SUNRISE UNIVERSITY ALWAR
COURSE CURRICULUMFOR
BACHELOR OF SCIENCE
DIALYSIS TECHNOLOGY

B. Sc Semester I, II (2025-26)

B. Sc Semester III, IV (2026-27)

B. Sc Semester V and VI (2027-28)

FIRST SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	CREDITS
BSDT101	ENGLISH	40	60	100	2
BSDT102	ENVIRONMENTAL SCIENCE	40	60	100	2
BSDT103	ANATOMY	40	60	100	4
BSDT104	PHYSIOLOGY	40	60	100	4
BSDT105	BASIC BIOCHEMISTRY	40	60	100	4
PRACTICAL					
BSDT106	PATHOLOGY LAB	60	40	100	2
BSDT107	MICROBIOLOGY LAB	60	40	100	2
BSDT108	PHARMACOLOGY LAB	60	40	100	2
Total		**380**	**420**	**800**	**22**

SECOND SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	CREDITS
BSDT201	PATHOLOGY-	40	60	100	4
BSDT202	MICROBIOLOGY	40	60	100	4
BSDT203	PHARMACOLOGY	40	60	100	4
BSDT204	HEALTH CARE	40	60	100	2
BSDT205	PSYCHOLOGY	40	60	100	2
PRACTICAL					
BSDT206	PATHOLOGY LAB	60	40	100	2
BSDT207	MICROBIOLOGY LAB	60	40	100	2
BSDT208	PHARMACOLOGY LAB	60	40	100	2
Total		**380**	**420**	**800**	**22**

THIRD SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	CREDITS
BSDT301	APPLIED PATHOLOGY RELATED TO RDT	40	60	100	4
BSDT302	APPLIED MICROBIOLOGY RELATED TO RDT	40	60	100	4
BSDT303	INTRODUCTION TO RDT	40	60	100	4
BSDT304	COMPUTER APPLICATION	40	60	100	2
BSDT305	ENVIRONMENT SCIENCE AND HEALTH	40	60	100	2
PRACTICAL					
BSDT306	APPLIED PATHOLOGY RELATED TO RDT LAB	60	40	100	2
BSDT307	APPLIED MICROBIOLOGY RELATED TORDT LAB	60	40	100	2
BSDT308	COMPUTER APPLICATION LAB	60	40	100	2
Total		**380**	**420**	**800**	**22**

FOURTH SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	CREDITS
BSDT401	PATIENT CARE AND BASIC NURSING	40	60	100	4
BSDT402	BASIC CONCEPTS OF RENAL DISEASE	40	60	100	4
BSDT403	HEMOEDIALYSIS PART 1	40	60	100	4
BSDT404	BIOSTATISTICS AND RESEARCH METHODOLOGY	40	60	100	2
BSDT405	CONSTITUTION OF INDIA	40	60	100	2
PRACTICL					
BSDT406	PATIENT CARE AND BASIC NURSING LAB	60	40	100	2
BSDT407	BASIC CONCEPTS OF RENAL DISEASE LAB	60	40	100	2
BSDT408	HEMO DIALYSIS PART 1 LAB	60	40	100	2
Total		**380**	**420**	**800**	**22**

FIFTH SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	CREDITS
BSDT501	ACUTE & CHRONIC KIDNEY DISEASES& NUTRITION	40	60	100	4
BSDT502	HEMODIALYSIS PART 2	40	60	100	4
BSDT503	PERITONEAL DIALYSIS	40	60	100	4
BSDT504	IMUNO TECHNIQUES IN DIAGNOSIS OF DISEASES	40	60	100	2
BSDT505	MEDICAL ETHICS	40	60	100	2
PRACTICAL					
BSDT506	ACUTE & CHRONIC KIDNEY DISEASES& NUTRITION	60	40	100	2
BSDT507	HEMODIALYSIS PART 2	60	40	100	2
BSDT508	PERITONEAL DIALYSIS	60	40	100	2
Total		**380**	**420**	**800**	**22**

SIXTH SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	CREDITS
BSDT601	HEMO DIALYSIS PART 3	40	60	100	4
BSDT602	DIALYSIS IN SPECIAL SITUATIONS	40	60	100	2
BSDT603	RECENT ADVANCES IN DIALYSIS TECHNOLOGY	40	60	100	2
BSDT604	MOLECULAR TECHNIQUES	40	60	100	2
BSDT605	HOSPITAL MANAGEMENT	40	60	100	2
PRACTICAL					
BSDT606	HEMO DIALYSIS PART 3	60	40	100	2
BSDT607	DIALYSIS IN SPECIAL SITUATIONS	60	40	100	2
BSDT608	RESEARCH PROJECT			100	6
Total		**320**	**380**	**800**	**22**

Table VII: Elective Subjects

Elective Subjects
Fifth Semester
Immune techniques in diagnosis of diseases
Dental Radiography
Pulmonary Function Testing
Telemedicine
Hands on training in Continuous ambulatory peritoneal dialysis
Echocardiography (Cardiology)
Echocardiography (CTVS)
Difficult airway intubation
Sixth Semester
Molecular Techniques
Digital Subtraction Angiography
Poly tomography
Practice Management
Renal Transplant
Coronary angiography
Intra Aortic Balloon pump
Ventilator management

I Semester
Core-1 Anatomy

Objectives:

At the end of this course, students should be able to:

1. **Describe the structure, composition, and functions** of the organ systems of the human body.
2. **Understand how the organ systems function and interrelate** with each other.
3. **Learn basic technical terminology** and language associated with human anatomy.
4. **Use anatomical investigation processes** to explore and study anatomical structures.
5. **Use microscopes** to learn and observe anatomical or histological structures.
6. **Study, interpret, and care for anatomical specimens** to enhance understanding.

Learning Objectives: Skills

- **Investigative Skills**: Use scientific investigation processes to explore anatomical structures and understand their functionality.
- **Microscopic Analysis**: Learn how to use a microscope effectively for examining anatomical or histological specimens.
- **Specimen Care**: Understand the processes for proper handling and care of anatomical specimens, ensuring preservation and detailed study.

Contents Theory:

Unit I: Organization of the Human Body (12 hours)

Introduction to the Human Body

- Definition of human body and its subdivisions.
- Overview of **anatomical position**: the standard reference position used in anatomical descriptions (standing upright, facing forward, arms at the sides, palms forward).
- Importance of **anatomical terminology**: directional terms like anterior, posterior, superior, inferior, etc., used for precise descriptions.

Cell - Structure and Function

- **Definition of a cell**: Basic structural and functional unit of living organisms.
- **Shapes and Sizes of Cells**: Cells vary in shape and size depending on their function (e.g., muscle cells are elongated, nerve cells are long and branched).
- **Parts of a Cell**:
    - **Cell Membrane**: Semi-permeable boundary that regulates the movement of substances in and out of the cell.
    - **Cytoplasm**: Jelly-like substance where the cell's internal structures are suspended.
    - **Sub-cellular Organelles**: Include the **nucleus** (contains genetic material), **mitochondria** (energy production), **ribosomes** (protein synthesis), **endoplasmic reticulum** (synthesis of proteins and lipids), **Golgi apparatus** (modifies and packages proteins), and **lysosomes** (breaks down waste).

Cell Division

- **Mitosis**: Process of cell division resulting in two identical daughter cells (used for growth and tissue repair).
    - **Stages of Mitosis**: Prophase, metaphase, anaphase, telophase.
- **Meiosis**: Cell division that results in four non-identical daughter cells (used for sexual reproduction).
    - **Stages of Meiosis**: Two rounds of division (Meiosis I and Meiosis II) that produce gametes (sperm and egg cells).

Tissues - Types and Functions

- **Definition of Tissue**: A group of similar cells that perform a specific function.
- **Types of Tissues**:
    - **Epithelial Tissue**: Covers the body's surfaces, lines cavities, and forms glands.
        - **Classification of Epithelial Tissue**: Based on cell shape (squamous, cuboidal, columnar) and layers (simple, stratified).
        - **Examples**: Simple squamous epithelium in blood vessels, stratified squamous in skin.
    - **Connective Tissue**: Provides structural and nutrient support, stores energy, and provides immune defense.
        - **Examples**: Bone, cartilage, blood, adipose tissue.
    - **Muscle Tissue**: Specialized for contraction, enabling movement.
        - **Types**: Skeletal (voluntary movement), smooth (involuntary movements of organs), cardiac (heart contractions).
    - **Nervous Tissue**: Conducts electrical impulses to coordinate body functions.
        - **Neurons**: The functional cells of the nervous system.
        - **Glial Cells**: Support neurons.

Unit II: Locomotion and Support (12 hours)

1. Cartilage

- **Types of Cartilage**:
    - **Hyaline Cartilage**: Found in the ribs, nose, and at joints (smooth, reduces friction).
    - **Fibrocartilage**: Found in intervertebral discs and pubic symphysis (strong, absorbs shock).
    - **Elastic Cartilage**: Found in the ear and epiglottis (flexible).

2. Skeletal System

- **Definition of Skeleton**: The internal framework of the body composed of bones and cartilage.
- **Axial Skeleton**: The central part of the skeleton, including the skull, vertebral column, and rib cage.
- **Appendicular Skeleton**: The limbs and girdles (shoulder and pelvic).

Bones Classification:

- **Long Bones**: e.g., femur, humerus.
- **Short Bones**: e.g., carpals, tarsals.
- **Flat Bones**: e.g., skull bones, sternum.
- **Irregular Bones**: e.g., vertebrae, pelvis.

Bone Markings: The characteristic surface features of bones that serve as attachment sites for muscles and ligaments. These include:

- **Projections**: E.g., tuberosities, spines.
- **Depressions**: E.g., fossa, sulcus.

Functions of Bones:

- **Support**: Provides structure and supports body weight.
- **Protection**: Shields vital organs (e.g., brain, heart).
- **Movement**: Bones act as levers for muscles to produce movement.
- **Mineral Storage**: Bones store calcium and phosphorus.
- **Blood Cell Production**: Bone marrow produces blood cells.

Bone Development and Growth:

- **Types of Ossification**:
  - **Intramembranous Ossification**: Direct formation of bone from mesenchyme (e.g., skull).
  - **Endochondral Ossification**: Bone replaces cartilage (e.g., long bones).
- **Growth of Bone**: Growth in length occurs at the epiphyseal plates, and in width at the periosteum.

Bone Structure:

- **Spongy Bone**: Found at the ends of long bones and in flat bones. It contains trabeculae (a network of bony fibers).
- **Compact Bone**: Dense and forms the outer layer of bones, composed of osteons (structural units).

Bones of the Body:

- **Skull**: Protects the brain.
- **Vertebral Column**: Composed of vertebrae, supports the head and body.
- **Rib Cage**: Protects vital organs such as the heart and lungs.
- **Limbs**: Include bones like the femur, tibia, fibula, radius, and ulna.

