of muscle contractions
- Red & white muscles
- Rigor mortis, muscular dystrophy, altered muscle tone, muscle cramp, atrophy, EMG

**UNIT-III (12 hours)**

**CARDIOVASCULAR SYSTEM**

- Structure of heart & blood vessels
- Properties of cardiac muscle
- Origin & spread of cardiac pulse
- Cardiac cycle & heart sounds
- Cardiac output
- Related terms
- Regulation of cardiac output
- Circulatory shock
- Pulse & Heart rate and its regulation
- Blood pressure
- Definitions
- Factors controlling & Influencing BP
- Regulation of BP
- Regional circulation
- Coronary circulation
- Cerebral circulation
- Normal ECG

**UNIT-IV (12 hours)**

**RESPIRATORY SYSTEM**

- Introduction, structure & function of RS
- Upper respiratory tract
- Lower respiratory tract
- Respiratory membrane

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- Mechanism of breathing
- Mechanisms of Breathing
- Respiratory pressure change
- Compliance
- Surfactant
- Respiratory volumes & capacities
- Pulmonary ventilation & Dead space
- Transport of respiratory gases
- Nervous & chemical regulation of respiration
- Pulmonary function test –direct & indirect method
- Physiological changes with altitude & acclimatization

**UNIT-V (12 hours)**

**EXERCISE PHYSIOLOGY**

- Basal Metabolic Rate & Respiratory Quotient
- Energy metabolism
- Fatigue
- Oxygen debt
- Acute cardio vascular changes during exercise ; difference between mild, moderate & severe exercise
- Concept of Endurance
- Acute respiratory changes during exercise
- Conceptoftraining/conditioning;effectsoflong-termexercise/trainingontheCVS&RS
- Body temperature regulation during exercise
- Hormonal & metabolic effects during exercise
- Exercise for muscle strength, power, endurance, and its effects on Physical fitness & its components

**RECOMMENDED TEXT BOOKS**

1. Textbook on Medical Physiology-Guyton
2. Textbook of Physiology-AK Jain (for MBBS students)
3. Human Physiology-C.C. Chatterjee
4. Essentials of Medical Physiology- Sembulingam, K.
5. ComprehensiveTextbookofMedicalPhysiology:Vol-1&2 -Pal, Gopal Krishna
6. Physiology: Prep Manual for Undergraduates-Joshi, Vijaya D.
7. Practical Physiology-Joshi, Vijaya D.

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# MEDICAL BIOCHEMISTRY–I

**L/T/P/C**
**4/-/-/4**

**Learning Objectives:**

- Understand the structure, classification, and functions of major biomolecules including carbohydrates, lipids, proteins, and Nucleic Acid Chemistry.
- Explain the role of Enzymes, vitamins, and minerals in maintaining normal physiological functions.
- Describe key metabolic pathways such as Glycolysis, TCA cycle, and lipid metabolism, along with their clinical relevance.

**Outcomes:**

- Demonstrate the ability to explain biochemical processes and their importance in normal body function and energy production.
- Interpret basic biochemical changes in body fluids, aiding in the understanding of clinical conditions such as Diabetes Mellitus and metabolic imbalances.
- Apply knowledge of enzymes, vitamins, and minerals to assess nutritional status and identify deficiency-related disorders.

## UNIT-I (12hours)

**CARBOHYDRATE CHEMISTRY**

- Definition, general classification with examples
- Composition and function of Monosaccharides and Polysaccharides
- Anomers, Epimers, Enantiomers, Mutarotation
- Glycosaminoglycan's (mucopolysaccharides)

**LIPIDCHEMISTRY**

- Definition, classification with examples.
- Classification and Functions of Fatty Acids, Phospholipids, Lipoproteins
- Structure and function of cholesterol
- Sources and functions of ketone bodies

## UNIT-II (12hours)

**AMINOACID CHEMISTRY**

- Definition, Classification of Amino Acids with Examples.
- Definition, Classification of Proteins with Examples
- Structural organization of proteins
- Biologically important peptides
- NUCLEIC ACIDS AND NUCLEOTIDE CHEMISTRY
- Composition and Function of Nitrogen bases, Nucleosides, Nucleotides
- Structure and Function of DNA
- Structure, Types, and Functions of RNA
- Differences between DNA and RNA

## UNIT-III (12hours)

**ENZYMES**

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- Definition, Classification of Enzymes with Examples
- Active site, Enzyme specificity.
- Factors affecting enzyme activity
- Enzyme inhibition
- Iso enzymes and their clinical significance, creatine kinase, ALP

**VITAMINS**

- Definition, Classification
- Fat-soluble Vitamins-Sources, RDA, Functions, and Deficiency.
- Water-soluble Vitamins-Sources, RDA, Functions, and Deficiency

## UNIT-IV (12hours)

**INTERMEDIARYMETABOILISM**

- Glycolysis
- TCA cycle
- B-oxidation of fatty acids (Palmitic acid)
- Ketone body formation and utilization, Urea cycle

## UNIT-V (12hours)

**MINERAL METABOLISM**

- Definition, Classification. Sources, RDA, Functions, and Deficiency of Calcium, Phosphorus, Iron, Sodium, Potassium

**CLINICAL BIOCHEMISTRY**

- Normal and abnormal constituents of urine and blood and their clinical significance:
- Normal constituents:
- Organic: Urea, Uric acid, Creatinine
- Inorganic: Ca, phosphate, chloride, electrolytes
- Abnormal constituents:
- Glucose, Ketone bodies, Protein, Blood, Bile salts, Bile Pigments

## RECOMMENDED TEXT BOOKS

1. Essentials of Biochemistry by U. Satya Narayana.
2. Textbook of Biochemistry for Medical Students. DM Vasudeva
3. Integrated textbook of Biochemistry Volume-land II.Indumathi.
4. Textbook of Biochemistry for Medical Students.MN Chatterjee and Rana Shinde.
5. Illustrated Biochemistry.
6. Essentials of Biochemistry. Pankaja Naik

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# SOCIOLOGY

**L/T/P/C**
**2/-/-/2**

**Learning Objectives**

- To understand the basic concepts of sociology, social structure, and their relevance to healthcare.
- To analyse the influence of social factors, culture, family, and community on health and disease.
- To develop awareness about social problems and their impact on individual and public health.

**Learning Outcomes**

- Students will be able to explain sociological concepts, methods, and their application in healthcare settings.
- Students will assess the role of socialization, family, community, and culture in health and illness.
- Students will identify major social problems and apply sociological knowledge in patient care and health planning.

## UNIT 1 (6 hours)

1.Introduction

- Meaning- Definition, Nature and Scope of Sociology
- Methods of Sociological Investigations, Case Study, Social Survey, Questionnaire, and Interview methods.
- Importance of its study with special reference to Health Care Professionals.

2. Social Factors in health and disease situations:

- Role of Social factors in health
- Role of social factors in illness
- Decision-making in taking treatment

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## UNIT II (6 hours)

1. Socialization:

- Definition and Meaning of Socialization
- Primary, Secondary, and Anticipatory socialization
- Agencies of Socialization

2. Social Groups:

- Definition and Features of Social Group
- Primary Social Group
- Secondary Social Group
- The role of Primary and Secondary Groups in Hospitals.

## UNIT III (6 hours)

1. Family:

- The family, meaning, and definition
- Functions of the family

- Changing family patterns
- Influence of Family on the individual's health, the effects of sickness in the family.

2. Community:

- Rural community: meaning and features- Health problems of the rural community.
- Urban community: meaning and features - Health problems in urban areas.

**UNIT IV (6 hours)**

1. Culture and Health:

- Concept of Health
- Concept of Culture
- Cultural factors affecting Health and diseases

2. Social Change:

- Meaning of social change
- Factors of social change
- Human adaptation and social change
- Social Planning and Health

**UNIT V (6 hours)**

1. Social Problems:

- Population explosion
- Juvenile delinquency
- Alcoholism
- Unemployment
- Poverty
- Problems of women

2. Social Security:

- Social security and social legislation

**RECOMMEMDED TEXT BOOKS**

1. Principles of Sociology --- C.N. Shankar Rao
2. Sociology for physiotherapy students--K.P. Neeraja

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# ENGLISH AND COMMUNICATION SKILLS

**L/T/P/C**
**2/-/-/2**

### Learning Objectives

- To develop reading, comprehension, and critical thinking skills through literary texts.
- To understand themes such as sympathy, work ethics, life stages, and social service.
- To enhance communication skills and appreciation of literature.

### Learning Outcomes

- Students will be able to interpret and analyze poems, essays, and letters effectively.
- Students will demonstrate understanding of moral values like empathy, dedication, and service.

| UNIT1: Sympathy (Poem) by Charles Mackay (6 hours) |
|---|
| Reading-Reading and its importance, techniques of effective reading.<br>Writing-Paragraph Writing (Topic sentence, Supporting sentences, and Conclusion) Grammar - Parts of Speech (Parsing), Articles<br><br>**ELCSLAB**<br>CALLLAB : Phonetics- Vowel Sounds (Monophthongs and Diphthongs)<br>Listening-Introduction to listening, Purpose of Listening, and Barriers to effective listening |

- Students will improve their language skills in reading, writing, and expressing ideas clearly.

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| UNIT2: A Birthday Letter by Jawaharlal Nehru (6 hours) |
| --- |
| Reading-Skimming and Scanning<br>Writing-Letter writing (Requests, Leave applications, Purchase letters,<br>Letters in correspondence with medical insurance companies)<br>Grammar- Phrase, Clause and Sentence; Prepositions<br>**ELCSLAB**<br>CALLLAB: Phonetics- Consonant Sounds<br>Listening-Listening for gist and specific information |

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| UNIT3: The secret of work by Swami Vivekananda (6 hours) |
|---|
| Reading-Making inferences and predictions<br>Writing-E-mail writing<br>Grammar-Tenses, Reported speech vocabulary–food and life style, instrument & equipment<br><br>**ELCSLAB**<br>CALLLAB: Intonation<br>Listening- Listening and identifying facts and opinions<br>ICSLAB: Speaking-Role Plays (OET) (Giving and taking instructions, Interacting with and explaining processes, conditions and instructions to the patients and their attenders, |

| UNIT4: All the world's a stage (Poem) by William Shakespeare (6 hours) |
|---|
| Reading-Reading for explicit and implicit meaning<br>Writing-Short essays: 2-ParagraphEssay, Thesis Statement<br>Grammar-Subject-Verbal agreement, Degrees of Comparison<br>**ELCSLAB**<br>CALLLAB: Consonant Clusters<br>Listening-Listen-Comprehend- Speak, Health Care |

| UNIT5: Sister Nivedita: Calcutta's Angel of Mercy (Article/Essay) by Monidipa Dey (6 hours) |
|---|
| Writing-Report writing (Analysing tests and Reporting patient condition) Grammar– Voice, If conditionals<br>Vocabulary-Health, Wellness, Medical Vocabulary/Terminology<br><br>**ELCSLAB**<br>CALLLAB: Past Tense Markers and Plural Markers<br>Listening- Listening tasks from OET and IELTS |

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## TEXTBOOK:

English for Nurses by Vijaya Laxmi Naidu. Nirali Prakashan. 2008.

## RECOMMENDED TEXT BOOKS

Practical English Usage by Michael Swan. OUP. 1995. On Writing Well by William Zinsser, Harper Resource Book. 2001. Cambridge English for Nursing by Virginia Allum and Patricia McGarr. CUP. 2010. English for Nursing by Ross Wright and Bethany Cagnol.Pearson.2001.
English for Nursing- 2 by Maris Spada Symonds and Ross Wright. Pearson. 2001. Every day English for International nurses by Joy Parkinson and Chris Brooker. Elsevier. 2004. Oxford English for Career Nurses by Tony Grice. Oxford University Press. 2007.

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## BASICS OF COMPUTERS

**L/T/P/C 1/-/2/2**

**Learning Objectives:**

- To understand all components of a computer, different working environments, and computer operations.
- To learn how to create different types of Word documents, MS Excel manipulations, and PowerPoint documents.
- To understand basic requirements of computer network hardware, software, and its network architecture.

**Learning Objectives:**

- At the end of the course, the student will be able
- Tounderstandperipheralsofthecomputerhowitworksandunderstandvarious languages of the computer.
- To create any kind of presentations for presenting their knowledge anywhere in the form of a document or PPT.
- To create Excel sheets to save data and process the data efficiently.
- To understand basic requirements of computer network hardware, software, and its network architecture.

### UNIT–I (3 hours)

Introduction to computers--Definition of Computer-Characteristics of Computer Components of Computer Hardware–Memories–RAM and ROM–MB, GB, their conversions – Software: Application Software and Systems software- Data and Information –Different computer languages- Number systems- Binary and decimal conversions.

### UNIT–II (3 hours)

MS Word: Typing text in MS Word–Manipulating text¬ text–formatting text–using different font sizes, bold, italic– bullets and numbering –Pictures, Aligning the text and justify– choosing paper size– adjusting margins– header and footer, inserting page numbers in a doc– printing a file with options–using spell check and grammar–find and replace– mail merge– insert tables in a document**.**

### UNIT–III (3 hours)

MSEXCEL: Creating MS Excel – Cell editing, using formulas and functions, manipulating data with Excel–using sort function to sort numbers and alphabets–drawing graphs and charts using data in Excel.

MSPOWERPOINT: Slide transition and animation-slides with sounds–inserting clip arts–Pictures, tables, and graphs.

### UNIT–IV (3 hours)

Introduction to Computer Networks: Introduction, Computer Network Devices(Hubs, Switches, Routers, Gateway, Bridge, Modems, Wireless Access Points, Firewalls & NIC), Types of computer Networks (LAN, MAN&WAN), Network Topologies(Star, Ring, Mesh, Tree, Hybrid Topologies), Internet Based Applications, Advantages & Disadvantages of Computer Networks, E-Mail, Components of E-Mail, Attaching Files in E-mail, Different

## UNIT–V (3 hours)

Introduction to Artificial Intelligence & ML: History of AI, Sub Areas of AI, Applications of Healthcare, Benefits of AI in Healthcare, Challenges of AI in Healthcare, Introduction to Machine Learning, Applications of Machine Learning, Machine Learning Algorithms, Real-world Machine Learning Use Cases.

## RECOMMENDED TEXT BOOKS

Computer Fundamentals by Goel, Anita Pearson

Computer Fundamentals: Concepts, Systems & Applications-8thEditionbyPritiSinha, Pradeep K., Sinha

MS-Office2010TrainingGuidebyProf.SatishJain, M. Geetha, Computer Networks, Andrews Stanenbaum, 5th Edition, Pearson Education
Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, Third Edition, Pearson Education

Hands-on Machine Learning with Scikit-Learn, Keras, and Tensor Flow, Aurelien Geron-O'Reilly, 2nd Edition.

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# HUMAN ANATOMY- I (Practical)

**L/T/P/C**
**-/-/4/2**

**Learning Objectives (LOs)**

- To understand the structure and identification of upper extremity bones, joints, muscles, vessels, and nerves.
- To develop skills in recognizing gross anatomical specimens and spotters of major organs and systems.
- To correlate anatomical structures with their functional and clinical significance.

**Learning Outcomes (COs)**

- Students will be able to identify bones, joints, vessels, nerves, and organs in gross specimens and spotters accurately.
- Students will demonstrate knowledge of surface anatomy and anatomical relationships of upper extremity and vital organs.
- Students will apply anatomical knowledge to understand basic clinical conditions and diagnostic procedures.

## GROSS SPECIMENS/SPOTTERS (30 hours)

### Upper Extremity

- Identify the spotter- (Cross section of shoulder Joint, Elbow Joint, Wrist complex, Hand)
- Identify the bone- UPPER EXTREMITY BONES (Scapula, Clavicle, Humerus, Radius and Ulna, Carpals, Metacarpals and Phalanges) Including side determination
- Surface Anatomy of the Upper Extremity – UPPER EXTREMITY BONES AND MUSCLES
- Spotters of Blood vessels (Profunda Brachii, Brachial, Radial, Ulnar)
- Spotter of Nerves (Axillary, Musculocutaneous, Radial, Median, Ulnar)
- Gross Specimen of Heart, Lung
- Spotters of Bronchial tree, Bronchopulmonary segments

**SYSTEMIC ANATOMY**

- Gross Specimen/Spotter (Stomach, Liver, Gall Bladder, Spleen, Pancreas, Intestines, Kidney, Uterus)
- Cross section of Kidney

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## HUMAN PHYSIOLOGY–I Practical (30 hours)

**L/T/P/C**

**-/-/4/2**

**Learning Objectives (LOs)**

- To understand basic physiological parameters and their importance in clinical assessment.
- To develop practical skills in performing routine physiological experiments and measurements.
- To correlate physiological findings with normal body functions and health status.

**Learning Outcomes (COs)**

- Students will be able to perform and interpret basic physiological tests such as blood grouping, haemoglobin estimation, and blood pressure measurement.
- Students will demonstrate skills in assessing vital signs including pulse, respiration, and auscultation of heart and lung sounds.
- Students will apply physiological knowledge to evaluate normal and abnormal clinical conditions.

These practical's typically align with the theoretical aspects of physiology and help students apply concepts to real-world clinical scenarios. Key Areas Covered in Human Physiology for this semester include the following:

- Determination of blood group, bleeding time and clotting time
- Estimation of hemoglobin concentration
- Peripheral pulse determination
- Auscultation of Heart sounds
- Determination of blood pressure
- Auscultation of breath sounds
- Assessment of respiratory rate

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## ENVIRONMENTAL AWARENESS

**L/T/P/C**

**1/-/-/1**

**Learning Objectives**

- To understand fundamental environmental concepts such as ecosystems, biodiversity, pollution, and climate change.
- To create awareness about environmental issues, resource conservation, and sustainable development.
- To encourage responsible behavior and participation in environmental protection and sustainability practices.

**Learning Outcomes**

- Students will be able to explain key environmental concepts, issues, and their impact on ecosystems and human life.
- Students will analyze environmental challenges like pollution, climate change, and resource depletion, and suggest solutions.
- Students will adopt eco-friendly practices and contribute to environmental conservation at individual and community levels.

**UNIT I (1 hour)**

1. Introduction to Environmental Awareness
2. What is environmental awareness?
3. The importance of environmental education.
4. Key environmental concepts: ecosystems, biodiversity, sustainability. Historical perspective on environmental awareness.

**UNIT II (1 hour)**

1. Earth's Ecosystems and Biodiversity
2. What are ecosystems?
3. Types of ecosystems: forests, oceans, wetlands, etc. Importance of biodiversity.
4. Threats to biodiversity: habitat loss, invasive species, climate change.

**UNIT III (2 hour)**

1. Pollution and Its Impact
2. Types of pollution: air, water, soil, noise, and light pollution. Causes and effects of pollution on health and ecosystems. Case studies of major pollution events.

UNIT-IV **(2 hour)**

1. Climate Change and Global Warming
2. The science of climate change.
3. Greenhouse effect and human contributions.
4. Impacts of climate change: rising temperatures, sea levels, extreme weather. Mitigation and adaptation strategies.

UNIT-V **(1 hour)**

1. Resource Conservation
2. Renewable vs. non-renewable resources.
3. The importance of conserving water, energy, and other resources.
4. Techniques for conservation: recycling, energy efficiency, and water-saving practices.

UNIT-VI **(1 hour)**

1. Sustainable Agriculture and Food Systems
2. Environmental impact of conventional farming practices.
3. Sustainable agriculture: organic farming, permaculture, and agroecology. The role of diet in environmental sustainability.

UNIT-VII **(1 hour)**

1. Waste Management
2. Types of waste: municipal, industrial, hazardous, electronic. The 3 Rs: Reduce, Reuse, Recycle.
3. Landfills, incineration, and composting. Zero waste lifestyle.

UNIT-VIII **(2 hour)**

1. Water Conservation and Management
2. The global water crisis: causes and consequences. Water management practices and policies.
3. The importance of clean water for all living organisms.

UNIT-IX **(2 hour)**

1. Environmental Policy and Legislation
2. Global environmental treaties: Paris Agreement, Kyoto Protocol. National environmental policies and regulations.
3. Role of NGOs, governments, and individuals in policy development.

UNITX **(2 hour)**

1. Green Technologies and Innovations
2. Introduction to renewable energy sources (solar, wind, hydro, etc.). Electric vehicles and sustainable transportation.
3. Innovations in waste-to-energy and sustainable agriculture.
4. The Role of Individuals in Environmental Protection
5. How individual actions impact the environment.
6. Eco-friendly lifestyles: reducing waste, sustainable consumption, green travel. Community action and grassroots movements.

**Reference Textbook**

Environmental Science: A Global Concern" by William P. Cunningham & Mary Ann Cunningham

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## SEMESTER-II

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | MARKS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Human Anatomy – II | 4 | - | - | 4 | 30 | 70 | 100 |
| 2 | | Human Physiology - II | 4 | - | - | 4 | 30 | 70 | 100 |
| 3 | | Pathology (practical) | 2 | - | 2 | 3 | 30 | 70 | 100 |
| 4 | | Microbiology (practical) | 3 | - | 2 | 4 | 30 | 70 | 100 |
| 5 | | Introduction to Dialysis Therapy | 1 | - | 2 | 2 | 30 | 70 | 100 |
| 6 | | General Psychology | 3 | - | - | 3 | 30 | 70 | 100 |
| 7 | | Human Anatomy – II Practical | - | - | 4 | 2 | 30 | 70 | 100 |
| 8 | | Human Physiology – II Practical | - | - | 2 | 1 | 30 | 70 | 100 |
| 9 | | Clinical Postings I (CT) | - | - | 6 | 3 | 100 | - | 100 |
| 10 | | Stress management | 1 | - | - | 1 | 100 | - | 100 |
| | | TOTAL | 18 | - | 18 | 27 | 440 | 560 | 1000 |

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## HUMAN ANATOMY–II

**L/T/P/C**

**4/-/-/4**

**Learning Objectives**

- To understand the detailed anatomy of the lower extremity, vertebral column, pelvic girdle, head, neck, and nervous system.
- To develop knowledge of bones, muscles, joints, nerves, and blood vessels along with their clinical relevance.
- To correlate anatomical structures with functional and radiological aspects in clinical practice.

**Learning Outcomes**

- Students will be able to identify and describe anatomical structures of the lower limb, spine, head & neck, and nervous system.

- Students will demonstrate understanding of muscle actions, joint movements, nerve supply, and vascular distribution.
- Students will apply anatomical knowledge to interpret clinical conditions and basic radiological findings.

**UNIT-I (12 hours)**

**BASIC ANATOMY OF LOWER EXTREMITY:**

1. Osteology including features, side determination, clinical and applied anatomy of the following lower extremity bones Innominate bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges.
2. Myology: Origin, insertion, nerve supply, action, function, clinical and applied anatomy

- Gluteal Region

**UNIT-II (12 hours)**

**BASIC ANATOMY OF LOWER EXTREMITY:**

1. Arthrology: Joint structure, articulating components, relations, joint actions, Clinical and Applied Anatomy including Radiography
2. Hip Joint, Knee joint, Ankle joint, joints of the foot.
3. Femoral triangle, femoral canal and inguinal canal, Adductor canal, popliteal fossa, arches of foot
4. Lumbar plexus, Sacral plexus, Nerves of the Lower Extremity including cutaneous Nerves
5. Blood vessels and lymphatic drainage

**UNIT-III (12 hours)**

**BASIC ANATOMY OF VERTEBRAL COLUMN AND PELVIC GIRDLE:**

1. Types of vertebrae
2. Basic Structure and features of Cervical, thoracic, lumbar, sacral and coccygeal vertebrae
3. Muscles of Trunk and Abdomen
4. Core muscle Anatomy
5. Joints of vertebral column, structure and composition of intervertebral disc including the Radiography Evaluation
6. Basic Joint structure, articulating components, relations, joint actions, Clinical and Applied Anatomy including Radiography of Sacro- Iliac joint
7. Basic Structure of Innominate bone Pelvic girdle and muscles of the pelvic floor including Applied Anatomy

**UNIT-IV (12 hours)**

**BASIC ANATOMY OF HEAD AND NECK:**

1. Bones of the skull and face
2. Muscles of the face and neck

**UNIT-V (12 hours)**

**BASIC NEURO ANATOMY**:

1. General organization of Nervous System
2. Central Nervous System-Gross structure of Brain and Spinal Cord
3. Diencephalon- Gross structure of Thalamus, Hypothalamus and Basal Ganglia
4. Cerebro-Spinal Fluid
5. Spinal Cord- Segmental features, Laminae, Nuclei
6. Spinal nerves
7. Basic blood supply to brain and spinal cord with clinical and applied anatomy
8. Peripheral Nervous system
9. Cranial nerves- Applied Anatomy

**RECOMMEMDED TEXT BOOKS**

1. Human Anatomy – Snell
2. Anatomy- Chaurasia, Volume- I,II & III
3. Neuro anatomy -- Inderbir Singh
4. Human Anatomy – Kadasne, Volume- I, II & III
5. Neuroanatomy -- Vishrsam Singh
6. Human Anatomy – Datta

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# HUMAN PHYSIOLOGY–II

**L/T/P/C**

**4/-/-/4**

**Learning Objectives**

- To understand the physiology of the nervous system, special senses, endocrine, reproductive, gastrointestinal, and excretory systems.
- To develop knowledge of functional mechanisms, regulation, and integration of body systems.
- To correlate physiological concepts with clinical conditions and applied aspects.

**Learning Outcomes**

- Students will be able to explain functions and mechanisms of major body systems including nervous, endocrine, and renal systems.
- Students will demonstrate understanding of sensory processes, reflexes, hormones, and reproductive physiology.
- Students will apply physiological knowledge to interpret normal and abnormal conditions in clinical practice.

## UNIT-I (12 hours)

### NERVOUS SYSTEM-I

1. Introduction to nervous system - CNS, PNS and ANS

2. Neurotransmitters - Definition, fate of neurotransmitter, types

3. Synapse - Definition, type, structure, transmission of impulse across a synapse, properties.

4. Receptors and Sensation - Types of sensations, Classification of receptors, properties

5. Sensory System - Organization of the sensory system, sensory Homunculus

6. Pathophysiology of pain - Definitions, hyperalgesia and allodynia, deep pain, referred pain and its theories, management of chronic pain, endogenous opioid analgesic system

7. functions of various parts of brain in brief.

## UNIT-II (12 hours)

### NERVOUS SYSTEM-II

1. Spinal cord - Introduction, effects of complete transection of the spinal cord, effects of hemi section of the spinal cord (Brown-Sequard Syndrome)

2. Reflexes - Reflex action, reflex arc, classification, properties, types – superficial and deep reflexes

3. Regulation of tone, Posture and it's reflexes, Equilibrium and vestibular apparatus

4. Higher Functions - Learning, Memory, Speech

5. Autonomic Nervous System - Sympathetic division, Parasympathetic division, control of autonomic functions

6. Cerebrospinal fluid - Formation and circulation, composition, functions, applied aspect - Hydrocephalus, lumbar puncture

**UNIT-III (12 hours)**

**SPECIAL SENSES:**

1. Vision - Anatomy of eye, visual pathway, pupillary reflexes, dark adaptation, light adaptation, photosensitivity

2. Hearing - Anatomy of ear, auditory pathway, tests for hearing - Watch test, Rinne's test, Weber's test, deafness, Audiometry

3. Taste and Smell: Taste sensations, taste pathway, olfactory pathway

**ENDOCRINOLOGY:**

1. Hormones - Definition, types, functions

2. Secretion, regulation, function and applied aspect of Hypothalamus, Pituitary Gland, Thyroid Gland, Parathyroid Gland, Pancreas, Adrenal Gland.

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**UNIT-IV (12 hours)**

**REPRODUCTIVE SYSTEM:**

1. Sex determination and differentiation & it's abnormalities, puberty, importance of sex hormones

2. Female reproductive system - Internal & external genital organs, Oogenesis, Structure of egg, Follicle development, ovulation, menstrual cycle, menopause

3. Male reproductive system - Testes, accessory sex organs, Spermatogenesis, structure of sperm

4. Physiology of pregnancy - Fertilization, Implantation, Placenta (formation, function, hormones), maternal changes during pregnancy, pregnancy tests, infertility

**UNIT-V (12 hours)**

**GASTROINTESTINAL SYSTEM**:

1. Physiological stages of digestion

2. Liver function

**EXCRETORY SYSTEM:**

1. Kidneys-structure & function

2. Urine formation (to exclude concentration and dilution)

3. Juxtaglomerular apparatus

4. Fluid and electrolyte balance – Na, K, H2O

5. Renal circulation

6. Applied physiology: Types of bladders

**RECOMMENDED TEXT BOOKS**

1. Text book on Medical Physiology – Guyton

2. Textbook of Physiology – A K Jains

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## PATHOLOGY (Theory)

**L/T/P/C**

**2/-/2/3**

**Learning Objectives**

- To understand the basic mechanisms of cell injury, inflammation, immunity, and neoplasia.
- To develop knowledge of infectious, environmental, and nutritional disorders and their effects on the human body.
- To correlate pathological processes with clinical features and disease progression.

**Learning Outcomes**

- Students will be able to explain fundamental pathological concepts such as cell injury, inflammation, immunity, and tumor biology.
- Students will identify causes and mechanisms of various diseases including infections and environmental disorders.
- Students will apply pathological knowledge to understand disease diagnosis, progression, and clinical manifestations.

**1. Cellular adaptation, Cell injury & cell death (5 hours)**

- Introduction to pathology.
- Overview: Cellular response to stress and noxious stimuli. Cellular adaptations of growth and differentiation.
- Overview of cell injury and cell death.
- Causes of cell injury. Mechanisms of cell injury.
- Reversible and irreversible cell injury.
- Examples of cell injury and necrosis.

**2. Inflammation (5 hours)**

- General features of inflammation Historical highlights
- Acute inflammation
- Chemical mediators of inflammation Outcomes of acute inflammation Morphologic patterns of acute inflammation Summary of acute inflammation
- Chronic inflammation

**3. Immunity disorders (5 hours)**

- General features of the immune system Disorders of the immune system

**4. Infectious diseases (5 hours)**

- General principles of microbial pathogenesis viral infections.
- Bacterial infections-Rheumatic heart disease.
- Fungal infections.
- Parasitic infections.

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**5. Neoplasia (5 hours)**

- Definitions Nomenclature.
- Biology of tumor growth benign and malignant neoplasms Epidemiology.
- Carcinogenic agents and their cellular interactions Clinical features of tumors.

**6. Environmental and nutritional disorders (5 hours)**

- Environmental and disease.
- Common environmental and occupational exposures Nutrition and disease.
- Coronary artery disease.

**RECOMMENDED TEXT BOOK:**

Pathology, Harsh Mohan e. Basic Pathology by Robbin

## PATHOLOGY(PRACTICAL)

**L/T/P/C**

**0 / 0 / 2 / 1**

**Learning Objectives**

1. To understand **basic pathological changes** in cells and tissues.
2. To identify **inflammation, infections, and tumors** in simple practical settings.
3. To develop skills in **microscope use and basic lab interpretation**.

**Learning Outcomes**

1. Students will be able to **identify common pathological conditions** under microscope.
2. Students will be able to **correlate pathology with basic clinical conditions**.
3. Students will be able to **interpret simple lab findings and slides**.

## UNIT 1: Basic Lab & Cell Injury (3 hours)

- Microscope handling
- Normal vs abnormal cells
- Cell injury:
    - Swelling
    - Fatty change
- Necrosis (basic types – demo)

## UNIT 2: Inflammation (3 hours)

- Acute inflammation (neutrophils)
- Chronic inflammation (lymphocytes)
- Granuloma (TB example)
- Slide identification

## UNIT 3: Infectious Diseases & Immunity (3 hours)

- Bacterial infection (pus cells)
- TB (granuloma)
- Fungal infection (demo)
- Basic immunity disorders (case discussion)

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## UNIT 4: Neoplasia (Tumors) (3 hours)

- Benign vs malignant tumors
- Basic features:
    - Pleomorphism
    - Mitosis
- Gross specimen observation

## UNIT 5: Environmental & Hematology Basics (3 hours)

- Fatty liver / atherosclerosis (demo)

- Nutritional disorders (case-based)
- Peripheral smear basics
- Hb / ESR (demo)

## MICROBIOLOGY

**L/T/P/C**

**3/-/2/4**

**Learning Objectives**

- To understand the basic characteristics, classification, and growth of microorganisms including bacteria, viruses, fungi, and parasites.
- To develop knowledge of sterilization, disinfection, culture techniques, and immunological principles used in diagnosis.
- To study common pathogenic microorganisms, the diseases they cause, and their laboratory diagnosis and prevention.

**Learning Outcomes**

- Students will be able to identify and describe morphology, growth, and classification of microorganisms.
- Students will demonstrate understanding of diagnostic methods including culture techniques, serological tests, and sterilization procedures.
- Students will apply microbiological knowledge in identifying infectious agents and understanding their role in disease prevention and control.

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**1. Morphology (5 hours)**

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

**2. Growth and nutrition (5 hours)**

- Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.

**3. Culture media (5 hours)**

- Use of culture media in diagnostic bacteriology, antimicrobial sensitivity test.

### 4. Sterilization and Disinfection (5 hours)

- Principles and use of equipment of sterilization namely hot air oven, autoclave, and serum inspissate, pasteurization, antiseptic and disinfectants.

### 5. Immunology (5 hours)

- Immunity, vaccines, types of vaccine and immunization schedule, principles, and interpretation of common serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA.
- Rapid tests for HIV and HBsAg (excluding technical details).

### 6. Systematic Bacteriology (5 hours)

- Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (excluding classification, antigenic structure, and pathogenicity),
- Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, E. coli, Klebsiella, Proteus,
- Vibrio cholerae, Pseudomonas & Spirochetes.

### 7. Parasitology (5 hours)

- Morphology, life cycle, laboratory diagnosis of following parasites: E.histolytica, Plasmodium, tape worms, Intestinal nematodes.

### 8. Mycology (5 hours)

- Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi

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### 9. Virology (5 hours)

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

**RECOMMENDED TEXT BOOKS:**

1. Microbiology, Ananthanarayan and Paniker's,
2. CP. Baveja. Textbook of Microbiology for nurses.
3. A textbook of Microbiology-Chakraborty.

# MICROBIOLOGY PRACTICAL

**L/T/P/C**

**0 / 0 / 4 / 2**

## Learning Objectives

1. To understand **basic identification and structure of microorganisms** using simple laboratory techniques.
2. To develop skills in **microscopy, culture methods, and sterilization procedures**.
3. To gain knowledge of **common infections, diagnostic tests, and basic immunology practices**.

## Learning Outcomes

1. Students will be able to **identify common bacteria, parasites, and fungi under microscope**.
2. Students will demonstrate **basic lab skills like staining, culture observation, and sterilization methods**.
3. Students will be able to **interpret simple diagnostic tests and correlate with infections**.

## UNIT 1: Microscopy & Bacterial Morphology (3 hours)

- Microscope handling
- Bacterial shapes:
  - Cocci, bacilli, spirilla
- Simple staining & Gram staining (demo)
- Observation of prepared slides

## UNIT 2: Culture Methods & Media (3 hours)

- Types of culture media (basic understanding)
- Culture plate observation (agar plates)
- Colony characteristics (shape, color, size)

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- Antimicrobial sensitivity test (demo)

## UNIT 3: Sterilization & Disinfection (3 hours)

- Autoclave (demo)
- Hot air oven (awareness)
- Disinfection methods
- PPE and hand hygiene
- Biomedical waste disposal basics

## UNIT 4: Immunology & Diagnostic Tests (3 hours)

- Blood grouping (demo)
- Serological tests (demo/awareness):
    - Widal
    - VDRL
    - CRP
    - ELISA
- Rapid tests (HIV, HBsAg – demo)
- Vaccine awareness & immunization schedule

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## UNIT 5: Systematic Microbiology (3 hours)

- Identification (slides/demo):
    - Bacteria (Staph, Strep, E. coli)
    - Parasites (Malaria, Amoeba)
    - Fungi (Candida)
    - Viruses (charts/images)
- Sample collection methods:
    - Blood, urine, sputum

# Introduction to Dialysis Therapy (theory and practical)

# (30 hours)

**L/T/P/C**

**1/-/2/2**

**Learning Objectives**

- To understand the basic concepts of kidney diseases including AKI, CKD, and ESRD and their management approaches.
- To gain knowledge of dialysis modalities such as hemodialysis and peritoneal dialysis, including their principles and procedures.
- To develop awareness about renal transplantation, conservative management, and functioning of a dialysis unit.

**Learning Outcomes**

- Students will be able to explain the principles, mechanisms, and components of hemodialysis and peritoneal dialysis.
- Students will demonstrate understanding of kidney disease management, including dialysis indications and transplantation basics.
- Students will apply knowledge of dialysis unit setup, patient care approaches, and conservative management strategies in clinical settings.

**Kidney Diseases Basics AKI & CKD**

1. **Hemodialysis (HD) (5 hours)**
   - History of dialysis
   - Define Hemodialysis
   - Components of hemodialysis apparatus
   - Mechanisms of hemodialysis

2. **Peritoneal Dialysis (PD) (5 hours)**
   - History of Peritoneal Dialysis
   - Define peritoneal dialysis.
   - Components of peritoneal dialysis apparatus.
   - Mechanisms of peritoneal dialysis.

3. **Renal Transplantation (5 hours)**
   - History of organ transplantation (including Kidney)
   - List & Define organ/tissue transplantation.

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- Define kidney transplantation.

**4. Normal Kidney & Dialysis (5 hours)**

- Compare the normal kidney functions with dialysis.
- Indications for dialysis.
- Compare HD & PD

**5. Conservative management (5 hours)**

- Define conservative management & Palliative care.
- Methods of conservative management.
- Importance of conservative management.
- Palliative care for ESRD.