Recommended Books for Further Study:

1. **Ross and Wilson: Anatomy and Physiology in Health and Illness**
2. **Understanding Human Anatomy and Physiology** by William Davis, McGraw Hill
3. **Essentials of Human Embryology** by Bhatnagar, Orient Blackswan Pvt. Ltd.
4. **Anatomy for B.Sc Nursing** by Renu Chauhan, Archal Publishing Company
5. **Handbook of Anatomy** by BD Chaurasia
6. **Basics in Human Anatomy for B.Sc Paramedical Courses** by Jaypee Publishers

JOINTS

• Definition and types of joints with examples
• Axes and kinds of movements possible
• Name, location, type, bones forming, ligaments, movements possible and the muscles producing such movements of the joints of the body

3. Muscular System

Parts of Skeletal Muscle:

- **Muscle Fiber**: The individual muscle cells, which are long, cylindrical, and multinucleated.
- **Myofibrils**: Subunits inside muscle fibers that contain the actin and myosin filaments responsible for muscle contraction.
- **Sarcomere**: The smallest functional unit of a muscle, responsible for contraction, formed by repeating units of actin and myosin.
- **Endomysium, Perimysium, Epimysium**: Layers of connective tissue surrounding individual muscle fibers (endomysium), bundles of muscle fibers (perimysium), and the entire muscle (epimysium).

Origin and Insertion:

- **Origin**: The fixed attachment point of a muscle to a bone, usually proximal to the center of the body.
- **Insertion**: The movable attachment point of the muscle, typically distal to the body and more mobile during contraction.

Classification of Muscular Tissue:

1. **Skeletal Muscle**: Voluntary muscles that are attached to bones and control movements.
2. **Cardiac Muscle**: Involuntary muscle found only in the heart, responsible for pumping blood.
3. **Smooth Muscle**: Involuntary muscle found in the walls of hollow organs like the stomach, intestines, and blood vessels.

Compartment Muscles of Upper Limb, Lower Limb, and Sternocleidomastoid:

- **Upper Limb**: Includes muscles like the biceps, triceps, deltoid, and forearm muscles.
- **Lower Limb**: Includes muscles such as the quadriceps, hamstrings, gluteus muscles, and calf muscles.
- **Sternocleidomastoid (SCM)**: A muscle in the neck that rotates and flexes the head.

Unit III: Maintenance of the Human Body

1. Cardio-Vascular System

Blood Vessels:

- **Arteries**: Blood vessels that carry oxygenated blood away from the heart (except the pulmonary artery). They have thick, muscular walls to withstand high pressure.
- **Veins**: Blood vessels that return deoxygenated blood to the heart. They have thinner walls and often contain valves to prevent backflow.
- **Capillaries**: Tiny blood vessels that facilitate the exchange of gases, nutrients, and wastes between the blood and tissues.

Heart Structure and Features:

- **Location**: The heart is located in the thoracic cavity, slightly to the left of the sternum.
- **External Features**: The heart has a pointed apex and a broad base.
- **Heart Wall**: The heart wall consists of three layers:
    - **Endocardium** (inner layer),
    - **Myocardium** (muscular middle layer),
    - **Epicardium** (outer layer).

Conducting System of the Heart:

- **SA Node (Sinoatrial Node)**: The natural pacemaker of the heart.
- **AV Node (Atrioventricular Node)**: Located between the atria and ventricles, it regulates electrical signals.
- **Bundle of His and Purkinje fibers**: Conduct electrical impulses to the ventricles.

Major Arteries and Veins:

- **Systemic Arteries**: Include the **aorta**, **coronary arteries**, and arteries that supply various organs.
- **Major Veins**: Include the **superior and inferior vena cava**, which return blood to the heart.

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2. Lymphatic System

- **Lymph**: A clear fluid that carries white blood cells and helps remove waste from tissues.
- **Lymphatic Vessels**: Vessels that transport lymph throughout the body.
- **Lymphoid Organs**:
    - **Lymph Nodes**: Filter lymph to remove pathogens.
    - **Spleen**: Filters blood, removing damaged cells.
    - **Thymus**: Matures T-lymphocytes (a type of white blood cell).
    - **Tonsils**: Protect the body from pathogens entering through the mouth and nose.

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3. Respiratory System

Organs of Respiration:

- **Nose**: Filters, warms, and moistens air entering the respiratory system.
- **Pharynx**: The throat, which connects the nasal and oral cavities to the larynx.
- **Larynx**: The voice box, responsible for sound production.
- **Trachea**: The windpipe, which carries air to the bronchi.
- **Bronchi**: Large airways that divide into smaller bronchioles leading to the lungs.
- **Lungs**: Paired organs where gas exchange occurs (oxygen in, carbon dioxide out).
- **Pleura**: Double-layered membrane surrounding the lungs, which produces a fluid to reduce friction.

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4. Digestive System

Organs of Digestion:

- **Mouth**: Ingests food and begins mechanical and chemical digestion.
- **Pharynx and Esophagus**: Pathways that carry food to the stomach.
- **Stomach**: A muscular organ that secretes acids and enzymes for food breakdown.
- **Small Intestine**: The site of nutrient absorption, consisting of the duodenum, jejunum, and ileum.
- **Large Intestine**: Absorbs water and forms solid waste.

Accessory Digestive Organs:

- **Salivary Glands**: Produce saliva for enzymatic breakdown of food.
- **Pancreas**: Produces digestive enzymes and bicarbonate to neutralize stomach acid.
- **Liver**: Produces bile, which is essential for fat digestion.
- **Gall Bladder**: Stores and concentrates bile from the liver.

Unit IV: Urinary and Reproductive Systems

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1. Urinary System

- **Kidneys**: Located in the retroperitoneal space, responsible for filtering blood, regulating fluid balance, and producing urine.
- **Ureters**: Tubes that transport urine from the kidneys to the urinary bladder.
- **Urinary Bladder**: A hollow organ that stores urine.
- **Urethra**: The tube that expels urine from the body.

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2. Reproductive System

Male Reproductive Organs:

- **Scrotum**: A pouch of skin that houses the testes and helps regulate their temperature.
- **Testes**: Produce sperm and testosterone.
- **Epididymis**: A coiled tube where sperm mature.
- **Vas Deferens**: Transports sperm from the epididymis to the urethra.
- **Seminal Vesicle**: Secretes fluid that nourishes sperm.
- **Prostate Gland**: Secretes fluid that helps form semen.
- **Penis**: The external organ used for sexual intercourse and urination.

Female Reproductive Organs:

- **Uterus**: The organ where a fertilized egg implants and develops into a fetus.
- **Uterine Tubes**: Also called fallopian tubes, where fertilization occurs.
- **Ovaries**: Produce eggs (ova) and hormones such as estrogen and progesterone.
- **Mammary Glands**: Produce milk for breastfeeding.

3. Development

- **Gametogenesis**: The formation of gametes (sperm and eggs) through meiosis.
- **Gestation Period**: The period of fetal development, typically lasting around 40 weeks in humans.
- **Development Stages**:
  - **1st Week**: Fertilization and initial cell divisions.
  - **2nd Week**: Implantation and early development of the placenta.
  - **3rd Week**: Formation of the primary germ layers (ectoderm, mesoderm, and endoderm).

Unit V: Control Systems of the Body

1. Nervous System

Subdivisions of the Nervous System:

- **Central Nervous System (CNS)**: Includes the brain and spinal cord.
- **Peripheral Nervous System (PNS)**: Includes all nerves outside the CNS that connect the body to the brain and spinal cord.

Brain Structure:

- **Medulla Oblongata**: Controls autonomic functions such as breathing and heart rate.
- **Pons**: Relays signals between the medulla and the cerebellum.
- **Midbrain**: Controls visual and auditory reflexes.
- **Cerebellum**: Coordinates voluntary movements and maintains balance.
- **Cerebrum**: The largest part of the brain, responsible for higher functions such as thinking, memory, and emotions.

Spinal Cord:

- **Location and Extent**: The spinal cord extends from the medulla oblongata to the lower back.
- **Spinal Segments**: There are 31 pairs of spinal nerves that branch from the spinal cord, providing sensory and motor functions.

Anatomy Overview:

1. Thalamus and Hypothalamus

- **Thalamus**:
  - **Location**: The thalamus is located deep in the brain, just above the brainstem and below the cerebral cortex. It is situated on either side of the third ventricle.
  - **Features**: The thalamus acts as a relay station for sensory signals (except smell) from the body to the appropriate areas of the cerebral cortex. It is involved in sensory perception and regulation of motor functions.
- **Hypothalamus**:

- **Location**: The hypothalamus lies just below the thalamus and is situated near the base of the brain, just above the pituitary gland.
- **Features**: The hypothalamus regulates autonomic functions, including temperature control, hunger, thirst, fatigue, and circadian rhythms. It also plays a crucial role in hormone release via its connection to the pituitary gland.

2. Basal Ganglia

- **Location**: The basal ganglia are deep brain structures located beneath the cerebral cortex, specifically in the forebrain.
- **Subdivisions**: The basal ganglia include the **caudate nucleus**, **putamen**, **globus pallidus**, **subthalamic nucleus**, and **substantia nigra**.
- **Meaning and Spaces Around Them**: The basal ganglia are involved in movement control, motor learning, and a variety of cognitive and emotional functions. They are located in a space surrounded by the lateral ventricles, internal capsule, and other brain structures.

3. Ventricles of the Brain and Cerebrospinal Fluid (CSF) Circulation

- **Ventricles**:
  - **Lateral Ventricles**: These are the largest ventricles located in each hemisphere of the brain.
  - **Third Ventricle**: A narrow cavity located between the two halves of the thalamus.
  - **Fourth Ventricle**: Located between the brainstem and the cerebellum.
- **CSF Circulation**: CSF is produced in the choroid plexuses of the ventricles and flows through the ventricular system, exiting into the subarachnoid space. It circulates around the brain and spinal cord before being absorbed into the venous system through the arachnoid granulations.

4. Blood Supply of the Brain and Spinal Cord

- **Brain**: The brain receives its blood supply from the **internal carotid arteries** and the **vertebral arteries**. These arteries form the **Circle of Willis**, which ensures collateral circulation in the event of vascular occlusion.
- **Spinal Cord**: The spinal cord is supplied by the **anterior spinal artery** and **posterior spinal arteries** that branch from the vertebral arteries.

5. Cranial Nerves

The **cranial nerves** are 12 paired nerves that arise directly from the brain. These include:

- **Olfactory (CN I)**
- **Optic (CN II)**
- **Oculomotor (CN III)**
- **Trochlear (CN IV)**
- **Trigeminal (CN V)**
- **Abducens (CN VI)**
- **Facial (CN VII)**
- **Vestibulocochlear (CN VIII)**
- **Glossopharyngeal (CN IX)**
- **Vagus (CN X)**
- **Accessory (CN XI)**

- **Hypoglossal (CN XII)**

Sense Organs

1. Nose

- **Location**: The nose is centrally located on the face, just below the forehead.
- **Features**: The nose houses the olfactory receptors and is essential for the sense of smell.

2. Tongue

- **Location**: Located in the mouth, attached to the floor of the oral cavity.
- **Features**: The tongue is involved in tasting (gustation), speaking, and swallowing. It contains taste buds for detecting sweet, salty, sour, bitter, and umami flavors.

3. Eye

- **Location**: The eyes are located within the orbital cavities of the skull.
- **Features**: The eye is responsible for vision, capturing light and sending visual information to the brain for processing.

4. Ear

- **Location**: Located on either side of the head.
- **Features**: The ear is involved in hearing (audition) and balance. It consists of the outer ear, middle ear, and inner ear.

5. Skin

- **Location**: Covers the entire surface of the body.
- **Features**: The skin is the largest sense organ and acts as a barrier, providing protection from environmental hazards. It contains receptors for touch, pain, temperature, and pressure.