**6. Introduction to Dialysis Unit (5 hours)**

- Various areas in the dialysis unit and their importance
- Staff, job responsibilities
- Protocol to establish a dialysis unit.

**REFERENCES**

1. Handbook of Nutrition and the Kidney by William E. Mitch (Editor), T. Alp Ikizler
2. Handbook of dialysis by John T. Daugirdas

## Psychology

**L/T/P/C**
**3/-/-/3**

**Learning Objectives**

- To understand the basic principles, concepts, and scope of psychology and its relevance to health sciences.
- To study human behavior, mental processes, personality, emotions, learning, and development across the lifespan.
- To develop awareness of psychological assessment, mental health disorders, and therapeutic approaches.

**Learning Outcomes**

- Students will be able to explain major psychological theories, concepts, and schools of thought.
- Students will demonstrate understanding of behavior, cognition, emotion, motivation, and personality in human life.
- Students will apply psychological principles in healthcare settings, including patient communication, stress management, and mental health awareness.

**1. Introduction to Psychology (3 hours)**

- Definition of Psychology, Branches, Fields and Scope of Psychology, Educational and

School Psychology‟ Physiological, Developmental, Social, Industrial and Organizational and Clinical Psychology. Emerging specialties, Environmental, Forensic and Health Psychology.

2. **Scientific methods of studying Psychology (3 hours)**
   - Experimental, Observational, Case Study/Clinical Methods, Interview, Survey, Introspective and Testing Methods – Merits and Demerits.

3. **Major schools of Psychology (3 hours)**
   - Structuralism-Functionalism-Behaviorism-Gestalt Psychology-Humanistic Psychology

4. **Physiological basis of Psychology (3 hours)**
   - The Nervous System: Division of the nervous system, Neurons, Transmission of neural signals. The Synapse; The Implication of Chemical Transmission, Reflex Arcs and The Spinal Cord, The Endocrine System, The Brain, The Cerebral Hemispheres, The Central Core, Disorders of the Brain, Studying Brain behavior relations

5. **Normal development (3 hours)**
   - Definition, Psychological needs and Development during Infancy, Early Childhood, Late Childhood, Adolescence, Adulthood and Old Age. Brief description of the relative importance of heredity and environment

6. **Attention and Perception (3 hours)**
   - Definition, Types of attention, Voluntary, Involuntary and Habitual. Determinants of attention. Principles of perception, Inaccurate perception and Underlying reasons. Brain mechanisms of visual perception, Effects of brain damage on visual perception, Perception of form, Perception of Space and Motion.

7. **Personality (3 hours)**

   Definition- Trait and Type Theories of Personality, The social learning approaches: Bandura, Psychodynamic approach: Freud, The humanistic approach: Maslow and Self- actualization. Rogers and Conditions of worth, Assessment of Personality through questionnaires and Projective tests.

8. **Learning and Memory (3 hours)**
   - Definition, Factors affecting learning, Laws of learning by Thorndike; Importance of studying Psychology of learning in relation to Allied Health Sciences. Experimentation in learning: Human and Animal learning, Quantitative assessment of learning; Learning curves; Theories of conditioning, Pavlov‟s contribution. The biological significance of classical conditioning-Basic principles of classical conditioning-Conditioned emotional responses, what is learned in classical conditioning?
   - Operant conditioning; The laws of effect of Skinner and operant behavior, The three contingencies, Reinforcement, Punishment and Extraction, Other Operant procedures and Phenomena. Conditioning of complex behavior, Aversive control of behavior, Observation and imitation.
   - Sensory memory, short term or Working memory, Long term memory learning and encoding in long term memory, Organization of long-term memory, Reasons for forgetting.

9. **Intelligence (3 hours)**

- Definition, meaning of intelligence, Theories of intelligence, Spearman‟s two factor theory, an information processing theory of intelligence, The neuro psychological theory of intelligence, Mental age, and I.Q, Normal distribution of intelligence levels, Intelligence Testing, Intelligence tests, Uses and abuses of intelligence tests.

**10. Motives and Emotions (3 hours)**

- Definition, Motives, Drives, Needs, Biological needs, Eating, Sexual behavior, Aggressive behavior. The nature of Emotions, Expression and recognition of Emotions, Feelings and Emotions, Physiological basis of Emotions, Emotion and health, Heart disease, Headache, Asthma, Rheumatoid arthritis, Cancer and Peptic Ulcer. Theories of Emotions, James Lange theory, Cannon Bard theory and other theories

**11. Attitudes and their Formation (3 hours)**

- Sources of attitude, Nature of attitudes. Measurement of attitudes. Change of attitudes, Persuasion, Prejudices. Social influences and Group behavior, Imitation, social facilitation, social loafing, Reciprocity, Commitment, Attractive people, Authority, Group decision making, resisting social influence, Interpersonal relation and loving.

**12. Lifestyle, Health, Stress and Coping Behavior (3 hours)**

- Cultural evolution, Life style choices and consequences, Healthy and Unhealthy life styles. Nutrition, Physical fitness, Smoking and Drinking. Stress and Health, the biological basis of stress, Stress and Physical functioning, Coping with stress, Adjustment a life-long process. Cognitive appraisal and Stress, Stressful life styles, coping with everyday stress, Sources of stress, Coping styles and Strategies, Stress inoculation training

**13. Communication (3 hours)**

- Persuasion, Communication, the source, the message, the audience, Behavior in groups, the nature of groups, Leadership, Group structure, Group thinking, Herold Leavitt‟s communication network.

**14. Clinical Psychology (3 hours)**

- Definition of Clinical Psychology, Role of Clinical Psychology in Allied Health Sciences, Concept of Normality and Abnormality. The nature and causes of mental disorders. Classification of abnormal behavior DSMIV, ICD 10, Difference between Neuroses and Psychosis. Anxiety, Somatoform and Dissociative disorders, Personality disorders, Psychoactive substance use disorders, Schizophrenic disorders, Mood disorders

**15. Psychological Assessment and Treatment (3 hours)**

- Tests of intelligence (important test), Tests of personality (important test), Tests for adjustments and conflicts (Bells adjustment inventory, Sentence Completion Test, Projective tests such as Rorschach, TAT, CAT, CPT etc.) The treatment of mental disorders, Insight therapies, Psychoanalysis and Psychodynamic approaches, Humanistic therapy, Gestalt therapy, Behavior and Cognitive Behavior therapies, Counselling. Group therapy, Electro convulsive therapy, Psychosurgery, Ethical and legal issues in Psychotherapy.

**REFERENCES**

1. Introduction to Psychology by Jennifer Walinga, Charles Stangor
2. The Little Book of Psychology: An Introduction to the Key ...by Caroline Riggs, Emily

Ralls · 2019
3. The Everything Psychology Book: Explore the Human Psyche and ...by Kendra Cherry, Paul G Mattiuzzi · 2010

## HUMAN ANATOMY PRACTICAL–II

**L/T/P/C**
**-/-/4/2**

### Learning Objectives (LOs)

- To identify bones, joints, and anatomical landmarks of the spine, pelvis, and lower extremity.
- To understand surface anatomy and neuro-anatomical structures through gross specimens and spotters.
- To develop practical skills in recognizing structural relationships of bones, joints, brain, and spinal cord.

### Learning Outcomes (COs)

- Students will be able to identify and locate bones, joints, and surface landmarks of the spine and lower limb accurately.
- Students will demonstrate knowledge of arthrology and neuro-anatomy using gross specimens and cross-sectional models.
- Students will apply anatomical understanding to interpret clinical and functional aspects of the musculoskeletal and nervous systems.

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### GROSSSPECIMENS/SPOTTERS (30 hours)

**SPINE, PELVISANDLOWEREXTREMITY**

- Identify the spotter- Osteology- Identify the bone, LOWER EXTREMITY BONES (Innominate bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges.) Including side determination, Spinal Segments, Vertebrae (Cervical, Thoracic, Lumbar, Sacral and Coccyx), Pelvis and Innominate Bones
- Surface Anatomy of the Spine and Lower Extremity –Atlas, Axis, C-7 vertebrae, Spinous and Transverse process of vertebra, Locate the Innominate bone, ASIS and PSIS, Coccyx, Sacrum, Greater Trochanter, Condyles of femur, Patella, Tibial Tubercles and condyles, Shin Bone, Tarsal bones, Malleoli
- Arthrology- (Cross section of Hip Joint, Knee Joint, Ankle Joint, Joints of Foot, Pelvic Joints, Joints of Spine, Intervertebral Joints, Facet Joints, Sacro-Iliac Joints)

**NEURO-ANATOMY IDENTIFY THE SPOTTER**

- Cross Section of the Skull

**SYSTEMIC ANATOMY**

- Gross Specimen/Spotter (Brain and Spinal Cord)

## HUMAN PHYSIOLOGY PRACTICAL–II (15 hours)

**L/T/P/C**

**-/-/2/1**

**Learning Objectives**

- To understand the assessment of sensory functions, reflexes, cranial nerves, and coordination.
- To develop practical skills in performing neurological examinations and interpreting findings.
- To correlate physiological functions of the nervous system with clinical neurological assessment.

**Learning Outcomes**

- Students will be able to perform and demonstrate examination of superficial, deep, and cortical sensations.
- Students will be able to assess reflexes, cranial nerve functions, and balance/coordination effectively.
- Students will apply physiological knowledge to identify normal and abnormal neurological responses in clinical practice.

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- Examination of superficial sensations
- Examination of deep sensations
- Examination of cortical sensations
- Examination of reflexes
- Cranial nerve examination
- Examination of Balance and coordination

## Clinical Postings- I (45hours)

**L/T/P/C**
**-/-/6/3**

**Learning Objectives**

- To provide hands-on clinical exposure in OPD and Dialysis Unit settings under supervision.
- To develop basic professional skills in patient care, communication, and dialysis procedures.
- To apply theoretical knowledge of dialysis therapy in real clinical environments.

**Learning Outcomes**

- Students will be able to demonstrate basic clinical dialysis skills under supervision in OPD and dialysis units.
- Students will develop effective communication and professional behavior with patients and healthcare staff.
- Students will apply foundational dialysis knowledge in patient assessment and routine clinical procedures.

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior dialysis therapist. Students are tested on intermediate clinical dialysis therapy skills.
Areas to be covered.

1. OPD
2. Dialysis Unit

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## STRESS MANAGEMENT

**L/T/P/C**
**1/-/-/1**

**Learning Objectives:**

By the end of the course, students will:

- Understand what stress is and how it affects the body and mind.
- Learn how to recognize personal stressors and individual responses to stress.
- Explore various coping strategies to manage stress effectively.
- Understand how lifestyle changes can reduce overall stress.
- Learn how to manage stress in academic and professional settings.
- Equip students with tools to build long-term resilience against stress.

**Learning Outcomes (COs)**

- Students will be able to explain the concept of stress, its types, biological mechanisms, and effects on physical and mental health.

- Students will identify personal and environmental stressors and analyze individual stress responses and coping patterns.
- Students will apply effective stress management techniques such as relaxation methods, time management, mindfulness, and lifestyle modifications in academic and professional life.

UNIT-I (3 hours)

- Introduction to Stress and Its Effects Definition of stress: Eustress vs. Distress Types of stress: Acute vs. Chronic
- The biology of stress (fight-or-flight response, hormones)
- Short-term and long-term effects on physical and mental health The role of perception and coping mechanisms

UNIT-II (3 hours)

- Identifying Stressors and Personal Stress Responses
- Internal vs. external stressors (work, relationships, environment) Identifying stress patterns (thoughts, behaviours, physical reactions) Emotional regulation and its role in stress management
- The Stress Process: How stress develops and escalates

UNIT-III (3 hours)

- Coping Strategies and Stress Relief Techniques
- Problem-focused vs. emotion-focused coping
- Cognitive Behavioral Therapy (CBT) techniques for stress
- Relaxation techniques (deep breathing, progressive muscle relaxation) Time management and organization as stress-relief tools
- Developing a personal coping plan

UNIT-IV (2 hours)

- Lifestyle Changes for Managing Stress The role of physical activity and exercise Sleep hygiene and its connection to stress Nutrition and its impact on mental health Social support and healthy relationships Mindfulness and meditation practices

UNIT-V (2 hours)

- Stress Management at Work and School
- Managing work and school stress: Time management, prioritization Dealing with high-pressure environments and deadlines
- Building resilience and avoiding burnout
- The importance of taking breaks and practicing self-care

UNIT-VI (2 hours)

- Building Long-Term Stress Resilience
- Resilience theory and how to bounce back from adversity Developing a growth mindset to handle challenges Building emotional intelligence to cope with stress Integrating stress management into daily life

**RECOMMENDED TEXT BOOKS:**

Stress Management: From Basic Science to Best Practice" by C. L. Cooper and Philip L. Merritt

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# SEMESTER – III

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | General Pharmacology | 2 | - | - | 2 | 30 | 70 | 100 |
| 2 | | Fundamentals of Dialysis Therapy &(practicals) | 3 | - | 1 | 4 | 30 | 70 | 100 |
| 3 | | Instrumentation Specific to Dialysis Therapy &(practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 4 | | Pathophysiology of the kidney Diseases | 2 | - | - | 2 | 30 | 70 | 100 |
| 5 | | Basic Principles of Nursing Care | 2 | - | - | 2 | 30 | 70 | 100 |
| 6 | | Medical Law and Ethics, Medical Terminology and Record keeping(including anatomical terms) | 3 | - | - | 3 | 30 | 70 | 100 |
| 7 | | Clinical Postings II (CT) | - | - | 5 | 5 | 100 | - | 100 |
| 8 | | Health care delivery system in India | 2 | - | - | 2 | 30 | 70 | 100 |
| | | TOTAL | 16 | - | 7 | 23 | 310 | 490 | 800 |

## General Pharmacology

**L/T/P/C**
**2/-/-/2**

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**Learning Objectives**

- To understand the basic principles of pharmacology including pharmacokinetics, pharmacodynamics, and drug safety.
- To study the classification, mechanism of action, and therapeutic uses of drugs acting on various body systems.
- To develop knowledge about chemotherapy, hormones, and drugs used in common clinical conditions.

**Learning Outcomes**

- Students will be able to explain the basic concepts of drug action, absorption, distribution, metabolism, and excretion.
- Students will identify major drug groups and describe their uses, mechanisms, and adverse effects in different systems.
- Students will apply pharmacological knowledge in understanding drug therapy and safe medication practices in clinical settings.

### 1. General Pharmacology (3 hours)

a. Introduction
b. Routes of drug administration
c. Pharmacokinetics
d. Pharmacodynamics
e. Drug toxicity and safety

**2. Autonomic nervous system including skeletal muscle relaxants. (3 hours)**

a. Cholinergic drugs
b. Anticholinergic drugs:
c. Neuromuscular blocking drugs
d. Adrenergic drugs
e. Adrenergic receptor antagonists

**3. Central nervous system (3 hours)**

a. General anesthetics (GAs)
b. Local anesthetics (LAs)
c. Sedative & hypnotics
d. Opioids
e. NSAIDs
f. Drug treatment of rheumatoid arthritis (RA)
g. Drug treatment of gout:
h. Psychopharmacology
i. Parkinsonism
j. Alcohol
k. Antiepileptic drugs

**4. GIT (3 hours)**

a. Drugs for peptic ulcer
b. Antiemetics
c. Laxatives and antidiarrheals

**5. Blood 3 hours)**

a. Hematinic
b. Anticoagulants
c. Antiplatelet drugs
d. Fibrinolytics and antifibrinolytics

**6. Cardiovascular system (3 hours)**

a. Diuretics
b. Drugs used in congestive heart failure (CHF)
c. Antihypertensives
d. Antianginal drugs
e. Hypolipidemic

**7. Respiratory System (3 hours)**

a. Pharmacotherapy of bronchial asthma
b. Pharmacotherapy of cough

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c. Antihistaminic

**8. Chemotherapy (3 hours)**

a. General aspects
b. Beta lactam antibiotics
c. Cotrimoxazole
d. Macrolides
e. Fluoroquinolones
f. Antifungal agents
g. Antiviral drugs
h. Antitubercular drugs
i. Antileprotic drugs
j. Aminoglycosides
k. Antiamoebic drugs
l. Anthelmintics
m. Antimalarial drugs

**9. Hormones and related drugs (3 hours)**

a. Glucocorticoids
b. Antidiabetic drugs
c. Thyroid and anti-thyroid drugs

**10. Immunosuppressors and Immunomodulators (3 hours)**

**REFERENCES**

1. Katzung & Trevor's Basic & Clinical Pharmacology,
2. Rang & Dale's Pharmacology
3. Goodman and Gilman's The Pharmacological Basis of Therapeutics
4. Essence of Pharmacology by K.D. Tripathi
5. Pharmacology and Pharmacotherapeutics by Satoskar
6. Text book of Pharmacology for Allied Sciences – Padmaja Udaykumar

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## Fundamentals of Dialysis Therapy & (practical's)

**L/T/P/C**
**3/-/1/4**

**Learning Objectives**

1. Understand basics of dialysis (types, principles, indications).
2. Know dialysis equipment and procedures.
3. Learn patient care and complications during dialysis.

**Learning Outcomes**

1. Explain how dialysis works.
2. Identify dialysis machines and steps.

**3.** Monitor patients and manage complications**.**

1. **Indications of dialysis (3 hours)**

2. **Types of dialysis. (4 hours)**
   - List the types of Hemodialysis
   - List the types of Peritoneal dialysis

3. **Principles of Hemodialysis (4hours)**
   - Define Hemodialysis Principles
   - Discuss the application of diffusion in HD and list the factors affecting diffusion
     Discuss ultrafiltration and convection in hemodialysis and factors affecting them
     List the factors affecting solute clearance in HD
   - Define Kuf & Koa

4. **Principles of Peritoneal Dialysis(4hours)**
   - Define Peritoneal Dialysis
     Principles
   - Discuss the application of diffusion in PD and list the factors affecting diffusion
   - Discuss ultrafiltration/ Osmosis, convection and fluid absorption in Peritoneal Dialysis and factors affecting them
   - List the factors affecting solute clearance in PD

5. **Hemodialysis Apparatus (3 hours)**
   - Vascular Access
   - Water Treatment Plant
   - Extracorporeal Blood Circuit
   - HD machine
   - Dialysate

6. **Basics of Semipermeable membrane & Peritoneal (5 hours)**
   - Membrane Define semipermeable membrane
   - List the properties of a semipermeable membrane
   - List the importance of biological semipermeable membrane
   - List the importance of semipermeable membrane in the field of dialysis – HD & PD
     Define biocompatibility and explain its importance in the dialysis field
   - Discuss the factors affecting the permeability of the semipermeable membrane in HD & PD

7. **Peritoneal Dialysis Apparatus. (4 hours)**
   - PD Access
   - PD fluid PD Cyclers

8. **Introduction to hemodialysis machine. (4 hours)**
   - Electronics Circuit
   - Hydraulics Circuit

- Alarms in HD machine

**9. Priming of dialysis apparatus. (4 hours)**

- Purpose
- Assembling
- Steps for priming HD apparatus.

**10. Dialyzer reuse. (4 hours)**

- Chemicals Used
- Purpose
- Advantages and Disadvantages Steps involved in reuse

**11. Common complications of hemodialysis. (3 hours)**

**12. Monitoring patients during dialysis. (3 hours)**

**REFERENCES**

1. Handbook Of Dialysis by John T. Daugirdas
2. Essentials of Dialysis by Majunath Kulkarni
3. Textbook of Dialysis Therapy by Dr. Jigar Shrimali

**(Practical's) (15 hours)**

**Learning Objectives**

1. Understand components of hemodialysis apparatus and their functions.
2. Learn procedures of priming, reuse, and blood circuit handling in dialysis.
3. Develop skills in patient monitoring and management of dialysis complications.

**Learning Outcomes**

1. Identify HD apparatus parts such as vascular access, dialyzer, and blood circuit.
2. Demonstrate basic steps of priming and dialyzer reuse procedures.
3. Monitor patients during dialysis and respond to common complications effectively.

**1. HD Apparatus Spotters (3 hours)**

a. Vascular Access
b. Water Treatment Plant
c. Extracorporeal Blood Circuit
d. HD machine
e. Dialysate

**2. Priming of Dialysis Apparatus (3hours)**

a. Assembling
b. Steps for priming HD apparatus

**3.Dialyzer reuse (3 hours)**

a. Steps involved in reuse

**4. Monitoring during dialysis (2 hours)**

a. Patient Monitoring

b. Vitals

**5. Managing complications during dialysis. (2 hours)**

**6. Understanding Dialysis Blood Circuit. (2 hours)**

**REFERENCES**

Oxford Handbook of Dialysis by Jeremy Levy · 2009

Renal Nursing: Care and Management of People with Kidney Disease books by Nicola Thomas · 2019

Manual of Nephrology book by Robert W. Schrier · 200

## Instrumentation Specific to Dialysis Therapy & (practical's)

**L/T/P/C**
**2/-/1/3**

**Learning Objectives**

1. Understand different dialysis equipment and their components (HD machine, water treatment, CRRT, PD cyclers, etc.).
2. Learn the working principles, maintenance, and disinfection of dialysis-related equipment.
3. Gain knowledge of advanced and special procedure equipment used in dialysis and critical care.

**Learning Outcomes**

1. Identify and explain functions of various dialysis and supportive equipment.
2. Describe operation, care, and troubleshooting of dialysis machines and systems.
3. Apply knowledge to safely use equipment in patient care and special procedures.

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**1. Equipment used in Hemodialysis. (2 hours)**

- HD machine -Components and function
- HD machine – Blood Circuit
- HD machine – Dialysate circuit
- Cleaning and disinfection of HD machine
- OCM
- Trouble shooting equipment related problems during HD.

**2. Water treatment System (2 hours)**

- Purpose of water treatment
- AAMI and ISO standards for RO water.
- Filtration
- Softener and carbon filtration
- Deionizer
- RO system
- Ultrafiltration and UV Irradiation

- Portable RO
- Heat disinfection of water lines

3. **Dialyzer Reprocessing Equipment (2 hours)**

- Types of Automated dialyzer reprocessing machine
- Automated reuse equipment – components and function
- Automated reuse equipment – care and maintenance

4. **Equipments used for special procedures. (2 hours)**

- Types of CRRT equipment
- CRRT equipment – components and function
- CRRT equipment – care and maintenance

5. **PD cyclers (2 hours)**
6. **Defibrillators (2 hours)**
7. **Cardiac Monitors (2 hours)**
8. **MARS, SPAD and Prometheus System for Liver dialysis (2 hours)**
9. **ECMO (2 hours)**
10. **Plasmapheresis Equipment‟s (2 hours)**
11. **Bioimpedance analysis machine/ Body Composition Monitors (2 hours)**
12. **Online Hemodiafiltration (2 hours)**
13. **Blood Temperature, Blood Volume monitor (2 hours)**
14. **Enuresis monitor (2 hours)**
15. **Ultrasound machine- For Depth, Flow of AVF (2 hours)**

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## REFERENCES

1. Handbook of Dialysis Therapy E-Book - Page 356 by Allen R. Nissenson, Richard E. Fine · 2007
2. Replacement of Renal Function by Dialysis - Page 1467 by C. Jacobs, C. M. Kjellstrand, Karl-Martin Koch · 2008
3. Replacement of Renal Function by Dialysis by Walter H. Hörl, Karl-Martin Koch, Robert M. Lindsay · 2013

## (Practical's) (15hours)

**Learning Objectives**

1. Understand parts of dialysis and related medical equipment.
2. Learn functions, usage, and maintenance of different devices.
3. Gain knowledge of special procedure equipment in patient care.

**Learning Outcomes**

1. Identify equipment parts and explain their functions.
2. Describe usage and basic maintenance of dialysis equipment.
3. Apply knowledge to handle equipment safely in clinical practice.

1. **Equipment's used in Hemodialysis Parts**
   - HD machine
   - Blood Circuit
   - Cleaning and disinfection of HD machine
   - OCM
   - Trouble shooting of HD.

2. **Water treatment System Parts**
   - Sand Filters
   - Softener and carbon filtration
   - Deionizer
   - RO system
   - Ultrafiltration and UV Irradiation
   - Portable RO
   - Heat disinfection of water lines

3. Dialyzer Reprocessing Equipment parts
4. Automated reuse equipment – care and maintenancs
5. Equipment"s used for special procedures
6. Types of CRRT equipment parts
7. PD cyclers parts and usage
8. Defibrillators parts and usage
9. Cardiac Monitors
10. MARS, SAPD and Prometheus System Parts
11. ECMO Machine parts
12. Plasmapheresis centrifugal machine parts
13. Bioimpedance analysis machine/ Body Composition Monitors parts and working mechanism.
14. Online Hemodiafiltration machine parts
15. Blood Temperature, Blood Volume monitor
16. Enuresis monitor Ultrasound machine- For Depth, Flow of AVF

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## REFERENCE

1. Handbook of Dialysis Therapy E-Book - Page 356 by Allen R. Nissenson, Richard E. Fine · 2007
2. Replacement of Renal Function by Dialysis - Page 1467 by C. Jacobs, C. M. Kjellstrand, Karl-Martin Koch · 2008
3. Replacement of Renal Function by Dialysis by Walter H. Hörl, Karl-Martin Koch, Robert M. Lindsay · 2013

# Pathophysiology of Kidney Diseases (30hours)

**L/T/P/C**
**2/-/-/2**

## Learning Objectives

1. Understand common kidney diseases and their pathology.
2. Learn causes, symptoms, and complications of renal and urinary disorders.
3. Gain knowledge of infections, diagnostic methods, and preventive measures.

## Learning Outcomes

1. Identify and explain various renal diseases and conditions.
2. Describe basic pathology, diagnosis, and complications.
3. Apply knowledge to recognize infections and ensure proper prevention and care.

1. Acute Kidney Injury.
2. Glomerular pathology Primary and Secondary
3. Renal biopsy
4. Nephrotic syndrome – primary & secondary.
5. Nephritic syndrome.
6. UTI (urinary tract infections.)
7. Asymptomatic urinary abnormalities.
8. Chronic Kidney Diseases.
9. Renal stone diseases.
10. Obstructive uropathies.
11. Congenital abnormalities of urinary system
12. Inherited renal diseases.
13. Tumors of kidney & Urinary Bladder.
14. Pregnancy associated renal diseases.
15. Renal vascular disorders & hypertension associated renal diseases.
16. Tubulo-interstitial diseases.
17. Renal vascular disorders.
18. Pathology of kidney in hypertension, diabetes mellitus.
19. Pathology of peritoneum, peritonitis, bacterial, tubular & sclerosing peritonitis, dialysis induced changes.
20. Renal Tuberculosis
21. Hepatotropic viruses in detail: mode of transfusion, universal precautions vaccinations.
22. Human immunodeficiency virus (HIV), mode of transfusion, universal precautions & HIVAN.
23. Opportunistic infections.
24. Microbiology of vascular access infection (femoral, jugular, subclavian catheters).
25. Sampling methodologies for culture & sensitivity.
26. Reflux Nephropathy
27. Basic tropical disease

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## REFERENCES

1. Pathophysiology of Kidney Disease and Hypertension by A. Vishnu Moorthy · 2009
2. Understanding Kidney Diseases by Hugh C. Rayner, Mark E. Thomas, David V. Milford · 2020
3. Diseases of the Kidney and Urinary Tract by Robert W. Schrier · 2007

# Basic Principles of Nursing Care (30hours)

**L/T/P/C**
**2/-/-/2**

**Learning Objectives**

1. Understand basic nursing procedures and patient care techniques.
2. Learn clinical skills like injections, catheterization, and wound care.
3. Gain knowledge of monitoring, documentation, and sample collection.

**Learning Outcomes**

1. Perform basic nursing procedures safely and effectively.
2. Monitor patients and assist in clinical procedures.
3. Maintain proper records and follow aseptic techniques in sample collection.

1. Bed making (2hours)
2. Vital Signs Monitoring (2hours)
3. Input and Output chart (2hours)
4. Maintenance of emergency crash cart (2hours)
5. Bladder catheterization (2hours)
6. Injections – intravenous, intramuscular, subcutaneous (3hours)
7. Insertion of intravenous canulae (2hours)
8. Cleaning and dressing of wounds and vascular access sites and peritoneal catheter exit site (3hours)
9. Assisting the physician in procedures like minor surgery, vascular access, etc (3hours)
10. Suturing & Removal of sutures (2hours)
11. Care of bed ridden patients, (2hours)
12. Documentation (2hours)
13. Collection of blood, urine and stool specimens and their transfer aseptic precautions to the laboratory (3hours)

**REFERENCES**

1. Basic Principles of Nursing Care by Virginia Henderson
2. Integrative Nursing by Mary Jo Kreitzer, Mary Koithan, Andrew Weil · 2018
3. Basic Nursing: Essentials for Practice Patricia Ann Potter, Anne Griffin Perry · 2003

# Medical Law and Ethics

**L/T/P/C**
**3/-/-/3**

**Learning Objectives**

1. Understand basic concepts of medical ethics, law, and professional conduct.
2. Learn patient rights, informed consent, and medico-legal responsibilities.
3. Gain knowledge of legal issues like negligence, medical records, and organ transplantation.

**Learning Outcomes**

1. Explain principles of medical ethics and legal responsibilities in healthcare.

2. Apply knowledge of informed consent, confidentiality, and patient rights in practice.
3. Maintain proper medical records and follow legal protocols to ensure safe patient care.

## MEDICAL LAW

### UNIT-I (3hours)

- Medical ethics - Definition - Goal Scope
- Introduction to Code of conduct

### UNIT-II (3hours)

- Basic principles of medical ethics Confidentiality Malpractice and negligence - Rational and irrational drug therapy

### UNIT-III (3hours)

- Autonomy and informed consent - Right of patients
- Care of the terminally ill- Euthanasia

### UNIT-IV (3hours)

- Organ transplantation
- Medico legal aspects of medical records-Medico legal case and type-Records and document related to MLC-ownership of medical records-Confidentiality Privilege communication Release of medical information - Unauthorized disclosure retention of medical records - other various aspects.
- Professional Indemnity insurance policy

### UNIT-V (3hours)

- Development of standardized protocol to avoid near miss or sentinel events Obtaining an informed consent

**RECOMMENDED BOOKS**:

1. Law relating to medical negligence and compensation- Dr. K.P.D.A. Prabakar & Dr. J.Paulraj Joseph-2023

2. A textbook of medical jurisprudence and toxicology-Justice K Kannan -25 edition-1" edition-2016

3. Law the doctor must know-Hitesh J Bhatt & Geetebdra Sharma-2017

4. Law on medical negligence and legal remedies-Dr. Annu Bahl Mehra & Harshit Kiran-2022

## RECORD KEEPING

**Learning Objectives**

1. Understand medical terminology, abbreviations, and prescription writing basics.

2. Learn principles, types, and legal aspects of medical record management.
3. Gain knowledge of ICD, EMR, registers, and medical audit processes.

**Learning Outcomes**

1. Use correct medical terms, abbreviations, and basic documentation.
2. Maintain and organize medical records effectively and legally.
3. Apply knowledge of coding, EMR, and audits in hospital record systems.

**UNIT-I (3hours)**

- Commonly Used Prefixes, Suffixes and root words in Medical Terminology, Common Latin Terms used in Prescription Writing, Study of Standard Abbreviations.

**UNIT-II (3hours)**

- Medical Records Management. Meaning, functions, principles of record keeping, Importance of medical records to patients, doctors, and hospitals, classification of records like coding system, indexing system, types of forms basic and special, legal aspects of medical records.

**UNIT-III (3hours)**

- International Classification of Diseases (ICD), Electronic Medical Record (EMR), Records Management: Registers, forms, retention and preservation of MR, Role of MRD personnel.

**UNIT-IV (3hours)**

- Medical Registers: Meaning, types, advantages of Medical Registers, registers used in various departments, Statutory registers and reports to be maintained-specimens

**UNIT-V (3 hours)**

- Medical Audit: its process, role and importance in hospitals.

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RECOMMENDED BOOKS:

Davies, Juanita. Essentials of Medical Terminology. 3rd edition. New York. Delmar. 2008
Mogli. J.D. Medical Records: Organization & Management 2nd edition New Delhi Jaypee Brothers.
The body by Bilbirson Agreed for Occupance

## ETHICS

**Learning Objectives**

1. Understand principles of public health ethics and resource allocation.
2. Learn ethical, legal responsibilities and medical terminology in healthcare.
3. Gain knowledge of human rights, health promotion, and ethical issues in practice.

**Learning Outcomes**

1. Explain concepts of public health ethics and justice in healthcare.

2. Apply ethical and legal principles in medical and public health settings.
3. Promote

**UNIT-I (3 hours)**

- Introduction to Public Health Ethics.
- Theories of Justice and Distribution of Public Health Resources.
- Principle for Public Health Ethics.

**UNIT-II (3 hours)**

- Priority-Setting and Resource Allocation at the Macro Level.
- Priority-Setting and Resource Allocation at the Micro Level.

**UNIT-III (3 hours)**

- Medical Ethics, Legal Aspects and Medical Terminology.

1) Role Definition and Interaction, Ethical, Moral, and Legal Responsibilities
2) Medical terminology
3) Medical waste Management

**UNIT-IV (3hours)**

- Contemporary Ethical and Legal Issues in Health Care: Legal regulation of a standalone diagnostic center, medico-legal cases and medical negligence, ethical aspects of health care.
- Balancing Individual and Community Interests.
- Ethics and Health Promotion.

**UNIT-V (3hours)**

- Role of Human Rights in Public Health
- Ethics of Beath Promotion and Disease Prevention

**RECOMMENDED BOOKS:**

1. Ethics and Public Health Archana Rani Sahoo & Patitapahan Das-2017
2. Public Health, Ethics and Equity-Sudhir Anand, Fabienne Peter and Amartya Sen-2006
3. Nursing and healthcare ethics-Robinson & Doody-6 edition-2022
4. Ethics- William K. Frankena 2 edition-2015

.

## Clinical Postings II (CT) (60 hours)

**L/T/P/C**
**-/-/4/4**

**Learning Objectives**

1. Develop intermediate clinical skills in dialysis and related procedures.
2. Gain experience in patient interaction and teamwork in clinical settings.
3. Learn to assist in specialized renal procedures under supervision.

**Learning Outcomes**

1. Perform and assist in basic to intermediate dialysis unit procedures.
2. Communicate effectively with patients and healthcare professionals.
3. Assist safely in OPD, dialysis unit, and procedure room activities.

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior dialysis therapist. Students are tested on intermediate clinical dialysis therapy skills.

Areas to be covered.

1. OPD
2. Dialysis Unit
3. Procedure room for assisting in renal biopsy & central venous catheterization/ PD catheterization.

## HEALTH CARE DELIVERY SYSTEM IN INDIA (30 hours)

**L/T/P/C**
**2/-/-/2**

**Learning Objectives**

1. Understand the structure and functioning of the healthcare delivery system in India.
2. Learn key concepts of health policies, HR management, and quality improvement in healthcare.
3. Gain knowledge of legal, ethical, and emerging trends in healthcare systems.

**Learning Outcomes**

1. Explain the organization, governance, and components of healthcare delivery systems.
2. Describe HR practices, patient safety measures, and quality improvement tools.
3. Apply knowledge of legal, ethical, and modern healthcare trends in practice.

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1.**Introduction to Health Care Systems (5 hours)**

- Overview of Health Care Organizations (Hospitals, Systems, Clinics); Governance and Leadership in Health Care Organizations; Decision-Making and Communication Flows;
- Health Care Policies and Regulations
- Financial Management and Budgeting
- Health Insurance and Reimbursement
- Health Information Systems

**2.Human Resources in Health Care: (5 hours)**

- Health care workforce: Challenges and Trends; Workforce planning and job analysis; Recruitment and selection in health care; Employee retention and turnover; orientation, training, and professional development; Performance appraisal systems; Workplace safety, Wellness, and burnout prevention; HR analytics and Strategic planning

**3.Quality Improvement and Patient Safety: (5 hours)**

- Health care errors and adverse events; Root cause analysis (RCA) and Failure mode and effects analysis (FMEA); Quality measurement and performance indicators; Lean and six sigma in health care; Accreditation and regulatory requirements; Reporting systems and learning from errors

**4.Legal and Ethical Issues (5 hours)**
**5.Strategic Planning and Marketing (5 hours)**
**6. merging Trends in Health Care (5 hours)**

**RECOMMENDED TEXT BOOKS:**

1. Hospital Administration and Human Resource Management by Sharma, D.C
2. Principles of Hospital Administration and Planning by B.M. Sakharkar
3. Essentials of Hospital Management & Administration by S.L. Goel and R.K. Sharma
4. Health Care Management: Organization Design and Behaviour by Shortell & Kaluzny
5. Organizational Behaviour in Health Care by Nancy Borkowski
6. Introduction to Healthcare Quality Management by Patrice Spath
7. Patient Safety and Healthcare Improvement at a Glance by Sukhmeet Panesar et al.

## SEMESTER – IV

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Pharmacology related to Dialysis therapy &(practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 2 | | Renal Nutrition | 2 | - | - | 2 | 30 | 70 | 100 |
| 3 | | Dialysis Therapies – Part I &(practicals) | 3 | - | 1 | 4 | 30 | 70 | 100 |
| 4 | | Medical Electronics for Health Sciences, | 3 | - | - | 3 | 30 | 70 | 100 |
| 5 | | Clinical Postings III (CT) | - | - | 8 | 8 | 100 | - | 100 |
| 6 | | Health and well- being | 1 | - | - | 1 | 100 | - | 100 |
| TOTAL | | | 11 | - | 10 | 21 | 320 | 280 | 600 |

## Pharmacology related to dialysis therapy & (practical's)

**L/T/P/C**
**2/-/1/3**

**Learning Objectives**

1. Understand the structure and functioning of healthcare delivery systems in India.
2. Learn principles of health administration, HR management, and quality improvement.
3. Gain knowledge of legal, ethical, and emerging trends in healthcare.