Endocrine System

Endocrine Glands and Their Hormones

- **Pituitary Gland**:
  - **Location**: Located at the base of the brain, in the sella turcica of the sphenoid bone.
  - **Hormones**: Growth hormone (GH), Prolactin (PRL), Thyroid-stimulating hormone (TSH), Adrenocorticotropic hormone (ACTH), Follicle-stimulating hormone (FSH), Luteinizing hormone (LH).
- **Thyroid Gland**:
  - **Location**: Located in the front of the neck, below the Adam's apple.
  - **Hormones**: Thyroxine (T4), Triiodothyronine (T3), Calcitonin.
- **Parathyroid Glands**:

    - **Location**: Four small glands located behind the thyroid gland.
    - **Hormones**: Parathyroid hormone (PTH).
- **Suprarenal (Adrenal) Glands**:
    - **Location**: Located on top of each kidney.
    - **Hormones**: Adrenaline, Noradrenaline, Cortisol, Aldosterone, Androgens.
- **Pancreas**:
    - **Location**: Located behind the stomach.
    - **Hormones**: Insulin, Glucagon.
- **Ovaries (in females)**:
    - **Location**: Located in the pelvis, on either side of the uterus.
    - **Hormones**: Estrogen, Progesterone.
- **Testes (in males)**:
    - **Location**: Located in the scrotum.
    - **Hormones**: Testosterone.

Practical Demonstrations and Examination

Demonstrations:

1. **Microscope Parts and Uses**: Understanding the components of a microscope and how it is used for histological examination.
2. **Skeleton and Joint Demonstration**: A visual and practical demonstration of the human skeleton and joint types.
3. **Muscle Demonstrations**: Understanding the structure and function of muscles such as the deltoid, gluteus maximus, and others.
4. **Heart and Blood Supply**: Visualizing the heart's anatomy and its associated blood vessels.
5. **Lung and Respiratory System**: Demonstrating the lungs, trachea, and histology of respiratory tissues.
6. **Digestive System**: Learning about the stomach, small and large intestines, liver, pancreas, and gall bladder.
7. **Kidney and Urinary System**: Understanding the kidney's structure and function, as well as the urinary system.
8. **Reproductive System**: Demonstrating the male and female reproductive organs.
9. **Brain and Spinal Cord**: Identifying parts of the brain and spinal cord.
10. **Histology**: Reviewing the histology of the cornea and retina.

Practical Examination Pattern

1. **Gross Anatomy Discussion**:
    - Discussion of one specimen from any of the following systems: **Cardiovascular**, **Respiratory**, **Gastrointestinal**, **Urinary**, **Reproductive**.
    - **Marks**: 10 Marks
2. **Spotters**:
    - Identifying specimens and labeling structures from the **Cardiovascular**, **Respiratory**, **Gastrointestinal**, **Urinary**, and **Reproductive systems**.
    - **Marks**: 20 Marks (10 x 2)
3. **Histology Slide Discussion**:
    - Histology discussion of any one demonstrated slide.

- **Marks**: 10 Marks

Recommended Books

1. **Ross and Wilson**: *Anatomy and Physiology in Health and Illness*
2. **William Davis**: *Understanding Human Anatomy and Physiology* (MC Graw Hill)
3. **Bhatnagar**: *Essentials of Human Embryology* (Orient Blackswan Pvt. Ltd.)
4. **Renu Chauhan**: *Anatomy for B.Sc Nursing* (Arichal Publishing)
5. **BD Chaurasia**: *Handbook of Anatomy* (6th Edition)
6. **Jaypee Publishers**: *Basics in Human Anatomy for B.Sc. Paramedical Courses*

I Semester

Core- 2 Physiology

Objectives

At the end of the semester students should be able to describe

1. Blood cell counts
2. Nerve and muscle functions
3. Cardiac functions
4. Pulmonary functions
5. Renal functions
6. The actions of various hormones
7. Functions of Central nervous system and special senses

Contents:

Theory

Unit -I

General physiology and Blood **12 Hrs**

General Physiology (2 Hrs)

- Organization of the cell and its function, homeostasis
- Transport across cell membrane
- Membrane Potentials - Resting Membrane Potential &Action Potential
- Body Fluid Compartments - Normal Values

Blood (10 Hrs)

- Introduction: composition and function of blood.
- Red blood cells: erythropoiesis, stages of differentiation, function, count, physiological variation.
- Structure, function, concentration, physiological variation, methods of estimation of haemoglobin.
- White blood cells: production, function, count.
- Platelets: origin, normal count, morphology & functions.
- Plasma proteins: types, functions
- Haemostasis: definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting - Blood groups: ABO system, Rh system. Blood grouping & typing, cross matching.

  Rh system: Rh factor, Rh incompatibility. Blood transfusion: indication. transfusion reactions.
- Anticoagulants: classification, examples and uses.

  Anaemias: morphological and etiological classification, -Blood indices: CI, MCH, MCV, MCHC.
- Erythrocyte sedimentation rate (ESR) and packed cell volume, normal values.

Unit -II

Digestive system & Respiratory system **12hrs**

Digestive System (4Hrs)

- Physiological anatomy of gastro intestinal tract, functions of digestive system.
- Salivary glands: structure and functions, deglutition: stages and regulation.
- Stomach: structure and functions. Gastric secretion: composition function regulation of gastric juice secretion.
- Pancreas : structure, function, composition of pancreatic juice
- Functions of liver. Bile secretion, composition, function. jaundice: types.
- Functions of gall bladder.
- Small intestine: functions, digestion, absorption, movements.
- Large intestine: functions, movements defecation

Respiratory system (8 Hrs)

- Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract, respiratory muscles.
- Mechanism of normal and rigorous respiration, forces opposing and favoring expansion of the lungs. Intra pulmonary & intrapleural pressure.
- Surface tension, recoil tendencyof the thoracic cage and lungs .
- Transport of respiratory gases: transport of oxygen & carbon dioxide, oxy haemoglobin dissociation curve, factors affecting it.
- Lung volumes and capacities - normal values
- Regulation of respiration: mechanisms of regulation, nervous and chemical regulation, respiratory centre.
- Applied physiology : hypoxia, cyanosis, dyspnoea, apnoea.

Unit -III

Cardiovascular and Endocrine system **12hrs**

Cardiovascular system (7Hrs)

- Heart: Physiological Anatomy, Nerve supply.
- Properties of cardiac muscle, cardiac cycle:
- Conducting System of Heart, Origin and Spread of Cardiac Impulse
- Electrocardiogram (ECG) waves and normal duration. Recording
- Cardiac Cycle: Phases and Volume Changes
- Normal heart sounds, areas of auscultation. Pulse: jugular, radial pulse,
- Cardiac output : definitions of stroke volume, cardiac index, factors Affecting It. measurement of Cardiac output.
- General principles of circulation
- Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, hypertension. Factors affecting it and regulation

- Physiological variations & regulation of heart rate.
- Coronary circulation.
- Shock

Endocrine System (5 Hrs)

- Classification of endocrine glands & Definition of hormone.
- Pituitary hormones: anterior and posterior pituitary hormones, secretion, functions
- Thyroid gland: physiological anatomy, hormone secreted, physiological function, regulation, secretion, disorders (hypo and hyper secretion of hormone).
- Adrenal cortex: physiological anatomy. cortical hormones, functions and regulation.
- Adrenal medulla: hormones, regulation and secretion. Functions of adrenaline and nor adrenaline.
- Hormones of pancreas. Insulin: secretion, regulation, function and action.

  Diabetes mellitus: regulation of blood glucose level.
- Parathyroid gland: function, action, regulation of secretion of parathyroid hormone.

  Calcitonin:

Unit -IV

Excretory system and Reproductive system 12 hrs

Excretory System (8Hrs)

- Functional anatomy of kidney
- Juxta glomerular apparatus: structure and function.
- Glomerular filtration
- Tubular function(reabsorption and secretion)
- Micturition, innervation of bladder, cystometrogram.
- Artificial kidney, renal function tests skin and body temperature

Reproductive system (4Hrs)

- Male reproductive system: functions of testes, spermatogenesis: Endocrine functions of testes -Female reproductive system: oestrogen, progesteron, menstrual cycle: ovulation, physiological changes during pregnancy, pregnancy tests.
- Lactation: composition of milk, factors controlling lactation.

Unit -V

Muscle nerve physiology, Nervous system and Special senses 12hrs

Muscle nerve physiology (3Hrs)

- Classification and properties of neuron and neuroglia. Classification of nerve fibers
- Classification of muscle, structure of skeletal muscle,
- Neuromuscular junction. Transmission across nmj
- Excitation contraction coupling. muscle tone, fatigue, rigor mortis

Nervous system (5Hrs)

- Organisation of nervous system
- Synapse: structure, types, properties.
- Receptors: definition, classification, properties. Sensations-pain
- Organization Spinal cord. Ascending tracts, descending tracts.
- Reflex : definition reflex arc, clinical classification of reflexes : Babinski's sign.
- Hypothalamus- functions
- Cerebral cortex lobes - functions,
- Cerebellum- functions
- Basal ganglia functions.
- Cerebro Spinal Fluid (CSF) : formation, circulation & reabsorption . composition and functions. Lumbar puncture.
- Autonomic Nervous System: Sympathetic and parasympathetic distribution

Special senses (4Hrs)

- Vision: structure of eye, function of different parts. Structure of retina. visual pathway, errors of refraction
- Hearing: structure and functions of ear.
- Taste : taste buds and taste pathway.
- Olfaction : receptors, pathway.

Practicals (20 Hrs)

1. Haemoglobinometry.
2. Haemocytometry
3. Total leucocyte count.
4. Total Red blood cell count.
5. Determination of blood groups.
6. Differential WBC count.
7. Determination of clotting time, bleeding time.
8. Erythrocyte sedimentation rate (ESR). Determination of packed cell Volume, Calculation of Blood indices: CI, MCH, MCV, MCHC.
9. Blood pressure recording.
10. Spirometery, Artificial Respiration

Practical Examination : 40 Marks

1. Estimation of Hemoglobin. - 10 marks
2. Determination of Blood Groups. - 10 marks
3. Determination of Bleeding and Clotting time. - 10 marks
4. Spotters-Haemocytometer, (Identification of cells) Differential Count, Sphygmomanometer, Spirometer . - 10 marks

Recommended Books Recent Editions

1. A.K.Jain, Human Physiology and Biochemistry for Physical Therapy and Occupational Therapy, 1st Ed. Arya Publication.
2. Dr. Venkatesh.D and Dr. Sudhakar H.S.Basic of Medical Physiology, 2nd Ed., Wolter-Kluwer Publication.
3. Chaudhari (Sujith K) Concise Medical Physiology 6th Ed. New Central Book.

Reference Books

1. A.K.Jain, Text book of Physiology for Medical Students, 4th Ed. Arya Publiction.
2. Guyton (Arthur) Text Book of Physiology.11th Ed. Prism Publishers.
3. Ganong (William F) Review of Medical Physiology. 23rd Ed. Appleton.

I Semester

Core- 3- Basic Biochemistry

Unit I **12hrs**

Chemistry of Cell & Chemistry of Carbohydrates, Proteins, Lipids &Nucleotides-

Cell- Structure & Function of Cell Membrane, Subcellular Organelles and their Functions.

Carbohydrates- Definition, Classification & Biological importance of carbohydrates, Derivatives of Monosaccharides.

Proteins- Definition & Classification of amino acids & Proteins, Biologically important peptides Plasma proteins, Immunoglobulins.

Lipids- Definition, Classification & Biological importance and Functions of Lipids. Structure and functions of Cholesterol, types and functions of Lipoproteins.

Nucleotides- Structure and Functions of DNA & RNA. Biologically important nucleotides.

Unit II **12hrs**

Enzymes & Acid base balance

Enzymes- Definition and Classification. Factors affecting enzyme activity. Coenzymes and Cofactors. Enzyme inhibition & Regulation of enzyme activity

Acid Base balance- Acids, Bases & Body Buffers, Regulation of pH, Acid base disorders.

Unit III **12hrs**

Vitamins & Minerals

Vitamins-Classification, Sources, RDA, Functions(in brief), deficiency manifestations and hypervitaminosis.

Minerals- Classification, Sources, RDA, Functions (in Brief), deficiency manifestations of the following: calcium, phosphorous, iron, copper, iodine, zinc, fluoride, magnesium, selenium, sodium, potassium and chloride.

Unit IV **12hrs**

Nutrition, Blood chemistry & Urine Chemistry

Nutrition- Nutrients, Calorific value of food, BMR, SDA, respiratory quotient and its applications, Balanced diet based on age, sex and activity, biological value of proteins, nitrogen balance, Protein energy malnutrition, Total parenteral nutrition, dietary fibers.

Blood chemistry- Biochemical components & their reference ranges in normal & diseased states.

Urine chemistry- Biochemical components & their reference ranges in normal & diseased states

Unit V **12hrs**

Clinical Biochemistry- 10 hrs

Specimen Collection- Blood,Urine and Body fluids.

Preanalytical, analytical and postanalytical errors

Clinical Biochemistry- Parameters to diagnose Diabetes & Cardiovascular diseases.

Diagnostic enzymology, Assessment of arterial Blood gas status and electrolyte balance, Point of Care Testing. Renal Function tests(in brief), Liver function tests(in brief), Biomedical Waste Management.

Practicals

1. General Reactions of Carbohydrates.
2. Color reactions of Proteins.
3. Reactions of Non Protein nitrogenous substances.
4. Demonstration of pH meter, Colorimeter and spectrophotometer.
5. Demonstration of Chromatography and Electrophoresis.

Practical Examination

1. Identification of Substance of physiological importance - 10 Marks
2. Color reactions of Proteins - 10 Marks
3. Spotters - 10 Marks
4. Charts on Clinical biochemistry - 10 Marks

Recommended books Recent edition

1. Textbook of Biochemistry -D.M.Vasudevan
2. Biochemistry -Pankaja Naik
3. Clinical Biochemistry-Principles and Practice-Praful.B.Godkar
4. Textbook of Biochemistry-Chatterjea and Shinde
5. Textbook of Clinical Chemistry-Norbert W Teitz

Reference Books Recent Edition

1. Harpers Biochemistry
2. Clinical Biochemistry-Michael L.Bishop
3. Textbook of Biochemistry-Rafi M.D
4. Lippincott's Illustrated review of Biochemistry
5. Practical Clinical Biochemistry-Harold Varley

I Semester

Language-1English

Unit I

Introduction

a) Study Techniques - Reading Comprehension

Exercises on reading passages and answering questions based on the passage.

b) Organization of Effective Note Taking

Why good note-taking is important

Effective note-taking is an important practice to master at university. You have a lot of new knowledge and you need to develop reliable mechanisms for recording and retrieving it when necessary. But note-taking is also a learning process in itself, helping you to process and understand the information you receive.

c) Use of the Dictionary

Tips on how to use the dictionary

1. Choose the right dictionary.
2. Read the introduction.
3. Learn the abbreviations.
4. Learn the guide to pronunciation.
5. Looking Up a Word
   a) Find the section of the dictionary with first letter of your word.
   b) Read the guide words.
   c) Scan down the page for your word.
   d) Read the definition.
6. Online dictionaries
7. Research various facts.
8. Thesaurus

It is a dictionary of synonyms and antonyms, such as the online Thesaurus.com.

Enlargement of Vocabulary

Roots : A to G

Effective Diction

Foreign Expressions - meaning and pronunciation

Unit II

Applied Grammar

a) Correct Usage

The Eight Parts of Speech

1. Noun
2. Pronoun
3. Adjective
4. Verb
5. Adverb
6. Preposition
7. Conjunction
8. Interjection

b) The Structure of Sentences

What is a sentence?

What are clauses?

What are phrases?

Types of sentences:

1. Simple sentences
2. Compound sentences
3. Complex sentences

c) The Structure of Paragraphs

1. What is a Paragraph?

Paragraphs are comprised of sentences, but not random sentences. A paragraph is a group of sentences organized around a central topic.

2. The Secrets to Good Paragraph Writing:

Four Essential Elements

The four elements essential to good paragraph writing are: unity, order, coherence, and completeness.

4. Paragraph Structure

A paragraph consists of 3 main structures :

1. Claim
2. Evidence
3. Analysis

d) Enlargements of Vocabulary

Roots: H to M

Unit III

Written Composition

a) Precise writing and Summarizing

1. Definition of Precise:

A **precise** is a brief and concise restatement or encapsulation of someone's writing or ideas. It focuses on condensing a larger body of text into its essential points. It should be roughly **one-third** the length of the original passage.

Purpose of a Precise:
The goal of writing a precise is to capture the core meaning or essence of a piece of writing while leaving out unnecessary details, repetitions, or embellishments.

2. Definition of Summary:

A **summary** is a condensed version of a larger text, which briefly outlines the main points, ideas, or arguments of the original content.

Key Features of a Summary:

- **Condensation**: It captures the key ideas of the original text in a shorter format.
- **Flexibility**: Unlike a precise, a summary doesn't always follow a direct line of the text. You may start with the conclusion and work backward, or you may paraphrase key points.

Guidelines for Writing a Summary:

1. **Divide and Conquer**: Break the original text into smaller parts and focus on understanding each part.
2. **Read**: Read the text thoroughly to understand the main ideas.
3. **Reread**: Rereading ensures that you've grasped the text's nuances and details.
4. **One Sentence at a Time**: Write one sentence for each key idea or point from the original text.
5. **Write a Thesis Statement**: Create a clear thesis or central theme for your summary to help guide the writing.
6. **Check for Accuracy**: Ensure that the summary accurately reflects the original text, without adding your own opinions.
7. **Revise**: Review your summary to ensure clarity, coherence, and correctness.

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3. Writing of a Bibliography

I. What is a Bibliography?

A **bibliography** is an **alphabetical list** of all the materials (books, articles, journals, etc.) that were consulted or referenced during the preparation of an assignment or project.

The purpose of a bibliography is to:

- Acknowledge the sources you consulted.

- Give credit to the original authors of the ideas, research, or data you used.
- Help others locate the sources for further reading.

II. What is an Annotated Bibliography?

An **annotated bibliography** is similar to a regular bibliography, but with **additional explanatory or critical notes**. After each citation, a short paragraph (or annotation) is included that summarizes, evaluates, or reflects on the source.

Components of an Annotated Bibliography:

- **Citation**: The full reference in the correct citation style (e.g., MLA, APA).
- **Annotation**: A brief summary and evaluation of the source, often including the relevance, quality, and applicability of the source to your research.

III. Why You Must Do a Bibliography?

1. **To Acknowledge and Give Credit**: Bibliographies acknowledge the work of others and give credit to sources of ideas, words, diagrams, illustrations, quotations, or materials you have summarized or paraphrased.
2. **To Avoid Plagiarism**: Creating a bibliography proves that you are not plagiarizing. It shows that you are respectfully borrowing ideas, rather than passing off someone else's work as your own.

IV. What Must Be Included in a Bibliography?

A standard bibliography entry must typically include the following elements:

- **Author**: The full name of the author(s) of the work.
- **Title**: The title of the work (book, article, etc.).
- **Place of Publication**: The city where the work was published.
- **Publisher**: The name of the publisher.
- **Date of Publication**: The year when the work was published.
- **Page Number(s)**: For articles, magazines, journals, periodicals, newspapers, encyclopedias, or chapters in edited books, you must include page numbers (e.g., "pp. 22-25").

Example (in MLA format):

- Book:
  Smith, John. *The Art of Writing*. New York: Penguin Books, 2020.
- Journal Article:
  Brown, Jessica. "The Future of Renewable Energy." *Science Today* 5 May 2020: 34-36.

By following these rules, you can accurately and effectively cite your sources and give proper credit to the original authors.

V. Writing a Bibliography in MLA Style

In academic writing, it is essential to credit sources properly. MLA (Modern Language Association) style provides a standardized format for citing various sources like books, articles, and journals. Below is an overview of the standard formats for writing a bibliography in MLA style:

1. Standard Format for a Book:

- **Format**:
  Author. *Title: Subtitle.* City or Town: Publisher, Year of Publication.
  - If the book has no author or editor stated, begin with the title.
  - If the city or town is not commonly known, add the abbreviation for the State or Province.

  Example:

  - Smith, John. *The Art of Writing*. New York: Penguin Books, 2021.
  - *The Great Adventure.* London: HarperCollins, 2003.

2. Standard Format for a Magazine, Periodical, Journal, or Newspaper Article:

- **Format**:
  Author. "Title: Subtitle of Article." *Title of Magazine, Journal, or Newspaper* Day, Month, Year of Publication: Page Number(s).

  Example:

  - Brown, Jessica. "The Future of Renewable Energy." *Science Today* 5 May 2020: 34-36.
  - McLeod, Mark. "Exploring the Deep Ocean." *National Geographic* 15 Feb. 2019: 45-47.

Unit IV: Reading and Comprehension

a) Review of Selected Materials and Express Oneself in One's Words

In this section, the aim is to enhance the student's ability to review and understand various types of reading materials and express their thoughts in their own words.

Seminar on PowerPoint Presentation & Book Review
A seminar where students can practice reviewing a book or any selected material and presenting their understanding through PowerPoint slides. This exercise helps students enhance their comprehension skills and develop effective presentation abilities.

Exercise Example:

- Read an article/book.

- Summarize the main points.
- Present a PowerPoint discussing the book or article and review it from your perspective.

b) Enlargement of Vocabulary Roots - T to Z

Vocabulary development is critical in improving comprehension and expression skills. This section will focus on expanding vocabulary by analyzing words and their roots from T to Z.

Exercise Example:

- Select 10 new words from a reading passage.
- Break each word down into its root, prefix, and suffix.
- Learn the meaning of each word and use it in a sentence.

Unit V: The Study of Various Forms of Composition

a) Paragraph

A paragraph is the basic building block of written work. It should present a unified idea and develop it coherently.

Exercises for Students on Short Paragraph Topics:

- **Topic Ideas**:
    1. My Favorite Season
    2. The Role of Technology in Education
    3. The Impact of Social Media on Society

Writing a Paragraph:

- Start with a topic sentence that clearly defines the paragraph's main idea.
- Support the idea with relevant details.
- Conclude with a sentence that reinforces the idea or transitions to the next paragraph.

b) Essay

An essay is a more formal type of writing that explores a topic in depth.

How to Write an Essay:

Stages of Writing an Essay:

1. **Essay Writing**:
   Write a structured essay with an introduction, body paragraphs, and a conclusion.

- **Introduction**: State your thesis and briefly introduce the topic.
- **Body**: Each paragraph should focus on a single point supporting the thesis.
- **Conclusion**: Summarize the main points and restate the thesis.

2. **Close Reading**:
   Carefully analyze the source material to understand its arguments and the evidence presented. Annotate the text and take notes.
3. **Research**:
   Use credible sources to support your thesis. Make sure to include references and citations to avoid plagiarism.