**Learning Outcomes**

1. Explain the organization and components of healthcare systems.
2. Describe key practices in HR, patient safety, and quality management.
3. Apply basic knowledge of legal, ethical, and modern healthcare developments.

1. **IV fluid therapy with special emphasis in renal diseases (2 hours)**
   - Basics of fluid therapy
   - Calculation of fluid infusion
   - Intra-venous fluid administration
   - Commonly used iv fluids

2. **Diuretics (1 hours)**
   - Diuretics and its classification, actions, dosage, side effects & contraindications

3. **Anti-hypertensives (2 hours)**
   - Classification of anti-hypertensive drugs, its actions, dosage, side effects & contraindications, special reference during dialysis, vasopressors, drugs used in hypotension.

4. **Drugs and dialysis (2 hours)**
   - Importance of dialyzabilty of drugs
   - Factors affecting the dialyzability of drugs.
   - Drugs that need modifications
   - Physicochemical characteristics of the drug and dialyzability
   - Dialysis properties that affect drug clearance.
   - Dialyzability of phenobarbital
   - Dialyzability of lithium
   - Dialyzability of methanol

5. **Vitamin-D & its analogues, phosphate binders, iron, folic acid & other vitamins of therapeutic value (2 hours)**
   - Metabolism of Vitamin D in health & disease.
   - Mechanism of action, Therapeutic use and contraindication of
     1. Vitamin D & its analogues.
     2. phosphate binders & Newer Phosphate Binders.
     3. Calcimimetics Agents
     4. vitamin B12and folic acid.

6. **Erythropoiesis Stimulating Agent (ESA) (2 hours)**
   - Use of ESAs
   - Different types of ESAs
   - Mechanism of action of ESAs
   - Pharmacokinetics of ESAs
   - Therapeutic use of ESAs
   - Adverse effect of ESAs.
   - Precautions and contraindications of ESAs.

7. **Heparin and low molecular weight heparin (LMWH) (2 hours)**
   - Mechanism of action of unfractionated heparin (UFH).
   - Mechanism of action of LMWH.
   - Contraindication of unfractionated heparin and LMWH.
   - Adverse effect of heparin and LMWH.
   - Monitoring of heparin therapy.
   - Heparin induced thrombocytopenia.

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8. **Protamine sulphate (1 hours)**
   - Therapeutic use of Protamine Sulphate.
   - Dosage and administration
   - Adverse reaction.

9. **Newer anticoagulants (1 hours)**
   - Pharmacology of heparinoids.
   - Pharmacology of regional citrate anticoagulant
   - Pharmacology of thrombin inhibitors

10. **Chemicals Used in Dialysis Unit (Renalin- Peroxyacetic Acid, Formalin, Citrate, Sodium hypochlorite and hydrogen peroxide) (2 hours)**
    - Therapeutic use, precautions, and adverse effects of formalin
    - Therapeutic use, precautions, and adverse effects of citrate
    - Therapeutic use, precautions, and adverse effects of sodium hypochlorite
    - Therapeutic use, precautions, and adverse effects of hydrogen peroxide
    - Therapeutic use, precautions, and adverse effects of Peroxyacetic Acid

11. **Hemodialysis concentrates (2 hours)**
    - Composition of hemodialysis concentrates.
    - Types of hemodialysis concentrates and write it"s advantages and disadvantages
    - Clinical implication of altered dialysate composition

12. **Peritoneal dialysis (PD) fluid (2 hours)**
    - Buffer and pH of PD fluid.
    - Electrolyte concentrations of PD fluid
    - Newer PD Solutions

13. **Potassium exchange resin(2 hours)**
    - Clinical pharmacology, mechanism of action and therapeutic use of potassium exchange resin.
    - Contraindications of potassium exchange resin
    - Adverse reactions of potassium exchange resins
    - Drug interactions of potassium exchange resin
14. Immuno Suppressive Drugs **(1 hours)**
15. CRRT Replacement & Dialysis Solutions **(1 hours)**
16. Online HDF **(1 hours)**
17. Emergency Drugs used in Dialysis **(1 hours)**
18. IV iron preparations. **(1 hours)**
19. Organ Preservation Solutions **(1 hours)**
20. Other Newer Drugs for Dialysis & Transplantation. **(1 hours)**

## REFERENCES

1. The Renal Drug Handbook: The Ultimate Prescribing Guide for by Caroline Ashley, Aileen Dunleavy · 2018
2. Renal Medicine and Clinical Pharmacy by Rhiannon Braund · 20

## (Practical's) (15 hours)

**Learning Objectives**

1. Understand commonly used drugs and solutions in dialysis practice.

2. Learn safe preparation and administration of dialysis-related medications and fluids.
3. Gain knowledge of emergency drugs and anticoagulation used in dialysis and CRRT.

**Learning Outcomes**

1. Identify and describe the use of drugs and solutions used in dialysis units.
2. Demonstrate basic understanding of preparation and administration techniques.
3. Apply knowledge of emergency and anticoagulation drugs in dialysis care.

**1.** Administration of Erythropoiesis stimulating agents (ESA) (3 hours)
**2.** IV Iron Preparation (3 hours)
**3.** Vitamin supplements (2 hours)
**4.** Crystalloids & Colloids (2 hours)
**5.** Inotropic drugs (2 hours)
**6.** Anti-pyretic drugs (2 hours)
**7.** Anti-emetic drugs (2 hours)
**8.** Heparin, LMWH and Tri-sodium citrate, Regional Anticoagulation (3 hours)
**9.** Chemicals used in dialysis unit (3 hours)
**10.** D fluids (3 hours)
**11.** Dialysis & CRRT solutions (3 hours)
**12.** Emergency Drugs used in Dialysis (2 hours)

**REFERENCES**

1. The Renal Drug Handbook: The Ultimate Prescribing Guide for by Caroline Ashley, Aileen Dunleavy · 2018
2. Renal Medicine and Clinical Pharmacy by Rhiannon Braund · 2020

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## Renal Nutrition

**L/T/P/C**
**2/-/-/2**

**Learning Objectives**

1. Understand basics of renal nutrition and nutritional requirements in kidney diseases.
2. Learn methods of nutritional assessment and interpretation in CKD, HD, PD, and AKI patients.
3. Gain knowledge of dietary management and metabolic changes in renal disorders.

**Learning Outcomes**

1. Explain nutritional needs and metabolic changes in kidney disease.
2. Perform basic nutritional assessment using standard tools.
3. Apply dietary planning principles for CKD, dialysis, transplant, and AKI patients.

1. **Basics of Nutrition (2 hours)**

2. **Nutritional Screening and Assessment (2 hours)**
   - Introduction

- Mini Nutritional Assessment
- Nutritional Assessment
  1. Medical History
  2. The effect of comorbidities
  3. Medications and Drug-Nutrient Interactions
  4. Psychosocial History
  5. Dietary History
  6. Physical Examination
  7. Anthropometric Measurements
- Biochemical Assessment and Laboratory Data

3. **Nutritional Assessment Tools (2 hours)**
   - Subjective Global Assessment (SGA)
   - Dialysis Malnutrition Score (DMS)
   - Malnutrition and Inflammation Score (MIS)

4. **Impact of kidney disease on amino acid, protein, carbohydrate and lipid metabolism (2 hours)**
   - Metabolic alterations in kidney disease
   - Impact of kidney disease on acid base balance,
   - Impact of kidney disease on protein and amino acid metabolism,
   - Impact of kidney disease on carbohydrate metabolism and
   - Impact of kdney disease on lipid metabolism

5. **Nutritional management in CKD patient (pre-dialysis) fluid and electrolytes (2 hours)**
   - Determine of Nutritional care in CKD patient,
   - Nutritional care indications
   - Nutrient guidance for adult patient with pre-ESRD
   - Management of fluid in patient with pre-ESKD and electrolytes management in patient with pre-ESRD.

6. **Nutritional management of HD patient (2 hours)**
   - Purpose of nutritional management in HD patient
   - Factors favoring nutritional status
   - Nutrient guidance in HD patient
   - Intentions of nutrition care in HD patient
   - Diet in HD patient

7. **Nutritional management of Peritoneal Dialysis (PD) patient (2 hours)**
   - Nutrient guidance in PD patient
   - Intentions of nutrition care in PD patient
   - Diet in PD patient

8. **Nutritional management of renal transplant recipient (2 hours)**
   - Motives of medical nutrition therapy for renal transplant recipient,
   - Factors favoring nutritional status,
   - Nutrient favoring for kidney transplant recipient
   - Determine nutrition care for kidney transplant recipient and diet for kidney transplant recipient

9. **Nutritional management of acute kidney injury (AKI) (2 hours)**
   - Determination of medical nutrition therapy for patient with AKI

- Factors favoring nutritional status,
- Nutrient recommendation for patient with AKI
- Determination of nutrition care in patient with AKI and nutritional support for patient with AK

10. **Calcium, phosphate, parathyroid hormone & vitamin-D in CKD patients (3 hours)**
    - Chronic kidney disease and mineral bone disease (CKD MBD),
    - Influence of kidney disease on Ca,
    - Phosphate, PTH and Vitamin- and nutritional modification in CKD MBD.

11. Goals of nutritional management in HD patient, **(3 hours)**
12. factors influencing nutritional status in HD & PD **(3 hours)**
13. Purpose of nutrition care in HD & PD. **(3 hours)**

**REFERENCES**


1. Nutrition Therapy for Chronic Kidney Disease by Lynn K. Thomas, Jennifer Bohnstadt Othersen · 2012
2. Handbook of Nutrition and the Kidney by William E. Mitch, T. Alp Ikizler · 2010
3. Chronic Kidney Disease and the Nutrition Care Process by Maureen P. McCarthy, Jessie M. Pavlinac, Arianna Aoun · 2013


## Dialysis Therapies – Part I & (practical's) (45 hours)

**L/T/P/C**
**3/-/1/4**

**Learning Objectives**

1. Understand hemodialysis equipment, vascular access, and dialysis procedures in detail.
2. Learn principles of dialysis initiation, adequacy, anticoagulation, and water treatment systems.
3. Gain knowledge of infection control, dialyzer reuse, and medications used in dialysis care.

**Learning Outcomes**

1. Explain functioning of dialysis machines, dialyzers, and vascular access systems.
2. Describe procedures like cannulation, anticoagulation, and dialysis adequacy assessment.
3. Apply infection control practices and safe dialysis techniques in clinical settings.

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1. **Hemodialysis equipment (3 hours)**
    - Hemodialysis apparatus, function of dialysis machine, parts of extracorporeal circuit of dialysis machine, parts of dialysis delivery system

2. **Initiation of dialysis therapy (3 hours)**
    - Initiating of dialysis therapy, choice of modality, options of renal replacement therapy, when to initiate dialysis, relationship between uremic syndrome and eGFR, indications of dialysis in the chronic setting and concept of early initiation of dialysis

3. **Types of dialyzers and its membrane (3 hours)**
    - Structure of dialyzer, types of dialyzers, hollow fiber dialyzer, Parts of hollow fiber dialyzer, types of dialyzer membranes, cellulosic membrane, Synthetic membranes and its advantages, dialyzer performance and clearance, biocompatibility of the dialyzer, advantages of biocompatible membrane

4. **Composition of dialysis solution (3 hours)**

- Preparation of dialysate, types of concentrate, mixing of dialysate, chemical used to prepare dialysate, monitoring of dialysate parameter for quality maintenance, consequences of altered dialysate composition

5. **Vascular access and its types and complication (4 hours)**
   - Types of vascular access for hemodialysis, permanent and temporary catheter, location of temporary catheter, pre-dialysis assessments for all types of vascular access, sign of exit site infection of catheter, importance of catheter care including hand hygiene and dressing, method of catheter lock, indication and contraindications of AVF, locations and construction of AVF, preparation of AVF evaluation, advantages, disadvantages and complications of AVF, AVG and its indications, characteristics of graft materials, types of synthetic materials, Types of AVG and its locations, Hero graft, advantages and disadvantages of AVG, use of Doppler for creating AVF & AVG, Use of USG for temporary access creation, Basic Uses of Doppler & USG.

6. **Cannulation of vascular access in HD (3 hours)**
   - Importance of cannulation, steps in cannulation, skin preparation, Rule of 6"s, cannulation and its techniques- ladder rope, buttonhole and same area, needle removal and hemostasis, post dialysis assessment and cannulation of new fistula

7. **Vascular access surveillance (4 hours)**
   - Arm Elevation Test, Allen"s Test, Inflow & Out flow stenosis & define vascular access recirculation, classify vascular access recirculation, causes, symptoms and indication of recirculation, Measurement of access recirculation, protocol for urea-based measurement recirculation, Alternative means of measuring access recirculation.

8. **Types of hemodialysis modalities (3 hours)**
   - Categorize types of HD, Incenter hemodialysis and its advantages and its disadvantages, home hemodialysis – its indications, contraindications, Requirements, Ideal characteristics, Machines, types advantages and its disadvantages.

9. **Dialyzer reprocessing (3 hours)**
   - Need for Dialyzer reprocessing, techniques, Steps in dialyzer reprocessing, advantages and disadvantages of dialyzer reprocessing, automated dialyzer reprocessor, advantages of dialyzer reprocessing machine, safe practice in reuse, factors affecting reusability of dialyzer, strategies to maximize reuse, preparation dialyzer for reuse, quality assurance and dialyzer reprocessing and water requirements.

10. **Anti-coagulation (3 hours)**
    - principle coagulation pathways, blood clotting in the extracorporeal circuit, heparin, clotting tests used to monitor heparin therapy, routine heparin dosage prescription, heparin rebound phenomenon, regional heparinization, tight heparinization, heparin free dialysis- its indication, bicarbonate dialysis solution with low-concentration citrate and other anticoagulation techniques.

11. **Hemodialysis adequacy (3 hours)**
    - Definition, explain urea kinetic modelling (UKM), urea as a marker for uremic toxins, urea reduction ratio (URR), advantages and disadvantages of URR, single pool kt/v, double pool UKM and eq kt/v.

12. **Water treatment unit (WTU) (3 hours)**
    - Purpose of water treatment for dialysis, various sources of water, types of contaminants in water, various contaminants in water and its effect, components of a dialysis center"s WTU, pre-treatment components, primary treatment components, distribution system, monitoring and testing of dialysis

water treatment system, microbial testing and chemical monitoring

**13. Medications used in dialysis patients. (3 hours)**

- List the drugs used in dialysis patients, indication of these drugs- heparin, Volume expanders like saline, albumin, Sodium bicarbonate, Glucose, Xylocaine, Antibiotics, Inj. Erythropoietin, iron, Vitamins, Anticonvulsants, Deferoxamine, Phosphate binders, Anti-hypertensives and emergency drugs.

**14. Infection control and universal precaution (4 hours)**

- Prevention of infection in dialysis unit, infection control practices in dialysis unit, Universal precaution, current recommendation for immunization in patients with chronic kidney disease, methods that decrease the risk of infection in the vascular access, spread of hepatitis B, hepatitis C, hepatitis D and HIV in dialysis unit, specific infection control requirement for a patient with hepatitis B, why person with CKD are predisposed to development of active tuberculosis after exposure to the bacterium, dialyzer reprocessing contributing to bacteremia, reasons why patients with HIV do not require special isolation or infection control procedures.

## REFERENCES


1. Core Concepts in Dialysis and Continuous Therapies by Colm C. Magee, J. Kevin Tucker, Ajay K. Singh · 2016
2. Dialysis Therapy by Allen R. Nissenson, Richard N. Fine · 1993 · Snippet view
3. Replacement of Renal Function by Dialysis by Walter H. Hörl, Karl-Martin Koch, Robert M. Lindsay · 2013


## (Practical's) (15 hours)

**Learning Objectives**

1. Understand key components of hemodialysis equipment and water treatment systems.
2. Learn basic maintenance, infection control, and dialysis procedure skills.
3. Gain knowledge of clinical assessment of dialysis adequacy and vascular access.

**Learning Outcomes**

1. Identify and explain functions of HD equipment parts and systems.
2. Perform basic procedures like cannulation, adequacy calculation, and access assessment.
3. Apply infection control practices and maintain dialysis unit equipment safely.

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**HD Equipment**

1. Motor brush
2. Loading valve
3. Shunt cover
4. Hansen connector
5. Blood pump motor
6. Diasafe or Cut-off filter
7. Degas filter

- Calculating Hemodialysis Adequacy
- Assessing HD Vascular Access
- Cannulating HD Vascular Access
- Water Treatment Plant Maintenance

1. Daily 2. Weekly

- Infection Control in dialysis unit

**REFERENCES**

1. Handbook of Nutrition and the Kidney by William E. Mitch (Editor), T. Alp Ikizler
2. Handbook of dialysis by John T. Daugirdas
3. Dialysis Therapy by Allen R. Nissenson, Richard N. Fine · 1993
4. Textbook of Dialysis Therapy by Dr. Jigar Shrimali MD DM Nephro(Gold Medalist) · 2018

# Medical Electronics for health sciences

**L/T/P/C**
**3/-/-/3**

**Learning Objectives**

1. Understand basic principles of electronics used in medical and health sciences.
2. Learn working of electronic components, amplifiers, ICs, and transducers.
3. Gain knowledge of diagnostic and imaging equipment used in healthcare.

**Learning Outcomes**

1. Explain functioning of basic semiconductor devices and electronic circuits.
2. Describe applications of amplifiers, ICs, and biomedical transducers.
3. Identify and understand basic working of diagnostic and imaging systems.

**1. Introduction to semiconductor devices (6 hours)**

- Principles of semiconductor diodes, Zener diode, BJT, FET, SCR & UJT and applications of diodes

**2. Amplifiers (7 hours)**

- Basic amplifier configuration, types of amplifiers – Voltage amplifiers, current amplifiers, power amplifiers, frequency response, low noise pre amplifiers.

**3. Feedback Amplifiers and Oscillators (6 hours)**

- Principles of feedback amplifiers, condition for sustained oscillation, RC and LC oscillators

**4. Introduction to ICs (6 hours)**

- Linear and digital ICs, applications of op amp like amplifiers, waveform generators, timer, A/D and D/A converters, active filters

**5. Transducers and display devices (7 hours)**

- Various types of transducers – electric, capacitive, inductive, photo electric and piezoelectric. Types of recorders – ink jet, heated styles, photographic, low frequency magnetic tape recorder. Different types of oscilloscopes – long persistence, storage, digital scopes.

**6. Introduction to diagnostic equipment (7 hours)**

- Bio potential recording devices, ECG, EEG, EMG, non-electrical parameter measurements, biochemical and microbiologic equipment.

**7. Introduction to imaging techniques (6 hours)**

- Principles of radiography, ultrasonography, and radioisotopes

**REFERENCES**

1. Introduction to Medical Electronics Applications by L. Nokes, D. Jennings, T. Flint · 1995
2. Joining and Assembly of Medical Materials and Devices by Y N Zhou, M D Breyen · 2013

3. Principles of Medical Electronics and Biomedical Instrumentation by C. Raja Rao, Sujoy K. Guha · 2001

## Clinical Postings III (CT) (120 hours)

**L/T/P/C**
**-/-/8/8**

**Learning Objectives**

1. Develop advanced clinical skills in dialysis procedures under supervision.
2. Learn proper cannulation, decannulation, and vascular access care (AVF & AVG).
3. Gain experience in patient management and assisting in clinical procedures.