Example Essay Topic:

- "The Benefits of Reading Fiction"

c) Letter

Mechanics of Writing Formal and Business Letters:

- **Format**:
  - **Sender's Address** (top right corner)
  - **Date** (below the sender's address)
  - **Receiver's Address** (left-aligned)
  - **Salutation** (e.g., "Dear Sir/Madam")
  - **Body of the Letter** (clear and concise)
  - **Closing** (e.g., "Sincerely," "Best regards")
  - **Signature** (your name and designation, if applicable)

Exercise Example:

- Write a formal letter requesting information about a course or internship opportunity.

d) Summary

Writing summaries helps distill important information from large texts into concise versions.

Writing Reports:

1. **Project Report**: Focuses on summarizing project objectives, methods, results, and conclusions.
2. **Magazine Article Summary**: Condense the main points of the article.
3. **Sporting Event Report**: Write a short report detailing the key moments and results of a sports game.

Example Summary:

- *Book Review Summary*: Summarize the key themes, arguments, and conclusions of the book in no more than 200-300 words.

e) Practice in Writing

Exercises and Assignments on Report Writing:

- Write a report based on a recent event, interview, or any subject matter of interest.
- Practice writing concise reports that capture the essential details without unnecessary elaboration.

Unit VI: Verbal Communication

a) Discussions and Summarization

Effective verbal communication is critical for discussions and summarizing key points. One common task in discussions, especially in meetings, is **taking minutes**, which is a vital skill to ensure the outcomes of the meeting are documented accurately.

Tips on Taking Minutes of a Meeting:

Why Meeting Minutes Matter:

Meeting minutes serve as a written record of the discussions, decisions, and actions taken during a meeting. They help keep track of what has been agreed upon, who is responsible for what tasks, and any deadlines or follow-up actions. Minutes are essential for future reference and can provide clarity in case of disputes or confusion.

Steps to Take Effective Meeting Minutes:

Before the Meeting:

- **Preparation**:
  - Avoid being an active participant if you are responsible for taking minutes. It's hard to focus on both tasks effectively.
  - **Create a Template**: Set up a template for meeting minutes, leaving spaces for each key item like attendees, agenda points, decisions, and action items.
  - **Decide on Your Method of Recording**: Choose whether to handwrite your notes, use a laptop, or use a recording device, based on what makes you most comfortable and efficient.

During the Meeting:

- **Attendee List**: As people enter, check off their names on your attendee list.
- **Note Key Details**:
  - Record decisions made, actions assigned, and any important discussion points.
  - Be clear about who is responsible for each task and what the deadlines are.
  - If you are unsure about something, ask for clarification immediately, rather than waiting until after the meeting.

After the Meeting:

- **Review and Clarify**: Go over your notes and ensure everything is clear and coherent. Fill in any gaps while the meeting details are still fresh in your mind.
- **Finalize the Minutes**: Organize your notes into a clear, concise document that accurately reflects the meeting's discussions and outcomes.
- **Distribute**: Send the finalized minutes to all attendees and relevant parties, so everyone knows what was agreed upon and what their responsibilities are.

b) Debates and Group Discussions

Debates and group discussions are common forms of verbal communication used to exchange ideas, challenge perspectives, and make decisions. Successful participation in these activities requires good speaking, listening, and teamwork skills.

Group Discussion: Do's and Don'ts

1. Do's in a Group Discussion:

- **Be Confident**: Confidence is key to effective communication. Introduce yourself with a warm smile, and get to the topic quickly.
    - Example: *"Good morning, my name is [Your Name], and I'd like to talk about the importance of renewable energy."*
- **Make Eye Contact**: Eye contact shows that you are engaged and confident. It also helps in building rapport with the other participants.
    - Try to look at different participants to keep the discussion inclusive.
- **Listen Actively**: Group discussions are about exchanging ideas. Pay attention to what others are saying, and don't just wait for your turn to speak.
    - You can acknowledge others' ideas by saying, "I agree with [Name], and to add on..." or "That's an interesting point, but here's another perspective..."
- **Be Polite**: Respect all participants' opinions, even if you disagree. A polite tone fosters a positive environment.
    - Example: *"I see your point, but have you considered this?"*
- **Be a Good Team Player**: Collaboration is key in group discussions. Offer your help to other participants when needed, and contribute positively to the conversation.
    - Example: *"I think we should move forward with this point, but let's hear from others before making a decision."*

2. Don'ts in a Group Discussion:

- **Don't Be Harsh**: If someone interrupts you, stay calm and assertive. It's important to address the interruption politely.
    - Example: *"I would appreciate it if you let me finish my point."*
- **Don't Interrupt**: Don't cut others off while they are speaking. Interrupting can make the discussion feel disjointed and disrespectful.
    - Wait for the other person to finish before you speak.
- **Don't Force Your Ideas on Others**: Present your ideas clearly, but don't try to impose them on others. A healthy discussion involves respect for differing viewpoints.
    - Example: *"I believe my point could work here, but I'm open to hearing others' thoughts."*
- **Don't Argue**: Healthy disagreements are fine, but avoid turning the discussion into an argument. If you disagree, offer constructive feedback and support your point with evidence.
    - Example: *"I understand your perspective, but I think the data shows a different trend."*

Oral Reports

An **oral report** is a structured presentation or speech where a person communicates information to an audience, typically in the form of a report. This could be delivered to classmates, teachers, or a wider community such as parents, visitors, or judges, depending on the context.

Key Characteristics of Oral Reports:

- **Purpose**: To present findings, research, or information about a topic in an organized manner.
- **Audience**: Can vary from a small group (e.g., teacher and classmates) to a large audience (e.g., science fair participants, parents).
- **Format**: Can involve visual aids (like slides or charts), and may include a Q&A session to clarify details.

Steps for Presenting an Oral Report:

1. **Introduction**: Briefly introduce the topic and purpose of the report.
2. **Body**: Present the main content, divided into clear sections. Use visual aids or examples to enhance understanding.
3. **Conclusion**: Summarize key points and provide closing remarks.
4. **Q&A**: Invite questions from the audience to clarify any doubts.

Use in Teaching Writing of Dialogues

Dialogue is the written or spoken conversation between two or more characters. Writing dialogue is an essential skill in storytelling, as it helps develop characters, plot, and mood. Here's how to approach writing dialogues effectively:

Grammar Rules for Writing Dialogues:

1. **Quotation Marks**:
    - Use quotation marks to enclose the spoken words of a character.
        - Example:
            - "Hello," she said. "How are you today?"
2. **Periods**:
    - If the dialogue ends with a statement, use a period inside the quotation marks.
        - Example:
            - "I'm fine," he replied.
3. **Question Marks**:
    - If the dialogue ends with a question, use a question mark inside the quotation marks.
        - Example:
            - "Are you coming with me?" she asked.
4. **Commas**:

- Use commas to separate the dialogue from the tag (the words that indicate who is speaking).
  - Example:
    - "That sounds great," John said.

5. **Capitalization**:
   - Always capitalize the first letter of the first word in the dialogue.
     - Example:
       - "What do you want for dinner?" he asked.
6. **Paragraphs**:
   - Start a new paragraph each time a different character speaks.
     - Example:
       - "I love this song," she said.
       - "It's my favorite too," he replied.

How Dialogue Enhances Writing

Dialogue can elevate a written work by adding depth to characters and advancing the plot. Here's how:

a) Exposes Character Traits:

- Dialogue provides insight into a character's personality. What they say, how they say it, and even what they choose **not** to say can reveal a lot about them.
  - Example:
    - Character A: "I don't care about that."
    - Character B: "Of course, you don't. You never care about anything!"

b) Unveils Mood/Emotions:

- Through word choice and tone, dialogue can reveal a character's mood or emotional state without explicitly stating it.
  - Example:
    - "I'm fine," she said, her voice quivering.
    - This indicates she's not fine but reluctant to admit it.

c) Reveals Motivation/Influences:

- Characters often express their desires, goals, or frustrations through dialogue, which can give clues to their motivations.
  - Example:
    - "I have to get this promotion," he said. "It's the only way out of this mess."

d) Establishes Relationships:

- Dialogue can show how characters interact with each other, helping establish relationships (e.g., friend, rival, mentor).
    - Example:
        - Character A: "You always know how to cheer me up."
        - Character B: "That's because I'm the best friend you've got."

Exercises for Students: Writing Dialogue Exchanges

Here are a few exercises for students to practice writing dialogue:

1. On the street (with a vegetable vendor):

- **Scenario**: A student is buying vegetables from a vendor on the street. They need to discuss the prices and make a purchase.
    - *Example*:
        - **Student**: "How much are the tomatoes?"
        - **Vendor**: "They're 30 rupees per kilo, madam."
        - **Student**: "Okay, I'll take two kilos, please."

2. At college with a lecturer (regarding admissions):

- **Scenario**: A student approaches a lecturer to inquire about the admission process for a course.
    - *Example*:
        - **Student**: "Good morning, Professor. Could you please tell me the admission requirements for the M.A. program?"
        - **Lecturer**: "Of course. You need a bachelor's degree in English and at least 50% marks."
        - **Student**: "Thank you! I'll prepare my application."

3. In a bank with the manager (for opening a bank account):

- **Scenario**: A customer goes to a bank to inquire about opening a savings account.
    - *Example*:
        - **Customer**: "Hello, I'd like to open a savings account."
        - **Bank Manager**: "Certainly. We need proof of identity and address. Do you have those documents?"
        - **Customer**: "Yes, I have my passport and utility bill."

4. Telephone conversation with a hotel receptionist (make room reservations):

- **Scenario**: A guest calls a hotel to make a reservation.
    - *Example*:

- **Guest**: “Hello, I’d like to book a room for two adults for three nights.”
- **Receptionist**: “Certainly! May I have your name and check-in date?”
- **Guest**: “My name is Ravi Sharma, and I’ll be arriving on the 15th of June.”

5. Telephone conversation (taking an appointment with the dentist/doctor):

- **Scenario**: A patient calls the doctor’s office to make an appointment.
  - *Example*:
    - **Patient**: “Good morning, I’d like to schedule an appointment with Dr. Smith for a check-up.”
    - **Receptionist**: “Of course! When would be convenient for you?”
    - **Patient**: “How about next Tuesday at 10 AM?”

II Semester

Core 4-General Pathology

Unit I: Introduction to Pathology (12 hours)

1. Introduction and Scope of Pathology:

- **Pathology** is the study of disease processes, including their causes, mechanisms, and effects on the body. It is a key field in understanding how diseases affect organs, tissues, and cells. Pathologists examine samples from patients to help diagnose and manage diseases.

2. Cell Injury and Cellular Adaptations:

- **Normal Cell**: A normal cell is characterized by homeostasis and proper function.
- **Cell Injury**:
  - **Types**:
    - **Reversible Injury**: Can recover once the injury is removed (e.g., ischemia).
    - **Irreversible Injury**: Results in cell death.
  - **Etiology**: Causes of cell injury include physical agents (trauma, heat, radiation), chemical agents (drugs, toxins), biological agents (bacteria, viruses), and genetic factors.
  - **Morphology**: Changes in the cell during injury, such as cellular swelling, mitochondrial changes, and membrane damage.
  - **Cell Death**:
    - **Autolysis**: The breakdown of cells after death by their own enzymes.
    - **Necrosis**: Uncontrolled cell death leading to inflammation, often due to injury or infection.
    - **Apoptosis**: Programmed cell death, which is a controlled and regulated process.
- **Cellular Adaptations**:
  - **Atrophy**: Reduction in cell size due to decreased function or stress.
  - **Hypertrophy**: Increase in cell size due to increased workload (e.g., muscle hypertrophy).
  - **Hyperplasia**: Increase in the number of cells (e.g., in response to hormonal changes).
  - **Metaplasia**: Reversible change in which one differentiated cell type is replaced by another (e.g., in the respiratory epithelium due to smoking).