**Learning Outcomes**

1. Perform and assist in intermediate dialysis procedures safely.
2. Demonstrate correct technique in AVF and AVG cannulation and decannulation.
3. Monitor patients and assist in OPD, dialysis unit, and procedure room activities.

- Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior dialysis therapist. Students are tested on intermediate clinical dialysis therapy skills.
- Students will continue with their clinical procedures along with careful analyzing and performing AVF and AVG cannulation and decannulation procedure, monitoring of water quality with the assistance of senior dialysis technologist.

**Areas to be covered.**

**1.** OPD
**2.** Dialysis Unit
3. Procedure room for assisting in biopsy & catheterization.

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## HEALTH AND WELL-BEING

**L/T/P/C**

**1/-/-/1**

**Learning Objectives:**

1. By the end of the course, students will be able to:
2. Understand the physical, mental, and social determinants of health.
3. Apply strategies for improving and maintaining physical health.
4. Recognize the importance of mental well-being and stress management techniques.

5. Understand the relationship between nutrition and overall health.
6. Develop practical skills for managing time, stress, and emotions.
7. Cultivate a balanced approach to achieving long-term health and well-being.

**Learning Outcomes**

1. Explain dimensions of health and factors influencing well-being.
2. Describe healthy practices in fitness, nutrition, sleep, and mental health.
3. Apply knowledge to develop and maintain healthy lifestyle habits for disease prevention.

**UNIT-I (1 hour)**

1. Introduction to Health and Well-being
2. Overview of health and well-being concepts
3. Dimensions of health: Physical, mental, social, and emotional The impact of lifestyle choices on health

**UNIT-II (2 hour)**

1. Physical Health and Fitness
2. Importance of physical activity for overall health
3. Types of exercise: Aerobic, strength, flexibility, and balance Creating a personal fitness plan

**UNIT-III (2 hour)**

1. Nutrition and Healthy Eating
2. Basics of nutrition: Macronutrients and micronutrients Healthy eating habits and food groups
3. Impact of nutrition on physical and mental health

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**UNIT-IV (2 hour)**

1. Mental Health and Emotional Well-being
2. Understanding mental health: Definitions, stigma, and myths Key aspects of emotional well-being
3. Building emotional resilience

**UNIT-V(1 hour)**

1. Stress Management Techniques Understanding stress and its effects on health Mindfulness and relaxation techniques
2. Time management for stress reduction

**UNIT-VI (1 hour)**

1. Sleep and Recovery
2. Importance of sleep for physical and mental health Sleep hygiene and healthy sleep habits
3. Impact of sleep deprivation on overall well-being

**UNIT-VII (2 hour)**

1. Social Health and Relationships
2. The role of social connections in well-being
3. Healthy relationships: Communication, boundaries, and support Community involvement and social well-being

**UNIT-VII (1 hour)**

1. Substance Use and Addiction
2. The impact of alcohol, tobacco, and drugs on health Understanding addiction and treatment options Preventive measures and harm reduction strategies

**UNIT-IX (2 hour)**

1. Chronic Diseases and Prevention
2. Common chronic diseases (e.g., diabetes, heart disease) Risk factors and lifestyle modifications for prevention Screening, early detection, and health monitoring

**UNIT-X (1 hour)**

1. Building Healthy Habits
2. The psychology of habit formation
3. Strategies for adopting and maintaining healthy habits Overcoming barriers to healthy behaviour changes

**Reference Textbook**

Health and Wellness" by S. L. Kaskutas & K. A. A. Nielson

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## SEMESTER - V

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Dialysis Therapies – Part II & (practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 2 | | Renal Transplantation and Coordination & (practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 3 | | Clinical Problems and Evidenced Based Practice in Dialysis Therapy | 3 | - | - | 3 | 30 | 70 | 100 |
| 4 | | Advanced Extracorporeal Therapies & (practicals) | 3 | - | 1 | 4 | 30 | 70 | 100 |
| 5 | | Clinical Postings IV (CT) | - | - | 8 | 8 | 100 | - | 100 |
| 6 | | Interpersonal Communication | 1 | - | - | 1 | 100 | - | 100 |
| | | TOTAL | 13 | - | 11 | 22 | 320 | 280 | 600 |

## Dialysis Therapies – Part II & (practical's)

**L/T/P/C**
**2/-/1/3**

**Learning Objectives**

1. Understand hemodialysis and peritoneal dialysis procedures, prescriptions, and monitoring.
2. Learn to identify and manage acute complications during dialysis.
3. Gain knowledge of pediatric dialysis, pregnancy in dialysis, and lab data interpretation.

**Learning Outcomes**

1. Explain HD and PD procedures, including assessment and machine monitoring.
2. Identify and manage common acute and chronic dialysis complications.
3. Interpret lab data and apply knowledge in special populations like children and pregnant patients.

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**1. Hemodialysis procedure (3 hours)**

- Patient assessment, management and prevention– General, pre, intra and post dialysis
- Lab data analysis
- Machine monitoring during hemodialysis

2. **Hemodialysis prescription (3 hours)**

- Acute hemodialysis prescription
- Chronic hemodialysis prescription

**3.Acute complication (3 hours)**

1. Classify intra-dialytic complications- frequent and less commonly occurring
2. Sign, symptoms, prevention and management of
3. Hypotension,

4. Muscle cramps,
5. Nausea and vomiting,
6. Chest pain and back pain,
7. Fever and chills,
8. Itching,
9. Headache,
10. Dialysis disequilibrium syndrome (DDS)
11. Dialyzer membrane reaction- type a and b,
12. Hemolysis,
13. Air embolism,
14. First use syndrome,
15. Arrhythmias,
16. Cardiac arrest,
17. Cardiac tamponade,
18. Hypertension,
19. Exsanguinations,
20. Seizures,
21. Anaphylaxis.

**3. Lab-data analysis (3 hours)**

- Various laboratory test use assesses kidney disease- urea, creatinine, GFR measurement, sodium, potassium, chloride, bicarbonate, serum uric acid, hemoglobin, phosphate, calcium, PTH, vitamin D level, albumin, cholesterol, blood glucose level-fasting, post-prandial and random, total protein, liver function tests, serum bilirubin, ALT, AST and urine analysis.
- Importance laboratory investigation of kidney disease

**4. Introduction to peritoneal dialysis (3 hours)**

- History of peritoneal dialysis
- Physiology of PD – Kinetics of PD,
- Three-pore model & Distributive Model
- Acute peritoneal dialysis
- Indications- Strong indications, PD preferences, non-renal indications
- Contraindications for chronic PD- relative contraindications to peritoneal dialysis and Peritoneal dialysis is not preferred but is possible in select circumstances.

**5. Peritoneal dialysis apparatus (3 hours)**

- Solution
- Transfer set,
- Connectologies.
- Access for PD
- Catheter and Exit site care

**6. Peritoneal dialysis process & Therapies (3 hours)**

- Assessment of peritoneal membrane permeability
- Adequacy of peritoneal dialysis
- PD therapies – intermittent & continuous

**7. Peritoneal dialysis complications & management (3 hours)**

- Non - infectious complications of PD
- Mechanical and metabolic complications

- Infectious complications of PD,
- Patient Education and Training
- Nutrition in PD
- Long term complications in PD

**8. Pediatric dialysis (3 hours)**

- Renal replacement therapy on children
- Complications of peritoneal dialysis in children
- Equipment required for pediatric chronic peritoneal dialysis.
- HD prescription in children
- Various vascular access for HD in children
- Dialysis machine and blood lines
- Extracorporeal blood access and circulation
- Immunization in children undergoing dialysis.

**10. Pregnancy in dialysis patients (3 hours)**

- Contraception
- Diagnosis of pregnancy in dialysis patients
- Hypertension in pregnant patients
- Drug removal
- Anemia
- Peritonitis occurrence
- Dialysis modalities- HD and PD
- Diet

## REFERENCES


- Handbook of Nutrition and the Kidney by William E. Mitch (Editor), T. Alp Ikizler
- Handbook of dialysis by John T. Daugirdas
- Dialysis Therapy by Allen R. Nissenson, Richard N. Fine · 1993
- Textbook of Dialysis Therapy by Dr. Jigar Shrimali MD DM Nephro (Gold Medalist) · 2018


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## (Practical's) (15 hours)

**Learning Objectives**

1. Develop hands-on skills in hemodialysis and peritoneal dialysis procedures.
2. Learn to design dialysis prescriptions and manage complications.
3. Gain practical knowledge in special dialysis situations such as pediatrics and pregnancy.

**Learning Outcomes**

1. Perform basic HD procedures including assessment, monitoring, and lab interpretation.
2. Design dialysis prescriptions and manage acute and PD-related complications.
3. Apply skills in pediatric dialysis and pregnancy-related dialysis care.

1. **Hemodialysis procedure (2 hours)**
   - Patient assessment, management and prevention– General, pre, intra and post dialysis

- Lab data analysis
- Machine monitoring during hemodialysis

**2. Hemodialysis prescription (2hours)**

- Design Acute hemodialysis prescription
- Design Chronic hemodialysis prescription

**3. Manage Acute complication (2 hours)**

- Hypotension,
- Muscle cramps,
- Nausea and vomiting,
- Chest pain and back pain,
- Fever and chills,
- Itching,
- Headache
- Dialysis disequilibrium syndrome (DDS)
- Dialyzer membrane reaction- type a and b, Hemolysis,
- Air embolism,
- First use syndrome,
- Arrhythmias,
- Cardiac arrest,
- Cardiac tamponade,
- Hypertension,
- Exsanguinations,
- Seizures, Anaphylaxis.

**4. Identify Peritoneal dialysis apparatus (2hours)**
**Solution**

- Transfer set,
- Connectologies
- Access for PD

**5. Calculate Peritoneal dialysis adequacy & PET (2hours)**

- Manage Peritoneal dialysis complications
- Non - infectious complications of PD
- Mechanical and metabolic complications Infectious complications of PD,

**6.Educate and Train Patient for PD (2hours)**

**7. Perform Pediatric dialysis(2 hours)**

- Equipment required for pediatric chronic peritoneal dialysis.
- HD prescription in children
- Various vascular access for HD in children
- Dialysis machine and blood lines
- Extracorporeal blood access and circulation
- Immunization in children undergoing dialysis.

**8. Plan to perform dialysis in Pregnancy (1 hours)**

## REFERENCES


1. Core Concepts in Dialysis and Continuous Therapies by Colm C. Magee, J. Kevin Tucker, Ajay K. Singh · 2016
2. Dialysis Therapy by Allen R. Nissenson, Richard N. Fine · 1993 · Snippet view
3. Replacement of Renal Function by Dialysis by Walter H. Hörl, Karl-Martin Koch, Robert M. Lindsay · 2013


# Renal transplantation and coordination &( practical's)

**L/T/P/C**
**2/-/1/3**

**Learning Objectives**

1. Understand principles of renal transplantation, immunology, and donor–recipient evaluation.
2. Learn the role and process of transplant coordination, including deceased and living donor programs.
3. Gain knowledge of legal, ethical, and counseling aspects in organ transplantation.

**Learning Outcomes**

1. Explain types of kidney transplantation, donor selection, and basic immunology concepts.
2. Describe transplant procedures, coordination processes, and post-transplant care.
3. Apply knowledge of ethics, grief counseling, and transplantation laws in clinical practice.

1. **Introduction & Renal Transplantation (3hours)**
   - Types of organ donors (Living and deceased donors)
   - Types of deceased organ donors – Deceased heart beating donors and non-heart- beating donors
   - Types of transplantation
   - Indications and contraindications for transplantation
   - Types of kidney transplantation
   - Importance of immunosuppressive drugs in kidney transplantation

2. **Brain stem death (3hours)**
   - Define brain stem death
   - List the tests to confirm brain stem death and their importance
   - Explain the brain stem death importance in organ transplantation
   - Explain the Human Organ Transplantation Act and ethical issues related to transplantation

3. **Basics of immunology (2hours)**
   - Define immunity, immunology, antibody, antigen and complement system
   - Types of immunity (Innate & Acquired immunity)
   - Explain the organs and cells involved in the immune system and their functions
   - List the functions of the immune system

4. **Immunology related to kidney transplantation. (2hours)**
   - Define sensitivity and autoimmunity
   - Causes for sensitization
   - Immunological tests recommended during kidney transplantation
   - Significance of blood groups in renal transplantation
   - Define HLA, its location
   - Types and significance of HLA
   - Explain the HLA inheritance and its importance in renal transplantation

- Define cross-match test and panel reactive antibodies & list the importance of these tests
- Explain CDC, ELISA and flow cytometry tests

5. **Renal Transplantation Procedure (2hours)**
   - Explain the pre-renal transplant donor (Living and deceased) and recipient evaluation.
   - Pre-transplant counselling of donor and recipient and importance of consent for organ donation
   - Steps of preoperative preparation of the kidney donor and the recipient
   - Types of nephrectomy methods (incision) and their importance
   - List the organs/tissues/parts procured from the donor during nephrectomy
   - Define warm and cold ischemia time.
   - List the steps of kidney preservation.
   - List the steps of kidney implantation.
   - Explain the relative and absolute contraindications of living and deceased donor renal transplantation.
   - Post-operative care of donor.
   - Post-operative care of recipient –immediately after the transplant and long term follow up

6. **Post renal transplantation. (2hours)**
   - History of immunosuppressive drugs
   - Define immunosuppressive drugs and list the importance of these drugs in renal transplantation
   - Types of immunosuppressive drugs used for kidney transplant induction therapy and list the drug names
   - Define maintenance therapy and list the drug names
   - Define triple therapy and list the drugs used under this therapy
   - Complications/side effects of cyclosporine, tacrolimus, Azathioprine, MMF,Prednisolone, Sirolimus and ATG
   - Explain the post-transplant complications (early and late) – Surgical, graft dysfunction and drug related complications
   - Define the types of graft rejection and list the risk factors, features, and management
   - Ethical and social issues related to dialysis and renal transplantation

7. **Introduction to transplant coordination (2hours)**
   - Define the term transplant coordinator
   - Eligibility criteria for transplant coordinator
   - Importance of transplant coordination team and their responsibilities
   - Explain the role of kidney transplantation coordinator and coordination team
   - Understand the work process of a transplant coordinator (routine)
   - Explain the importance of consent for the organ donation

8. **Living Donor kidney donation process (2hours)**
   - Process of coordinating and monitoring living donor kidney transplantation
   - Importance of document preparation for kidney transplantation
   - Apply the acquired knowledge of transplantation for giving awareness about kidney disease and transplantation (Patient education)

9. **Deceased donor kidney donation process (2hours)**
   - Explain the process of identification of donor, declaration of brain stem death and evaluation of donor
   - Explain the process of coordinating and monitoring the deceased donor kidney transplantation (Approaching the family members of donor, Coordination with regional committees, Allocation,

Matching, organ procurement, storage, and transportation)
- Explain the process of creating a kidney transplantation registry
- Apply the acquired knowledge of transplantation giving awareness about deceased donor transplantation and becoming a deceased donor in the society

10. **Introduction to grief counselling (2hours)**
    - Define grief counselling and bereavement.
    - Explain the grieving or bereavement process (Kubler Ross Model, Individual‟s mental status during grief)

11. **Grief counselling and organ transplantation (2hours)**
    - Explain how grief counselling is applied to end stage organ failure
    - Explain the role of transplant coordinator during grief counselling

12. The functioning of transplant registration centers **(2hours)**
13. Explain the functions of national, state or regional transplant registry services & registration centers **(2hours)**
14. Human Organ Transplant Act and its amendments **(2hours)**

## REFERENCES


1. Kidney Transplantation: Principles and Practice Peter J. Morris · 1984
2. Renal Transplantation - Page 429 by Nicholas Torpey · 2010
3. Current Issues and Future Direction in Kidney Transplantation by Thomas Rath · 2013


## (Practical's) (15 hours)

**Learning Objectives**

1. Understand the basic process of renal transplant work-up and patient evaluation.
2. Learn principles and techniques of grief and transplant counseling.
3. Develop communication skills required for patient and family counseling in transplantation.

**Learning Outcomes**

1. Perform basic renal transplant work-up procedures under supervision.
2. Demonstrate understanding of grief and transplant counseling approaches.
3. Communicate effectively with patients and families regarding transplantation.

- Renal transplants work up.
- Grief Counseling
- Transplant Counseling

## REFERENCES


- Kidney Transplantation: Principles and Practice Peter J. Morris · 1984
- Renal Transplantation - Page 429 by Nicholas Torpey · 2010
- Current Issues and Future Direction in Kidney Transplantation by Thomas Rath · 2013

# Clinical Problems in Dialysis & Evidence Based Practice in Dialysis Therapy

**L/T/P/C**
**3/-/-/3**

**Learning Objectives**

1. Understand common clinical problems in dialysis patients and their pathophysiology.
2. Learn diagnosis, management, and evidence-based treatment approaches in ESRD complications.
3. Gain knowledge of systemic complications affecting cardiovascular, neurological, endocrine, and other systems in dialysis patients.

**Learning Outcomes**

1. Explain major clinical problems such as anemia, hypertension, bone disease, and infections in dialysis patients.
2. Describe diagnostic methods and management strategies using evidence-based practice.
3. Apply clinical knowledge to improve patient care and outcomes in dialysis therapy.

**1. Anemia and ESA use (3hours)**

- Anemia in dialysis patient.
- Causes of anemia in CKD patient.
- Clinical features
- Diagnostic test
- Treatment.

**2. Hypertension in dialysis patients (4hours)**

- Definition and measurement of hypertension.
- Pathophysiology of hypertension.
- Management of hypertension in dialysis patient.
- Various types of antihypertensive drugs used in end-stage kidney disease.
- Mechanism of intra-dialytic hypertension

**3. Cardiovascular abnormalities(3hours)**

- Epidemiology of CVD in chronic kidney disease
- Risk factors for cardiovascular disease in dialysis patients.
- Left ventricular hypertrophy.
- Uremic pericarditis.
- Risks of dialysis therapy in patients with pericarditis

**4. Psychological aspect in dialysis patients (3hours)**

- Common psychologic problem in ESRD patients
- Depression
- Dementia
- Anxiety and behavioral disorders
- Other psychologic problems- marital issues, sexual dysfunction, socioeconomic issues, rehabilitation, quality of life (QOL)

5. **Blood borne disease in dialysis patients (4hours)**
   - Major blood borne infection in dialysis patient
   - Hepatitis B infection in dialysis patient
   - Interpretation of diagnostic test in hepatitis b infection
   - Epidemiology of hepatitis B virus in dialysis units
   - Hepatitis B vaccination
   - Hepatitis C infection in dialysis patient
   - Interpretation of diagnostic test in hepatitis c infection
   - Epidemiology of hepatitis C virus in dialysis units
   - Human immunodeficiency virus (HIV) infection in dialysis patient
   - Clinical manifestations of HIV
   - Management of HIV infection
   - Dialysis in patients who are HIV positive
   - Prevention of blood borne infection in dialysis patients

6. **Endocrine disturbances (3hours)**
   - CKD and endocrine abnormalities.
   - Effects of Thyroid Dysfunction on the Kidney
   - Various hormones like insulin, glucagon, renin–angiotensin, aldosterone, norepinephrine and epinephrine, cortisol, thyroid function, testicular function, growth hormone, parathyroid hormone (PTH), sexual dysfunction in men and women, and its effect on dialysis patient.