3. Inflammation:

- **Introduction**: Inflammation is a protective response of the body to injury or infection.
- **Acute Inflammation**:
  - **Vascular Events**: Changes in blood flow and permeability, leading to redness, heat, and swelling.
  - **Cellular Events**: Leukocyte migration, activation, and phagocytosis.
  - **Chemical Mediators**: Prostaglandins, leukotrienes, histamine, cytokines, etc., that regulate inflammation.
- **Chronic Inflammation**:
  - General features include tissue destruction and attempts at repair.

- **Granulomatous Inflammation**: Chronic inflammation characterized by granuloma formation (e.g., in tuberculosis).

4. Healing and Repair:

- **Definition**: Healing is the process by which tissue damage is repaired.
- **Phases of Healing**:
  - **Inflammatory Phase**: Initial response to injury (swelling, redness).
  - **Proliferative Phase**: Formation of new tissue, including granulation tissue.
  - **Maturation Phase**: Remodeling of tissue, scar formation.
- **Factors Influencing Wound Healing**: Infection, nutrition, oxygenation, systemic diseases (e.g., diabetes).
- **Fracture Healing**: Involves inflammation, soft callus formation, hard callus formation, and remodeling of bone.

5. Haemodynamic Disorders:

- **Edema**: Accumulation of fluid in tissues.
- **Hyperemia**: Increased blood flow to tissues.
- **Congestion**: Passive accumulation of blood due to impaired venous return.
- **Hemorrhage**: Loss of blood from the circulatory system.
- **Embolism**: Obstruction of a blood vessel by a clot or foreign material.
- **Thrombosis**: Formation of a clot inside a blood vessel.
- **Infarction**: Tissue death due to ischemia (lack of blood supply).

6. Neoplasia:

- **Definition**: Neoplasia is the uncontrolled growth of cells, forming a tumor.
- **Nomenclature**: Tumors are classified based on their cell of origin, e.g., carcinoma (epithelial origin), sarcoma (mesenchymal origin).
- **Benign vs Malignant Tumors**:
  - **Benign Tumors**: Non-cancerous, usually slow-growing, well-circumscribed.
  - **Malignant Tumors**: Cancerous, aggressive, tend to spread to other parts of the body (metastasis).
- **Spread of Tumors**: Direct extension, lymphatic spread, hematogenous spread.
- **Dysplasia**: Abnormal growth, often pre-cancerous.
- **Carcinoma in Situ**: Localized cancer that has not spread.
- **Precancerous Lesions**: Conditions that may develop into cancer if not managed.

7. Environmental and Nutritional Pathology:

- **Smoking**: Leading cause of lung cancer and respiratory diseases.
- **Radiation Injury**: Damage to tissues due to exposure to ionizing radiation.
- **Malnutrition**: Deficiency or imbalance of nutrients causing health problems.
- **Obesity**: Increased risk of metabolic diseases like diabetes and cardiovascular diseases.

- **Vitamin Deficiencies**: Lead to specific conditions like scurvy (vitamin C deficiency), rickets (vitamin D deficiency), etc.

Unit II: Haematological Disorders (12 hours)

1. Introduction to Haematopoiesis:

- **Haematopoiesis**: The process by which blood cells are formed, occurring in the bone marrow. Blood cells include red blood cells (RBCs), white blood cells (WBCs), and platelets.

2. Anemia:

- **Introduction and Classification**: Anemia is a condition characterized by a decrease in red blood cells or hemoglobin, leading to reduced oxygen delivery to tissues.
  - **Morphological Classification**: Microcytic, normocytic, macrocytic anemia.
  - **Etiological Classification**: Iron deficiency, megaloblastic anemia, hemolytic anemia, etc.
- **Iron Deficiency Anemia**:
  - **Causes**: Poor diet, blood loss, malabsorption.
  - **Lab Findings**: Low serum iron, low ferritin, elevated total iron-binding capacity (TIBC).
- **Megaloblastic Anemia**: Caused by vitamin B12 or folate deficiency.
  - **Lab Findings**: Macrocytic RBCs, low serum B12 or folate.
- **Hemolytic Anemia**: Early destruction of red blood cells.
  - **Causes**: Autoimmune diseases, infections, hereditary conditions.
  - **Lab Findings**: Elevated reticulocyte count, bilirubin, and lactate dehydrogenase (LDH).

3. WBC Disorders:

- **Leukemia**: A group of cancers affecting the bone marrow and blood.
  - **Acute Leukemias**: Rapid onset, large numbers of immature white blood cells.
  - **Chronic Leukemias**: Slow progression, more mature white blood cells.

4. Bleeding Disorders:

- **Physiology of Hemostasis**: The process of blood clot formation to prevent excessive bleeding.
  - **Inherited Disorders**: Hemophilia, von Willebrand disease.
  - **Acquired Disorders**: Vitamin K deficiency, liver disease, DIC.
- **Thrombocytopenia**: Low platelet count leading to increased bleeding risk.
- **DIC (Disseminated Intravascular Coagulation)**: Abnormal clotting leading to bleeding and clot formation throughout the body.

Unit III: Basic Hematological Techniques (12 hours)

1. Characteristics of a Good Technician:

- A technician should have attention to detail, precision, good organizational skills, and the ability to follow safety protocols.

2. Blood Collection Methods:

- **Capillary Blood**: Collected from a fingerstick or heelstick, used for small sample volumes.
- **Venipuncture**: Blood collected from a vein, commonly used for larger samples.
- **Arterial Puncture**: For collecting blood from an artery (e.g., for ABG tests).
- **Complications**: Hematoma, infection, or nerve damage.
- **Patient Aftercare**: Ensuring patient comfort and preventing complications post-collection.

3. Anticoagulants:

- Anticoagulants (e.g., EDTA, heparin, sodium citrate) are used to prevent blood clotting during sample collection.

4. Transport of Specimens:

- Proper transportation conditions to prevent specimen degradation (e.g., refrigeration, avoiding freezing).

5. Laboratory Tests:

- **Complete Blood Count (CBC)**: A comprehensive test to measure levels of RBCs, WBCs, and platelets.
- **Peripheral Smear**: A blood smear examined under a microscope to check the shape and number of cells.
- **Bleeding Time (BT), Clotting Time (CT)**: Tests to assess platelet function and clotting ability.
- **Prothrombin Time (PT)** and **Activated Partial Thromboplastin Time (APTT)**: Measure clotting factors.
- **Erythrocyte Sedimentation Rate (ESR)**: A non-specific test for inflammation.

6. Disposal of Waste:

- All waste (biological, chemical, and sharps) should be disposed of according to safety and environmental guidelines.

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Unit IV: Transfusion Medicine (12 hours)

Topics Covered:

1. **Selection of Donor**:
   - **Eligibility Criteria**: The donor must be healthy, aged between 18 to 65 years, and free of any infectious diseases. The donor's weight, blood pressure, and hemoglobin levels are also considered.
   - **Exclusion Criteria**: Donors with certain medical conditions (like diabetes, hypertension, or active infections) or high-risk behavior for transfusion-transmissible infections may be excluded.
2. **Blood Grouping**:
   - **ABO System**: Blood is classified into four main groups: A, B, AB, and O. Group A has A antigens on the red blood cells and anti-B antibodies in the plasma, and so on for the other groups.
   - **Rh Typing**: Rh factor (positive or negative) is determined by the presence or absence of the Rh antigen (also known as the D antigen) on red blood cells.
3. **Cross-Matching**:
   - This test checks if the donor's and recipient's blood is compatible. It is done to ensure that the transfusion does not cause any immune reaction.
   - **Major crossmatch**: Mixing donor red blood cells with recipient serum.
   - **Minor crossmatch**: Mixing donor plasma with recipient red blood cells.
4. **Storage**:
   - **Whole Blood**: Stored at 1–6°C for up to 21 days.
   - **Red Blood Cells**: Stored at 1–6°C, can be refrigerated for up to 42 days.
   - **Platelets**: Stored at 20-24°C and can be kept for up to 5 days.
   - **Plasma**: Frozen at -18°C and can be stored for up to 1 year.
5. **Transfusion-Transmitted Diseases (TTDs)**:
   - Common infections transmitted through blood transfusion include HIV, Hepatitis B and C, Syphilis, Malaria, and Chagas disease.
   - Screening of blood donations for these diseases is mandatory to ensure the safety of transfusion.
6. **Transfusion Reactions**:
   - **Hemolytic Reactions**: Caused by incompatibility between donor and recipient blood.
   - **Allergic Reactions**: Mild to severe reactions like itching, rash, or anaphylaxis.
   - **Febrile Non-Hemolytic Transfusion Reaction**: Common reaction resulting from cytokines in the blood.
   - **Transfusion-Related Acute Lung Injury (TRALI)**: A rare but serious reaction involving lung injury.
   - **Bacterial Contamination**: If blood is improperly stored or handled.
7. **Components of Blood**:
   - **Red Blood Cells (RBC)**: For anemia treatment.
   - **Platelets**: Used for bleeding disorders.
   - **Plasma**: Contains clotting factors; used in conditions like burns or liver disease.
   - **Cryoprecipitate**: Contains clotting factors and fibrinogen.
8. **Indications for Transfusion**:

- **RBC Transfusion**: Anemia, blood loss during surgery or trauma.
- **Platelet Transfusion**: Thrombocytopenia, bleeding disorders like leukemia.
- **Plasma Transfusion**: Burns, liver disease, coagulation disorders.
- **Cryoprecipitate**: For bleeding due to fibrinogen deficiency or certain clotting disorders.

Unit V: Clinical Pathology (12 hours)

Introduction to Clinical Pathology:

- **Clinical Pathology** involves the study of bodily fluids and tissues to diagnose diseases. It includes the collection, transport, preservation, and processing of clinical specimens to determine the presence of infections, conditions, and abnormalities.

1. **Collection of Clinical Specimens**:
   - Specimens are collected from patients for various laboratory tests, including blood, urine, sputum, stool, and body fluids (e.g., cerebrospinal fluid, pleural, and peritoneal fluids).
   - Proper collection techniques are vital to ensure accurate results. The specimen must be labeled correctly and sent to the laboratory for processing in a timely manner.
2. **Urinalysis**:
   - **Collection**: Fresh urine samples are collected for analysis. Mid-stream urine samples are usually preferred.
   - **Preservatives**: Some samples require preservatives to prevent bacterial growth or chemical changes before analysis.

Physical Examination:

- **Volume**: Amount of urine passed.
- **Color**: Color can vary due to hydration, medications, or disease.
- **Odor**: A foul odor may indicate infection.
- **Appearance**: Urine should be clear; cloudiness could indicate infection.
- **Specific Gravity**: Measures the kidney's ability to concentrate urine.
- **pH**: Normal urine pH ranges between 4.5 and 8.

Chemical Examination (using test strips):

- **Protein**: Test for protein in urine (indicating kidney disease). Methods include heat test and acetic acid test.
- **Reducing Sugar**: Benedict's test for glucose.
- **Ketones**: Rothera's test for ketones, indicating diabetic ketoacidosis or starvation.
- **Bile Pigments**: Fouchet's test for bilirubin, indicating liver disease.
- **Bile Salts**: Hays method for bile salts, typically associated with liver dysfunction.
- **Blood**: Benzidine test for the presence of blood in the urine.
- **Urobilinogen**: Test for urobilinogen, which increases in liver disease.
- **Bence Jones Protein**: A test for monoclonal light chains, which can be indicative of multiple myeloma.