7. **Bone disease (3hours)**
   - Renal Bone disease.
   - Chronic Kidney Disease –Mineral and Bone Disorder.
   - Role of PTH, Vitamin D, and Fibroblast Growth Factor-23.
   - Development of secondary hyperparathyroidism in CKD
   - Classification bone diseases in CKD patients
   - Medical treatments of CKD-MBD.
   - Role of optimal dialysis prescription in CKD – MBD.

8. **Neurologic aspects of uremia(4hours)**
   - Neurological problems in dialysis patients.
   - Uremic encephalopathy.
   - Acute aluminum intoxication.
   - Acute cerebral dysfunction during or immediately after dialysis.
   - Stroke in dialysis patient.
   - Physical disability in dialysis patient.
   - Peripheral neuropathy
   - Carpel tunnel syndrome
   - Autonomic neuropathy and myopathy
   - Sleep disorders in dialysis patients.

9. **APKD (3hours)**
   - Introduction
   - Pathologic features
   - Clinical manifestations
   - Diagnosis and differential diagnosis

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- Management
- Outcome

**10.Dialysis amyloidosis (3hours)**

- Define amyloidosis.
- Risk factors for dialysis related amyloidosis.
- Pathophysiology of amyloidosis.
- Clinical and laboratory manifestations of amyloidosis.
- Symptoms of amyloidosis.
- Treatment of amyloidosis

**11.Geriatric Dialysis(3hours)**

- RRT in geriatric patient.
- Features of ageing in CKD patients.
- Choice of modality for geriatric patients‟ dialysis.
- Lifestyle benefits from the patient perspective
- QOL for geriatric patients on dialysis
- Falls and factors associated with falls in dialysis patients.
- Dialysis related risk factors in geriatric patients.

**12.Malnutrition (3hours)**

- Epidemiology
- Pathogenesis
- Nutritional assessment
- Supplementation

**13.Skin Disorders (3hours)**

- Dermatologic manifestations of disease
- related with ESRD
- related with uremia
- related with renal transplant
- Management
- Treatment

**14.GI Disorders (3hours)**

- GI symptoms in kidney disease
- Gastritis, duodenitis, upper gastrointestinal hemorrhage
- Diseases of the colon
- Gastroparesis
- Management and treatment

## REFERENCES

1. Principles and Practice of Dialysis by William L. Henrich · 2012
2. Hemodialysis - From Basic Research to Clinical Trials C. Ronco, Claudio Ronco, D. N. Cruz · 2008
3. Management of Chronic Kidney Disease: A Clinician’s Guide Mustafa Arici · 2014
4. Hemodialysis Technology C. Ronco, Claudio Ronco, G. La Greca · 2002

# Advanced extracorporeal therapies & (practical's)

**L/T/P/C**
**3/-/1/4**

**Learning Objectives**

1. Understand advanced extracorporeal therapies used in critical care and dialysis practice.
2. Learn indications, principles, and technical aspects of therapies like CRRT, SLED, plasmapheresis, and ECMO.
3. Gain knowledge of practical application, equipment handling, and complications management in advanced therapies.

**Learning Outcomes**

1. Explain principles and indications of advanced dialysis and extracorporeal treatments.
2. Describe operation, prescription, and complications of therapies like CRRT, SLED, and plasmapheresis.
3. Apply knowledge to support safe use of advanced extracorporeal therapies in clinical practice.

1. **Hi-flux and Hi-efficiency (3hours)**
   - Hi-flux dialysis and its characteristics
   - Hi-efficiency dialysis and its characteristics

2. **Slow continuous therapies (4hours)**
   - Multidisciplinary team
   - indications of CRRT
   - vascular access used and extracorporeal circuit
   - types of CRRT- SCUF, C-HD, C-HF, C-HDF
   - contraindications of CRRT
   - complications of CRRT

3. **SLED (4hours)**
   - Describe slow low efficiency dialysis (SLED).
   - indication and contraindication of SLED.
   - advantages and disadvantages of SLED.
   - equipment used for SLED.
   - prescription of SLED

4. **Plasmapheresis (4hours)**
   - Indication and contraindication.
   - Pharmacokinetics of immunoglobulin removal
   - Pharmacokinetic basis for TPE prescriptions.
   - How to estimate plasma volume.
   - Various replacement solutions used in Plasmapheresis.
   - Various complication of Plasmapheresis.
   - Double filtration plasmapheresis

5. **Hemoperfusion (4hours)**
   - Indications of hemoperfusion

- Choice of therapy for the treatment of poisoning
- Technical requirements for hemoperfusion
- Complications occurs during hemoperfusion

6. **Principle of ICU care (4hours)**
   - Ventilator – Mode and operation
   - Dialysis in ICU
   - Basics of ICU management
   - Basics of ECG

7. **Common uro-surgical procedures (3hours)**
   - Common urosurgical procedures
   - Instruments & their management
   - ESWL

8. **Liver Dialysis/ Extracorporeal Albumin Dialysis (4hours)**
   - Indications and contraindications
   - Toxins cleared in Liver Dialysis
   - Liver Dialysis system & Types
   - Principles
   - Process
   - Types of treatment
   - Complications and Management

9. **ECMO (4hours)**
   - Indication & Contraindications
   - Principles
   - Risk of ECMO
   - Preparation and expectation of ECMO
   - ECMO & Dialysis

10. **Hemodiafiltration (4hours)**
    - Introduction
    - Preparation replacement fluid
    - Techniques of HDF
    - Technical aspects
    - Advantages and disadvantages

11. **Sorbent Dialysis (4hours)**
    - Introduction
    - Requirements
    - Sorbent cartridge and its function
    - Parameters of sorbent system
    - Serum electrolytes and acid base adjustments
    - Uses
    - Conclusion

12. **Adsorption techniques (3hours)**
    - Introduction

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- Basic principles
- Extracorporeal techniques using adsorption
- Extracorporeal filtration in adsorption systems
- Clinical experiences with high filtrate reinfusion (HFR)

**REFERENCES**


1. ECMO Specialist Training Manual Fourth Edition by Thomas V. Brogan, Gail Annich, W. Cory Ellis · 2018
2. ISCCM Manual of RRT and ECMO in ICU: A Reference Book for ..by .Rajesh Chandra Mishra, Kanwalpreet Sodhi, KC Prakash · 2020
3. Extracorporeal Membrane Oxygenation: Advances in Therapy by Michael S. Firstenberg · 2016
4. Shockwave Medicine J. Wang, W. Schaden, J. -Y. Ko · 2018


## (Practical's) (15 hours)

**Learning Objectives**

1. Understand dialysis management in complex and high-risk clinical conditions.
2. Learn special dialysis procedures for critical care, infectious, pediatric, and pregnancy cases.
3. Gain knowledge of application of advanced extracorporeal support systems like ECMO.

**Learning Outcomes**

1. Perform and assist in dialysis for special patient conditions under supervision.
2. Apply appropriate precautions for infectious, pediatric, and critically ill patients.
3. Demonstrate basic understanding of ECMO application in dialysis-related care.

- Conducting dialysis for-
- Patient with congestive heart failure (CHF)
- Advanced liver disease
- Patient positive for HCV, HIV & HBsAg
- Acute rejection and failed transplant
- Poisoning patient
- Pregnancy
- Dialysis in infants and children
- Application of ECMO

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**REFERENCES**


1. ECMO Specialist Training Manual Fourth Edition by Thomas V. Brogan, Gail Annich, W. Cory Ellis · 2018
2. ISCCM Manual of RRT and ECMO in ICU: A Reference Book for ..by .Rajesh Chandra Mishra, Kanwalpreet Sodhi, KC Prakash · 2020
3. Extracorporeal Membrane Oxygenation: Advances in Therapy by Michael S. Firstenberg · 2016
4. Shockwave Medicine J. Wang, W. Schaden, J. -Y. Ko · 2018

# Clinical Postings IV (120 hours)

**L/T/P/C**
**-/-/8/8**

**Learning Objectives**
1. Develop advanced clinical skills in dialysis and critical care settings under supervision.
2. Understand patient management in dialysis unit, ICU, and transplant work-up.
3. Gain exposure to surgical and procedural environments related to renal therapy.

**Learning Outcomes**
1. Perform and assist in intermediate dialysis procedures in clinical settings.
2. Demonstrate understanding of ICU-based dialysis care and transplant preparation.
3. Observe and describe surgical procedures like AVF/AVG creation and renal transplantation.

- Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a senior dialysis therapist. Students are tested on intermediate clinical dialysis therapy skills.

Areas to be covered:
- Dialysis unit
- ICU
- Renal transplants work up.
- Operation Theater for Observing AVF/AVG Creation, PD catheter Insertion & Renal Transplantation.

# INTERPERSONAL COMMUNICATION

**L/T/P/C**
**1/-/-/1**

**Learning Objectives**
1. Understand the basic concepts and theories of interpersonal communication.
2. Learn verbal, non-verbal, and listening skills for effective communication.
3. Gain knowledge of communication in relationships, workplace, and digital platforms with ethical awareness.

**Learning Outcomes**
1. Explain principles and models of interpersonal communication.
2. Demonstrate effective verbal, non-verbal, and listening skills.
3. Apply communication skills in personal, professional, and digital contexts ethically.

## UNIT-I (2 hours)

- Introduction to Interpersonal Communication
- Overview of interpersonal communication theory.
- Key principles: sender, message, receiver, feedback, noise. Importance of communication in daily life.

**UNIT-II (2 hours)**

- Verbal Communication
- The role of language in communication.
- Choosing words carefully: Clarity, precision, and ambiguity. Influence of culture and context on verbal communication.

**UNIT-III (2 hours)**

- Non-Verbal Communication
- Body language, facial expressions, and gestures. Space, posture, and touch in communication.
- The role of non-verbal cues in conveying emotions

**UNIT-IV (1 hour)**

- Listening Skills
- Types of listening: Active, passive, reflective. Barriers to effective listening.
- Developing empathy through listening.

**UNIT-V (1 hour)**

- Self-Disclosure and Relationship Development The importance of self-disclosure in relationships. The Johari Window model.
- How self-disclosure affects trust and intimacy.

**UNIT-VI (1 hour)**

- Conflict in Interpersonal Communication Types of conflict: Productive vs. destructive. Conflict management styles.
- Strategies for resolving conflict in healthy ways.

**UNIT-VII (1 hour)**

- Cultural and Gender Differences in Communication
- Cultural influences on communication styles. Gender communication differences.
- Strategies for effective cross-cultural communication.

**UNIT-VIII (2 hours)**

- Communication in Close Relationships
- Communication patterns in romantic relationships, family, and friendships.
- Managing expectations and maintaining healthy communication in intimate relationships.

**UNIT-IX (1 hour)**

- Communication in the Workplace
- Interpersonal communication in professional settings.
- Navigating professional relationships and maintaining boundaries. Communication and leadership.

**UNIT-X (2 hours)**

- Digital Communication
- The role of technology in interpersonal communication. The impact of social media on relationships.
- Pros and cons of digital communication tools.
- The Ethics of Communication
- Ethical dilemmas in communication.
- Honesty, transparency, and privacy in conversations. Balancing openness with respect for others' boundaries.

**Reference Textbook:**

*"Interpersonal Communication: Everyday Encounters"* (Author: Julia T. Wood, 9th

## SEMESTER - VI

| S.NO | SUBJECT CODE | SUBJECT | L | T | P | C | Max. Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INT | EXT | TOTAL |
| 1 | | Recent Advancements in Renal replacement therapies & (practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 2 | | Principals of Management | 2 | - | - | 2 | 30 | 70 | 100 |
| 3 | | Introduction to Quality Assurance in dialysis and Patient safety | 1 | - | 1 | 2 | 30 | 70 | 100 |
| 4 | | Basic and Advanced Cardiac Life Support & (practicals) | 2 | - | 1 | 3 | 30 | 70 | 100 |
| 5 | | Research Methodology and Biostatistics | 3 | - | - | 3 | 30 | 70 | 100 |
| 6 | | Clinical Postings V (CT) | - | - | 8 | 8 | 100 | - | 100 |
| 7 | | Art of Being a Better Person | 1 | - | - | 1 | 100 | - | 100 |
| TOTAL | | | 11 | - | 11 | 22 | 350 | 350 | 700 |

## Recent Advancements in Renal replacement therapies & (practical's)

**L/T/P/C**
**2/-/1/3**

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**Learning Objectives**

1. Understand recent advances and innovations in renal replacement therapies and dialysis technology.
2. Learn the role of information technology, AI, and home-based dialysis in modern practice.
3. Gain knowledge of emerging pediatric dialysis techniques and experimental renal technologies.

**Learning Outcomes**

1. Explain newer dialysis technologies including wearable and bioartificial kidneys.
2. Describe applications of IT, telemedicine, and home dialysis systems.
3. Discuss recent advancements such as AI, nanotechnology, and pediatric innovations in dialysis care.

**1. Current research and recent advances in dialysis technology (4 hours)**

- Newer dialysis technologies
- Wearable artificial kidney
- Bio artificial kidney
- New sorbent technologies

2. **Information technology and dialysis (4 hours)**
   - TDMS
   - Patient Online
   - Web based education.
   - Short message service (SMS) texting
   - Mobile apps
   - Telemedicine in dialysis practice
   - Other IT delivery methods

3. **Home Hemodialysis (4 hours)**
   - Indications and contraindications of home hemodialysis
   - Technical aspect of dialysis- legal, water preparation (plumbing), electrical considerations including backup power supply, dialysis machine choice and other equipment, space considerations and siting of dialysis machine, hygiene and noise, safety, medical staff and technical support, disposal of waste, storage of medication
   - Psychological aspect of home hemodialysis.
   - Advantages and disadvantages of conventional home dialysis
   - Impact on daily hemodialysis

4. **Nocturnal hemodialysis (4 hours)**

   - Brief note on nocturnal hemodialysis
   - Advantages of longer, slower dialysis
   - Nocturnal dialysis in a dialysis center

5. **Artificial Intelligence in renal replacement therapies (4 hours)**

6. **Application of nanotechnology, microfluidics, bioreactors with kidney cells, and miniaturized sorbent systems (4 hours)**

7. **New Techniques of Pediatric Dialysis (3 hours)**
   - NIDUS
   - Carpediem

8. **Other Recent Advances in Dialysis Therapy (3 hours)**

## REFERENCES

1. Continuous Renal Replacement Therapy by John Kellum, Rinaldo Bellomo, Claudio Ronco · 2009
2. 40 Years of Continuous Renal Replacement Therapy by R. Bellomo, J. A. Kellum, G. La Manna · 2018
3. Dialysis Therapy by Allen R. Nissenson, Richard N. Fine · 1993

## (Practical's) (15 hours)

**Learning Objectives**

1. Understand recent innovations and practical applications in dialysis and renal replacement therapy.
2. Learn the use of information technology, AI, and home-based dialysis systems in clinical practice.
3. Gain knowledge of advanced pediatric dialysis techniques and emerging biomedical technologies.

**Learning Outcomes**

1. Identify and explain new dialysis technologies including wearable and artificial kidneys.
2. Demonstrate understanding of IT tools, home hemodialysis, and nocturnal dialysis systems.
3. Apply knowledge of recent advances such as AI, nanotechnology, and pediatric innovations in dialysis practice.

1. **Current research and recent advances in dialysis technology (2hours)**
   - Newer dialysis technologies
   - Wearable artificial kidney
   - Bio artificial kidney
   - New sorbent technologies

2. **Information technology and dialysis (2 hours)**
   - TDMS
   - Patient Online
   - Web based education.
   - Short message service (SMS) texting
   - Mobile apps
   - Telemedicine in dialysis practice
   - Other IT delivery methods

3. **Home Hemodialysis (2 hours)**
   - Indications and contraindications of home hemodialysis
   - Technical aspect of dialysis- legal, water preparation (plumbing), electrical considerations including backup power supply, dialysis machine choice and other equipment, space considerations and siting of dialysis machine, hygiene and noise, safety, medical staff and technical support, disposal of waste, storage of medication
   - Psychological aspect of home hemodialysis.
   - Advantages and disadvantages of conventional home dialysis
   - Impact on daily hemodialysis

4. **Nocturnal hemodialysis (2 hours)**
   - Brief note on nocturnal hemodialysis
   - Advantages of longer, slower dialysis
   - Nocturnal dialysis in a dialysis center

5. **Artificial Intelligence in renal replacement therapies (2 hours)**
6. **Application of nanotechnology, microfluidics, bioreactors (2 hours)**
7. **with kidney cells, and miniaturized sorbent systems (1 hours)**

8. **New Techniques of Pediatric Dialysis (1 hours)**
   - NIDUS
   - Carpediem
9. **Other Recent Advances in Dialysis Therapy(1 hours)**

## REFERENCES


1. Continuous Renal Replacement Therapy by John Kellum, Rinaldo Bellomo, Claudio Ronco · 2009
2. 40 Years of Continuous Renal Replacement Therapy by R. Bellomo, J. A. Kellum, G. La Manna · 2018
3. Dialysis Therapy by Allen R. Nissenson, Richard N. Fine · 1993


# Principals of management

**L/T/P/C**
**2/-/-/2**

**Learning Objectives**

1. Understand basic principles and functions of management in healthcare settings.
2. Learn organization and administration of hospital clinical, support, and diagnostic services.
3. Gain knowledge of safety, risk management, and hospital support systems.

**Learning Outcomes**

1. Explain principles of management such as planning, organizing, staffing, directing, and controlling.
2. Describe functioning of various hospital services including clinical, diagnostic, and support services.
3. Apply knowledge of safety, waste management, and risk control in hospital settings.

1. **Introduction to Management (5 hours)**
   - Introduction
   - Definition
   - Steps
   - Planning
   - Organizing
   - Staffing
   - Directing
   - Controlling

2. **Introduction to Clinical service Types of Hospitals (4 hours)**
   - Organization and administration of various clinical services: Outpatient services- In- patient services, Emergency services, Operation theatres, Nursing services and ICU,,s.