Microscopy:

- **Red Blood Cells (RBC)**: Presence indicates bleeding in the urinary tract.
- **White Blood Cells (WBC)**: Indicates infection or inflammation.
- **Casts**: Can be indicative of kidney disease, particularly when seen in the renal tubules.
- **Crystals**: Urinary crystals can indicate kidney stones or metabolic disturbances.

3. **Examination of Cerebrospinal Fluid (CSF)**:
   - **Physical Examination**: Normal CSF should be clear and colorless. Cloudy or bloody CSF suggests infection or bleeding.
   - **Chemical Examination**: Includes protein, glucose, and cell counts. Elevated protein levels could indicate infection, while low glucose levels could indicate bacterial infection.
   - **Microscopic Examination**: Presence of WBCs, RBCs, or organisms can suggest meningitis, hemorrhage, or other conditions.
4. **Examination of Body Fluids**:
   - **Pleural, Pericardial, and Peritoneal Fluids**: Examined for color, clarity, and the presence of cells, microorganisms, or other abnormalities that can indicate infection or malignancy.
5. **Sputum Examination**:
   - Used primarily to diagnose respiratory infections like tuberculosis and pneumonia. It involves microbiological testing and cytological examination for the presence of abnormal cells.

Practicals:

1. **Laboratory Organization**:
   - Reception of specimens, dispatch of reports, record-keeping, and coding of cases.
   - Laboratory safety guidelines to prevent contamination and ensure safe handling of biohazardous materials.
2. **SI Units and Conventional Units in Laboratory**:
   - Conversion between SI units (metric system) and conventional units in laboratory measurements.
3. **Hematology Techniques**:
   - **Complete Blood Count (CBC)**: Includes RBC count, WBC count, and platelet count.
   - **Hemoglobin Estimation**: To assess the oxygen-carrying capacity of blood.
   - **Erythrocyte Sedimentation Rate (ESR)**: A non-specific test for inflammation.
   - **Packed Cell Volume (PCV)**: A measure of the proportion of blood occupied by red blood cells.
   - **Differential Leukocyte Count**: The percentage of each type of white blood cell.
   - **Reticulocyte Count**: Measure of immature RBCs.
   - **Platelet Count**: Assessing platelet levels for bleeding disorders.
   - **Morphology of Blood Cells**: Identifying abnormal cells in the blood.
4. **Urinalysis Practical**:
   - Performing all aspects of urinalysis, including physical, chemical, and microscopic examination.
5. **Examination of Cerebrospinal Fluid**:
   - Practical exercises involving the collection, processing, and analysis of CSF samples.

Examination of body fluids (pleural, pericardial, peritoneal)
Sputum examination.

Practical Examination- 40 marks.

Spotters- 10 marks.

Estimation of Haemoglobin or blood grouping- 10 marks.

Urine analysis- 10 marks.

Determination of ESR and PCV- 10 marks.

1.Recommended Books Recent Editions.

1. Basic Pathology Robbins Saunders, an imprint of Elsevier Inc., Philadelphia, USA.
2. Text book of Pathology Harsha Mmohan Jaypee Brothers, New Delhi.
3. Practical Pathology P. Chakraborthy, Gargi Chakarborty New Central book agency, Kolkata.
4. Text book of Haematology Dr Tejinder Singh Arya Publications, Sirmour (H P)
5. Text book of Medical Laboratory Technology Praful Godkar Bhalani Publications house, Mumbai.
6. Textbook of Medical Laboratory Technology Ramanik Sood.
7. Practical Haematology Sir John Dacie Churchill Livingstone, London.
8. Todd and Sanford, Clinical Diagnosis and Management by Laboratory
9. Methods John Bernard Henry, All India Traveller Bookseller.
10. Histopathology Techniques, Culling.
11. Histopathology Techniques Bancroft.
12. Diagnostic Cytopathology Koss.
13. Diagnostic Cytopathology Winfred Grey.
14. Hand book of Medical Laboratory Technology, CMC Vellore.
15. Basic Haematological Techniques Manipal.

II Semester

Core 5- Microbiology

Theory

Unit - I

General Microbiology **12 hrs**

1. Morphology and classification of microorganisms.
2. Growth, nutrition and multiplication of bacteria
3. Sterilization and Disinfection - Principles and use of equipments of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptics and disinfectants
4. Immunology - antigen, Antibodies, Immunity, vaccines, types of vaccine and immunization schedule.
5. Hospital acquired infection - Causative agents, transmission methods, investigation, prevention and control of hospital Acquired infections.

Unit - II

Bacteriology **12 hrs**

Classification of bacteria, morphology, infections, lab diagnosis, treatment and prevention of common bacterial infections. Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacterium diphtheriae, Clostridia, Enterobacteriaceae - Shigella, Salmonella, Klebsiella, E.coli, Proteus, Vibrio cholerae, Pseudomonas and Spirochetes

Unit III

Mycobacteriology & Parasitology **12 hrs**

Mycobacteria- classification, pathogenesis, lab diagnosis and prevention

Classification, infections and lab diagnosis of following parasites. Entamoeba, Giardia, Malaria, Hookworm, Roundworm and Filarial worms.

Unit IV

Mycology **12 hrs**

Morphology, disease caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi (Aspergillus, Zygomycetes and Penicillium)

Unit V

Virology **12 hrs**

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

Practicals: 20 hours

1. Compound microscope and its application in microbiology.
2. Demonstration of sterilization equipments: hot air oven, autoclave, bacterial filters. Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, Mac conkey medium, L J media, Robertson cooked meat media, MacConkey agar with LF & NLF, Nutrient agar with staph colonies.Anaerobic culture, Methods and Antibiotic susceptibility test.
3. Demonstration of common serological tests: Widal, VDRL, ASLO, CRP, RF, Rapid tests for HIV, Hbsag and HCV.
4. Grams staining.
5. Acid fast staining.
6. Principles and practice of Biomedical waste management.
7. Stool Microscopy.

Practical examination pattern

Spotters (10 spotters carrying 2 marks each) 20 marks

Culture media - 6

Equipments - 2

Slides - 2

Discussion:

1. Gram stain 10 marks
2. Ziehl - Neelsen stain 10 marks

Recommended Books Recent Editions.

1. Anathanarayana & Panikar: Medical Microbiology - Revised 8th edition University Press.
2. Parasitology by Chatterjee - Interpretation to Clinical Medicine.
3. Textbook of Microbiology - Baveja, 5th edition, Arya Publications
4. Textbook for Laboratory technicians by RamnikSood. Jaypee Publishers
5. Textbook of Parasitology by Paniker. 7th edition

II Semester

Core - 6 - Pharmacology

Unit I

General Pharmacology, ANS, PNS. **12 Hrs**

Sources of Drugs
Route of drug administration
Pharmacokinetics (Absorption, Metabolism, Distribution, Excretion)
Pharmacodynamics (Mechanisms of action)
Adverse drug reactions
ANS : ADRENERGIC Drugs - Adrenaline, Noradrenaline, Ephidrine, Dopamine, Dobutamine
Anti adrenergic - Phentolamine, Phenoxybenzamine, Prazocin, Tamsulosin, Propranolol, Atenolol, Carvidelol
Cholinergic drugs-Acetyl choline, Pilocarpine, Neostigmine, Organophosphorous compounds
Anti cholinergic agents-Atropine, Glycopyrrolate, Ipratropium Bromide, Dicyclomine

Unit II

PNS, CVS, Renal System **12 hrs**

Skeletal muscle relaxants - D Tubocurarine, Succinyl choline, Diazepam, Dantroline
Local anaesthetics - lignocaine, la + vasoconstrictor
CVS - ionotropic agents - Digoxin,
Antianginal drugs - GTN,
Antihypertensives - Betablockers (Propranolol, Atenolol, carvidelol), CCBs (Nifedeine), Diuretics (Thiazide, Furesemide, ace inhibitors, ARBs, Clonidine
Drugs used in treatment of different types of shock, Plasma expanders
Renal system - Diuretics Furosemide, Thiazide, Spiranolactone
Antidiuretics - Vasopressin

Unit III

CNS, Blood **12 hrs**

CNS - general Anaesthetics - nitrous oxide, Halothane, iv anaesthetics
Sedative hypnotics - diazepam, barbiturates, zolpidem
Antiepileptics - Phenytoin, carbamezapine, phenobarbitone, valproate
Opioid analgesics - morphine, pethidine, codiene
NSAIDS - Aspirin, Diclofenacibuprofen, Selective COX2 inhibitors
Respiratory system-treatment of cough And Bronchial asthma
Blood - Hematinics, Anticoagulants - Warfarin, Heparin
Thrombolytics & Antiplatelet drugs - streptokinase,/ aspirin, clopidogrel

Unit IV

GIT, Chemotherapy **12 hrs**

GIT - drugs used in peptic ulcer - ppi, H2 blockers, Antacids
Antiemetics - Metaclopromide, Domperidone, Ondensetron
Purgatives & Laxatives-bran, ispaghula, Lactulose, Bisacodyl &senna
Drugs used in Diarrhoea- ORS, Super ORS, Antimotility drugs (loperamide, diphenoxylate)
Chemotherapy - general considerations MOA, Resistance, Prophylaxis
Sulfonamides, cotrimoxazoles, Quinolones
Tetracyclines, chloramphenicol
Betalactam antibiotics

Unit V

Chemotherapy, Hormones. **12 hrs**

Aminoglycosides
Macrolides, other antibiotics (vancomycin, linezolid) & treatment of UTI
Antifungal (clotrimazole, flucanozole)
Antiviral (Acyclovir, Few drugs used in HAART,)
Cancer chemotherapy
(names, common Adverse effects, general principles in the treatment of cancer)
Hormones - Corticosteroids its uses and adverse effects,
Treatment of Diabetes mellitus(insulin, Metformin, Glibenclamide)

Practicals Syllabus : -20 hrs

Dosage forms
Solid Dosage forms
Liquid Dosage forms
Gaseous Dosage forms
Oral route
Parentral routes
Novel routes
Fixed dose combination - Amoxycillin + clavulinic acid - cotrimoxazole, Lignocaine + Adrenaline
Drug stations - Adrenaline, dopamine, Dobutamine)
Drug stations - Corticosteroids (hydrocortisone, prednisalone, inhaltional steroids)
Drug stations - common antibiotics (amoxycillin, ciprofloxacin, Azithromycin, Metronidazole, Cephalosporins)
Drug stations - Insulin preparations
Instrument & devices (Nasogastric tube, laryngoscope, Different Cathetors, nebulizers, Inhalers, Rotahalers)

Practical examination : 40 marks

1. Dosage Forms : 15 Marks (5 X 3)

Capsules, Tablets, Syrup, Iv, Im, Sc, Ia, Intra Articular -
Advantages (1 Mark), Disadvantages (1 Mark) Examples (1 Mark)

2. Mention the name of the Device / Instruments and uses : 15 marks (5X3)
   Inhalares, Rotahalers, Spacehalers, Dripsets, Vasofix, ryles tube, urinary catheter, Endotracheal tube, Hand gloves
3. 10 Spotters : 10 marks (10X 1) 2 uses of preparation

Recommended Books Recent Editions.