3. **Hospital Support services (4 hours)**
   - Organization and Administration of various Support services
     1. CSSD
     2. Diet

4. **Medical records (4 hours)**

5. **Hospital Ancillary Services (4 hours)**
   - Organization and Administration of various Ancillary services:
     1. Housekeeping – Linen and Laundry-
     2. Engineering services – Transportation

6. **Hospital Diagnostic and Therapeutic services (4 hours)**
   - Organization and Administration of various Diagnostic and Therapeutic services:
     1. Radiology
     2. Laboratory
     3. Pharmacy
     4. Blood bank

7. **Safety and Risk management (5 hours)**
   - Hospital waste management
   - Nosocomial infection
   - Disaster management
   - Hospital security service
   - Occupational safety in hospitals

**REFERENCES**


1. Principles of Management by David S. Bright, Anastasia H. Cortes, Eva Hartmann · 2023
2. Management--process, Structure, and Behavior by Daniel A. Wren, Dan Voich · 1984 · No preview
3. Principles of Management: Text and Cases by Pravin Durai · 2015


## Introduction to quality assurance in dialysis and patient safety (Theory and practical) (30 hours)

**L/T/P/C**
**1/-/1/2**

**Learning Objectives**

1. Understand principles of quality assurance and patient safety in dialysis and related therapies.
2. Learn standards, monitoring systems, and infection control practices in dialysis units.
3. Gain knowledge of safety protocols, vascular access surveillance, and disaster management in healthcare settings.

**Learning Outcomes**

1. Explain quality assurance concepts including dialysis adequacy, infection control, and quality indicators.
2. Describe vascular access monitoring and safety standards in HD, PD, and transplantation.
3. Apply safety and risk management practices in dialysis unit operations and emergencies.

1. **Quality assurance in Hemodialysis (6 hours)**
   - Dialysis Adequacy

- Infection control in dialysis units
- Universal Precaution
- RO water quality monitoring
- Hemodialysis unit management
- Quality indicators in Hemodialysis
- Hazardous materials use and safety in Hemodialysis
- Disaster management in Hemodialysis unit
- NABH Standards
- JCI standards

2. **Hemodialysis Vascular Access Surveillance (6 hours)**

- Clinical monitoring of vascular access
- Recirculation
- Flow based techniques
- Rule of Six in AV fistula
- Pressure based techniques
- Other surveillance techniques

3. **Quality Assurance in Peritoneal Dialysis (6 hours)**

- Peritoneal dialysis quality management
- Kinetic Modeling in peritoneal dialysis
- Peritoneal Dialysis patient and catheter survival
- Quality improvement in peritoneal dialysis
- Quality indicators in peritoneal dialysis

4. **Quality Assurance in Renal transplantation coordination (6 hours)**

- Quality indicators in renal transplantation
- Graft and Patient survival in renal transplantation
- Assessment techniques for renal donors and recipients

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5. **Safety in dialysis (6 hours)**

- IPSG
- Advanced disaster preparedness
- Preparations to perform an emergency dialysis
- Fire safety
- Safety access of needle
- Violence at dialysis unit
- Employee safety
- Electrical safety in dialysis unit
- Emergency evacuation.

- Infection control

**REFERENCES**

1. Quality Assurance in Dialysis L.W. Henderson, R.S. Thuma · 1999
2. Patient safety and quality issues in end stage renal disease- United States. Congress. House. Committee on Ways and Means · 2007

## Basic and advanced cardiac life support (Theory) (30 hours)

**L/T/P/C**
**2/-/1/3**

**Learning Objectives**

1. Understand principles of basic and advanced cardiac life support (BLS & ACLS).
2. Learn emergency cardiac algorithms and management of life-threatening conditions.
3. Gain knowledge of airway management, defibrillation, and emergency drugs used in ACLS.

**Learning Outcomes**

1. Explain BLS and ACLS algorithms for cardiac arrest and emergencies.
2. Demonstrate understanding of emergency management of arrhythmias, shock, and MI.
3. Apply basic life support skills and understand the role of dialysis technologist in emergencies.

1. BLS & ACLS
2. The universal algorithm for adult ECC
3. Ventricular fibrillation/Pulseless ventricular tachycardia algorithm
4. Pulseless electrical activity (PEA) / asystole algorithm
5. Bradycardia treatment algorithm
6. Tachycardia Treatment algorithm
7. Hypotension / Shock
8. Acute myocardial infarction
9. Paediatric Advanced life support
10. Airway management
11. Defibrillation
12. Drugs used in ACLS
13. Emergency Cardiac pacing
14. AED
15. Techniques for oxygenation and ventilation
16. Role of dialysis technologist & dialysis therapist.

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**REFERENCES**

1. Advanced Cardiovascular Life Support (ACLS) Instructor Manual AHA, American Heart Association Staff
2. 2015 Handbook of Emergency Cardiovascular Care for by American Heart Association Staff · 2015 ·
3. ACLS (Advanced Cardiac Life Support) Review: Pearls of by Michael Zevitz, Scott Plantz, William Gossman · 2007
4. Strategies to Improve Cardiac Arrest Survival: A Time to Act: Institute of Medicine, Board on Health Sciences Policy, Committee on the Treatment of Cardiac Arrest: Current Status and Future Directions · 2015

## (practical's) (15 hours)

**Learning Objectives**

1. Understand basic and advanced life support procedures in emergency situations.
2. Learn the correct use of defibrillator and AED in cardiac emergencies.
3. Gain knowledge of managing shock and hypotension in clinical practice.

**Learning Outcomes**

1. Perform basic steps of BLS and ACLS under supervision.
2. Demonstrate correct use of AED and defibrillator.
3. Apply appropriate initial management for shock and hypotension.

- ACLS and BLS
- Use of defibrillator and AED
- Management of Shock and Hypotension

**REFERENCES**


1. Advanced Cardiovascular Life Support (ACLS) Instructor Manual AHA, American Heart Association Staff
2. 2015 Handbook of Emergency Cardiovascular Care for by American Heart Association Staff · 2015 ·
3. ACLS (Advanced Cardiac Life Support) Review: Pearls of by Michael Zevitz, Scott Plantz, William Gossman · 2007
4. Strategies to Improve Cardiac Arrest Survival: A Time to Act: Institute of Medicine, Board on Health Sciences Policy, Committee on the Treatment of Cardiac Arrest: Current Status and Future Directions · 2015


## Research methodology and biostatistics

**L/T/P/C**
**3/-/-/3**

**Learning Objectives**

1. Understand basic concepts and steps involved in research methodology and study design.
2. Learn principles of qualitative, quantitative, and mixed-method research along with data collection techniques.
3. Gain knowledge of biostatistics including probability, descriptive and inferential statistics used in health sciences.

**Learning Outcomes**

1. Explain the research process, including problem identification, literature review, and proposal writing.
2. Differentiate between research methods and apply appropriate sampling and data collection techniques.
3. Analyze and interpret basic statistical data using descriptive and inferential methods.

**1.Introduction to the Process of Conducting Research (7 hours)**

- Introduction, Steps in the Process of Research, identifying a hypothesis and/or research problem, specifying a purpose, Research Designs, creating research questions, Review of literature, Ethics of research and informed consent, Research proposal writing & components of Research paper.

**2.Introduction to Qualitative, Quantitative and Mixed methods Research (8 hours)**

- Essence of Qualitative Data, Sampling, Collection Techniques, Biography, Essence of Quantitative Data, Collection and Analysis Techniques, Choosing a good instrument, Interval and Ratio Scales, Validity and Reliability, Essence of Mixed Methods, Advantages, Design Components, Explanatory Mixed Methods Frameworks.

**3.Epidemiological Methods (8 hours)**

- Measuring disease frequency, Descriptive and analytical studies-observational and experimental studies and Biases in Epidemiological Studies

**4.Introduction to Probability, distributions and sampling (8 hours)**

- Probability, addition and multiplicative theorems, problems, Probability Distribution- Binomial, Poisson, Normal, Applications to health sciences, Sampling methods, uses of sampling, Sample size

**5.Introduction to Descriptive Statistics (7 hours)**

- Introduction, Summarizing and describing a collection of data, Univariate and bivariate analysis, Mean, mode and standard deviation, Percentages and Ratios, Histograms, identifying randomness and uncertainty in data, summarizing biological data, Identifying the dependent and independent variables, Confidence levels

**6.Introduction to Inferential Statistics (7 hours)**

- Drawing inference from data, Estimation, testing of hypothesis, Type I & type II errors, power and p-value, modelling assumptions, Identifying Patterns, Regression analysis, t- test, Analysis of Variance, Correlations, Chi-square, Non-parametric tests

**REFERENCES**

1. Essentials Of Biostatistics & Research Methodology by Indranil Saha, Bobby Paul · 2020
2. Biostatistics & Research Methodology by G Nageswara Rao · 2018 ·
3. Introduction To Biostatistics and Research Methods by P. S. S. Sundar Rao, J. Richard · 2012

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## Clinical Postings V (120 hours)

**L/T/P/C**

**-/-/8/8**

**Learning Objectives**

1. Strengthen advanced clinical skills in dialysis, ICU care, and emergency life support.
2. Gain exposure to surgical and transplant procedures under supervision.
3. Understand and apply BLS and ACLS principles in clinical practice.

**Learning Outcomes**

1. Perform and assist in advanced dialysis procedures in clinical settings.
2. Observe and understand surgical procedures like AVF/AVG creation and renal transplantation.
3. Demonstrate basic knowledge of BLS and ACLS in emergency situations.

**Students will continue with their previous clinical procedures and other special procedures with the assistance of a senior dialysis technologist. They are also allowed to view the renal transplant procedure along with internee.**

**Areas to be covered:**

- Dialysis unit
- ICU
- Operation Theater for Observing AVF/AVG Creation, PD catheter Insertion & Renal Transplantation.
- BLS and ACLS

## ART OF BEING A BETTER PERSON

**L/T/P/C**
**1/-/-/1**

**Learning Objectives**

1. Understand ethical living, empathy, and personal values in daily life.
2. Learn skills for emotional intelligence, kindness, and positive relationships.
3. Develop awareness of social responsibility and personal growth practices.

**Learning Outcomes**

1. Explain key concepts such as empathy, integrity, and emotional intelligence.
2. Demonstrate improved self-awareness and positive interpersonal behavior.
3. Apply ethical and compassionate practices in personal and social life.

**UNIT-I (2 hour)**

- Introduction to Being a Good Human
- Defining "goodness" and ethical living
- Overview of moral philosophies: Utilitarianism, Deontology, Virtue Ethics The role of self-awareness in personal growth

  Activity: Reflective journaling on what "being good" means to you.

**UNIT-II (2 hour)**

- The Power of Empathy
- Understanding empathy vs. sympathy
- The science behind empathy and its benefits for social connections Techniques for cultivating empathy in everyday life

  Activity: Empathy-building exercises and discussions.

**UNIT-III (2 hour)**

- Emotional Intelligence (EQ)
- What is Emotional Intelligence? (Self-awareness, self-regulation, motivation, empathy, and social skills) The role of EQ in personal and professional relationships

- Strategies to improve emotional intelligence
  Activity: Self-assessment of emotional intelligence and EQ development exercises.

**UNIT-IV (1 hour)**

- Compassion and Kindness
- The science of kindness: How kindness benefits us and others
- Practicing kindness in small, everyday actions
- Overcoming barriers to kindness (e.g., stress, biases, indifference)
  Activity: "Random Acts of Kindness" challenge.

**UNIT-V (1 hour)**

- Personal Integrity and Honesty
- The importance of integrity in personal and professional life Consequences of dishonesty and lack of integrity
- How to align actions with values
  Activity: Case study discussion on ethical dilemmas and decision-making.

**UNIT-VI (1 hour)**

- Building Positive Relationships
- Communication skills for healthy relationships Setting boundaries and respecting others' boundaries Conflict resolution and forgiveness
  Activity: Role-playing scenarios to practice healthy communication.

**UNIT-VII (1 hour)**

- Responsibility and Accountability
- The concept of personal responsibility in life Accountability in both personal and community contexts How to take ownership of mistakes and learn from them Activity: Reflect on past mistakes and plan for growth.

**UNIT-VIII (1 hour)**

- Contributing to the Community and Society
- The role of individuals in building strong communities Volunteering, activism, and social responsibility
- The impact of small, positive actions on a larger scale
  Activity: Brainstorming session on potential ways to contribute to the local community.

**UNIT-IX (1 hour)**

- Practicing Gratitude and Contentment
- The psychological and emotional benefits of gratitude Practicing contentment in a consumer-driven world Techniques for cultivating a mindset of abundance Activity: Gratitude journal and daily reflection.

**UNIT-X (1 hour)**

- Living with Purpose and Meaning
- Discovering personal values and purpose
- The intersection of passion, skills, and service Creating a life plan that aligns with core values Activity: Create a personal mission statement.

**UNIT-XI (1 hour)**

- Overcoming Negative Traits: Greed, Anger, and Envy The psychology behind negative emotions and traits How greed, anger, and envy affect our well-being
- Strategies for managing and transforming negative emotions

Activity: Mindfulness meditation and reflection exercises.

**UNIT-XII (1 hour)**

- Bringing It All Together: A Life of Goodness Review of key learnings from the course Creating a vision for continuous personal growth
- How to maintain a positive and ethical life in a challenging world

**Reference Textbook**

How to Win Friends and Influence People" by Dale Carnegie
The Seven Habits of Highly Effective People" by Stephen R. Covey

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## SEMESTER – VII

| Course Code | Course Title | Credits/Week | | | Hours/Semester | | | Assesments | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | P | C | L | T/P | Total | INT | EXT | |
| | Internship | 2 | 20 | 22 | 30 | 900 | 930 | - | 100 | 100 |
| | Project work | | 06 | 06 | | 270 | 270 | | 100 | 100 |
| **Total** | | **2** | **26** | **28** | **30** | **1170** | **1200** | **-** | **200** | **200** |

## Internship

**L/T/P/C**
**2/-/20/22**

The internship will span 1 year/ 2 semesters. This will include 8 hours of practice a day, totaling to 2160 hours for two semesters.
As a part of this, the students will choose a relevant subject and prepare an in-depth project report of not less than 1000 words which will be handed over to the supervisor or trainer. The report can include objective, scope of the project and an in-depth report.

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in simulation and treatment delivery. Students will demonstrate competence in beginning and intermediate procedures. Students will observe the advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 8 hours per day and this may be more depending on the need and the healthcare setting.

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## Project :

**L/T/P/C**
**-/-/6/6**

Each candidate will have to carry out a dissertation/ Project on the related subject. The dissertation will be guided by one or two members of the faculty of the department.

## SEMESTER – VIII

| Course Code | Course Title | Credits/Week | | | Hours/Semester | | | Assesments | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | P | C | L | T/P | Total | INT | EXT | |
| | Internship | 2 | 20 | 22 | 30 | 900 | 930 | - | 100 | 100 |
| | Project work | | 06 | 06 | | 270 | 270 | | 100 | 100 |
| **Total** | | **2** | **26** | **28** | **30** | **1170** | **1200** | **-** | **200** | **200** |

## Internship

**L/T/P/C**
**2/-/20/22**

The internship will span 1 year/ 2 semesters. This will include 8 hours of practice a day, totaling to 2160 hours for two semesters.
As a part of this, the students will choose a relevant subject and prepare an in-depth project report of not less than 1000 words which will be handed over to the supervisor or trainer. The report can include objective, scope of the project and an in-depth report.

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in simulation and treatment delivery. Students will demonstrate competence in beginning and intermediate procedures. Students will observe the advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 8 hours per day and this may be more depending on the need and the healthcare setting.

## Project :

**L/T/P/C**
**-/-/6/6**

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Each candidate will have to carry out a dissertation/ Project on the related subject. The dissertation will be guided by one or two members of the faculty of the department.

# List of Recommended Books for UG from National Commission of Allied and Healthcare Professions

1. Human anatomy by B.D.Chaurasia's
2. Gray's Anatomy
3. Manual of practical physiology – A.K.Jain
4. Medical Physiology- Guyton
5. Text Book of Pathology - Harsh Mohan
6. Basic Pathology – pocket Robbins
7. Harper's Biochemistry – 26th edition
8. Text Book of Biochemistry – DM Vasudevan
9. Psychology – The Sciences of Behaviour - Fifth edition 1982 - Neil Carlson -William Bulkist - Allyn and Bacon.
10. Psychology made simple - Abraham Sperling, Ph D - Advisory editor - M.S Gill. MA., Ph D - 'Made simple books' - W.H.Allen, London.
11. Developmental Psychology - David R Schaffer - 2nd edition 1989 - Books/Cole publishing companyPacific Gnaue, California
12. Psychology - Lefton. L - III edition 1985 - Allyn and Bacan
13. Medical Terminology: A Short Course,7th Edition, Author: Davi-Ellen Chabner, Saunders Publishers
14. Medical Terminology & Anatomy for Coding , 3rd Edition (2017), Author : Betsy J Shiland, Mosby Publisher
15. Introduction to computers & Data processing – Shelly, Gray. B
16. Information Technology – Dennis P Curtin
17. An Introduction to Computer Applications in Medicine – N. F. Kember
18. Medical Records Organization & Management – G.D Mogli
19. Computer Aided Tomography & Ultrasonics in Medicine – J. Raviv, J.F. Greeniat
20. Introduction to Biostatistics and Research Methods by Sunder Rao PSS Y Richard J . PHI publishers 2012.
21. Biostatistics: A Foundation for Analysis of Health Sciences by Danial WW. John Wiley Publishers
22. Research Methods: Methods and Techniques by Kothari CR. New Age International Publishers- 2004
23. Research Methodology: A step-by-Step Guide to Beginners by Ranjit Kumar. SAGE Publishers-2014.
24. Mosby's paramedic text book,
25. Barbara paramedic practice today
26. Medical Pharmacology – PadmajaUdaykumar
27. ECG made easy – John R. Hampton
28. Medical pharmacology – Padmaja Udaykumar
29. Handbook of Dialysis – Daugirdas
30. Essentials of Medical Pharmacology- K.D.Tripati, 8th edition
31. Textbook of Pathology- P.HarshMohan , 8th edition (2018)
32. Basic pathology -Robbin , 10th edition, Elseivier
33. Principle and Practices of Medicine -Davidson , 23rd edition (2018)
34. Kidney Diseases in Primary care-Anil K. Mandal, N.StanleyNahman, (1998)
35. Pocket companion to Robbins andCotran Pathologic Basics of Diseases, 8th edition (2011)
36. Primer on Kidney Diseases-Arthur GreenBerg , 5th edition(2010), ElsevierOxford Textbook of Clinical Nephrology -Neiljuna,Norbert Lameire, David J. Goldsmith,

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Christopher G.Winarls, Jonathan Himmil farb, Giuseppe Remuzzi ,4th edition (2015)
37. Handbook of Dialysis Therapy- Allen .R. Nisseson,RichardN.Fine ,5th edition
38. Principles and Practice of Dialysis -Henrich, 5th edition(2016), Wolterskluwer
39. Oxford Handbook of Dialysis - Jeremy Levy, Edwina Brown, Anastasia Lawrence, 4th edition (2016)
40. Handbook of Kidney Transplantation- Gabriel M. Danovitch, Wolters Kluwer
41. Textbook of Peritoneal Dialysis-Nolph and Gokal, 3rd edition(2009), Springer
42. .Handbook of Kidney Transplantation- Gabrieb M. Danovilch, 6th edition ( 2017),Wolters

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