1. K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, Emca House, 23/23, Bansari Road, Daryaganj, New Delhi.
2. Padmaja Udaykumar -Pharmacology for Allied Sciences.
3. R.S. Satoskar, S.D. Bhandarkar, S.S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th edition, Single Volume, M/s Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay - 400 034.

II Semester: Allied - 1 Health Care

Learning Objectives:

1. To define Health and understand various concepts of Health.
2. To understand the healthcare delivery system in India.
3. To understand various National Health Programmes of India.
4. To have an overview of First Aid principles and guidelines.

Unit I: Concepts of Health (12 hours)

1a. Definition and Evolution of Concepts of Health

- **Definition of Health**: Health is defined by the **World Health Organization (WHO)** as a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity.
- **Evolution in Concepts of Public Health**:
    - **Sanitary Awakening**: Early public health measures focused on improving sanitation to prevent disease, such as clean water and sewage systems.
    - **Germ Theory of Disease**: The understanding that microorganisms (germs) are the cause of many diseases.
    - **Rise of Public Health**: Over time, governments and societies began to implement health policies, sanitation practices, and medical interventions to improve public health.
    - **Changing Concepts of Health**:
        - **Biomedical Concept**: Focuses on the physical aspect of health, where disease is seen as the result of malfunctioning organs or systems.
        - **Ecological Concept**: Focuses on the relationship between individuals and their environment, and how this relationship affects health.
        - **Psycho-social Concept**: Highlights the importance of mental health and social factors (e.g., family, community, and societal structures) in health.
        - **Holistic Concept**: Takes a broader view, encompassing physical, mental, emotional, social, and environmental factors to define health.

1b. Dimensions of Health

- **Physical Dimension**: Refers to the functioning of the body and its ability to perform daily activities.
- **Mental Dimension**: Involves cognitive and emotional well-being, the ability to cope with stress, and the presence of mental illnesses.
- **Social Dimension**: Encompasses social relationships, social support, and community well-being.

Common Health Problems in India

- **Communicable Diseases**: Diseases that are spread from one person to another, such as tuberculosis, malaria, and dengue.
- **Non-communicable Diseases**: Chronic diseases such as cardiovascular diseases, diabetes, and cancer.
- **Maternal and Child Health (MCH) Problems**: Issues like maternal mortality, infant mortality, malnutrition, and lack of access to healthcare.
- **Nutritional Problems**: Malnutrition, especially undernutrition and micronutrient deficiencies, are widespread in India.
- **Environmental Sanitation**: Poor sanitation facilities and waste management contribute to various health problems.

Unit II: Evolution of Health Care Delivery Systems (12 hours)

2a. History of Health Care Delivery Services

- The evolution of healthcare in India has been influenced by colonial practices, post-independence health policies, and the integration of traditional medicine systems (e.g., AYUSH).
- **Genesis of Primary Health Care**: The concept of Primary Health Care (PHC) was introduced as part of global health policy initiatives, with the **Alma-Ata Declaration** (1978) advocating for universal access to healthcare.
- **National Health Policy**: India's National Health Policy defines healthcare objectives, strategies, and policies to improve the health status of the population.
- **Millennium Development Goals (MDGs)**: Health goals under the MDGs aimed to reduce poverty, improve maternal health, reduce child mortality, and combat HIV/AIDS, malaria, and other diseases.

2b. Levels of Health Care

- **Primary Health Care**: Basic, first contact healthcare, which includes prevention, early diagnosis, and treatment of common diseases.
    - **Principles**: Universal access, community participation, and equity.
    - **Elements**: Health education, immunization, maternal and child health services, nutrition, safe water, sanitation, and essential medicines.
- **Secondary Health Care**: Includes specialized care, such as treatment for more serious conditions requiring hospitalization, offered in district hospitals and specialized clinics.
- **Tertiary Health Care**: Highly specialized care for complex medical conditions requiring advanced technology and expertise, typically provided by specialized hospitals and medical centers.

Unit III: Primary Health Care Delivery of Services (12 hours)

3a. Delivery of Primary Health Care Services

- **Structure of Health Care Delivery System**:
  - **Village Health Guide, ASHA (Accredited Social Health Activist), ICDS (Integrated Child Development Services)**: Community-level workers who provide basic health services, awareness, and outreach in rural areas.
  - **Subcenter**: The smallest health facility that provides basic services like immunization, antenatal care, and treatment of common diseases.
  - **Primary Health Centre (PHC)**: A more comprehensive health center offering a range of services, including outpatient care, maternal and child health services, and basic diagnostic services.

3b. Secondary and Tertiary Health Care: Delivery of Services

- **Community Health Centre (CHC)**: Provides specialized medical services and facilities for basic surgery, maternity, and pediatric care.
- **First Referral Unit (FRU)**: A higher-level healthcare facility to which patients from primary and secondary centers are referred for specialized care.
- **District Hospital**: A full-fledged hospital that offers more specialized services, such as advanced surgeries, diagnostics, and emergency services.

Unit IV: Current Status of Primary Health Care in India (12 hours)

4a. Primary Health Care - Current Status in India

- **Status of Health Care Infrastructure**: A mixed picture with urban areas having better infrastructure while rural and remote areas face challenges in access to health services.
- **Health Team Concept**: The team includes doctors, nurses, auxiliary nurse midwives (ANMs), health workers, and community-based workers.
- **Health Insurance and Social Security**: The government has launched various schemes such as **Ayushman Bharat** and **Rashtriya Swasthya Bima Yojana (RSBY)** to provide health coverage to low-income groups.
- **AYUSH**: The Ministry of AYUSH promotes traditional medicine systems (Ayurveda, Yoga, Unani, Siddha, and Homeopathy) alongside modern medicine.

4b. National Health Programmes

- **National Vector-Borne Disease Control Programme**: Aimed at controlling diseases like malaria, dengue, and chikungunya through prevention, surveillance, and treatment.
- **National Leprosy Eradication Programme**: Focuses on the early detection and treatment of leprosy, aiming for its elimination.

- **Revised National Tuberculosis Control Programme (RNTCP)**: Focuses on diagnosing, treating, and preventing tuberculosis through active surveillance, Directly Observed Treatment (DOT), and contact tracing.

Recommended Books (Recent Editions)

1. **Park K.** *Park's Textbook of Preventive and Social Medicine* (23rd Edition). Jabalpur: Banarsidas Bhanot Publishers, 2015.
2. **Suryakantha.** *Textbook of Community Medicine with Recent Advances* (4th Edition).
3. **Bhalwar R.** *Textbook of Public Health and Community Medicine* (2nd Edition). Pune: Department of Community Medicine AFMC, 2012.
4. **Essentials of Community Medicine for Allied Health Sciences**, JSS University Publications, 2015.

National Health Programmes and First Aid

Unit V

5a: National Health Programmes (12 hours)

The **National Health Programmes** are vital initiatives established by the Government of India to improve public health and prevent diseases across the country. These programs are designed to address specific health issues prevalent in the population, with an emphasis on prevention, education, and timely medical interventions.

1. **Reproductive and Child Health Programme (RCH)**
    - **Objective**: To reduce maternal and child mortality and morbidity by improving access to quality reproductive health services and family planning.
    - **Components**: Maternal health, child health, adolescent health, family planning, and prevention of maternal and neonatal tetanus.
    - **Key Strategies**: Institutional delivery, immunization, antenatal and postnatal care, and educating communities on reproductive health.
2. **Integrated Management of Neonatal and Childhood Illnesses (IMNCI)**
    - **Objective**: To reduce child mortality by managing common childhood illnesses in a community setting.
    - **Components**: Includes guidelines for managing pneumonia, diarrhea, malaria, malnutrition, and neonatal infections in children.
    - **Key Strategies**: Early recognition of illness, oral rehydration therapy (ORT), appropriate use of antibiotics, and immunization.
3. **National Nutritional Anemia Prophylaxis Programme**
    - **Objective**: To prevent and treat anemia, especially in vulnerable groups like pregnant women, children, and adolescent girls.
    - **Components**: Iron and folic acid supplementation, nutrition education, and regular health check-ups.
    - **Key Strategies**: Distribution of iron supplements, especially to pregnant women and children, and dietary modification to include iron-rich foods.
4. **National Programme for Control of Blindness**
    - **Objective**: To reduce preventable blindness in India by promoting awareness and providing access to medical treatments.
    - **Components**: Eye care services, cataract surgery, treatment for glaucoma, and awareness campaigns.
    - **Key Strategies**: Free eye surgeries, cataract screening, and distribution of spectacles.
5. **National Cancer Control Programme**
    - **Objective**: To reduce the incidence of cancer and provide treatment for cancer patients.
    - **Components**: Early detection, screening, palliative care, and awareness campaigns for cancer prevention.
    - **Key Strategies**: Screening for breast cancer, cervical cancer, oral cancer, and tobacco-related cancers, and facilitating treatment access.
6. **National Mental Health Programme**

- **Objective**: To provide mental health services, reduce the stigma surrounding mental health, and ensure better mental health care facilities.
- **Components**: Establishing mental health centers, training healthcare providers, and integrating mental health into primary healthcare.
- **Key Strategies**: Awareness campaigns on mental health, de-stigmatization, providing mental health counseling, and ensuring access to psychiatric care.

5b: First Aid (12 hours)

First Aid is the immediate care given to a person suffering from an injury or illness before professional medical treatment can be administered. It aims to stabilize the person's condition and prevent further harm.

1. **Basic Terminologies**:
   - **First Aid**: The first and immediate assistance provided to any person suffering from either a minor or serious illness or injury.
   - **Casualty**: A person who is injured or unwell and requires medical help.
   - **CPR (Cardiopulmonary Resuscitation)**: An emergency procedure used to assist someone whose heart has stopped beating or is having difficulty breathing.
2. **General Guidelines for First Aid**:
   - **Stay Calm**: Assess the situation carefully.
   - **Ensure Safety**: Make sure both the person and yourself are safe.
   - **Provide Assistance**: Offer the necessary first aid based on the injury or illness.
   - **Seek Medical Help**: If required, call for professional help immediately.
3. **First Aid in Specific Situations**:
   - **Wound**: Clean the wound with water and apply a sterile dressing.
   - **Bleeding**: Apply pressure on the wound to stop bleeding. For severe bleeding, apply a tourniquet above the wound.
   - **Fracture**: Immobilize the broken bone, apply ice, and elevate if possible.
   - **Choking**: Perform the Heimlich maneuver or back blows to dislodge the object.
   - **Burns**: Cool the burn under cold running water and cover with a sterile dressing.
   - **Epistaxis (Nosebleed)**: Pinch the nostrils together and lean forward to prevent swallowing of blood.
   - **Strains and Sprains**: Rest, ice, compression, and elevation (R.I.C.E.).
   - **Animal Bites**: Clean the wound, apply antiseptic, and seek professional care for rabies prophylaxis.
4. **Cardio-Pulmonary Resuscitation (CPR)**:
   - **Objective**: To restore normal breathing and circulation in cases of cardiac arrest or severe respiratory issues.
   - **Steps for Adults**:
     1. Check the person's responsiveness and call for help.
     2. Open the airway by tilting the head backward.
     3. Perform chest compressions (30 compressions).
     4. Provide rescue breaths (2 breaths after every 30 compressions).

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5. Continue until help arrives or the person begins breathing.

Recommended Books (Recent Editions)

1. **Park K.** *Park's Textbook of Preventive and Social Medicine* (23rd Edition). Jabalpur: Banarsidas Bhanot Publishers, 2015.
2. **Suryakantha.** *Textbook of Community Medicine with Recent Advances* (4th Edition).
3. **Bhalwar R.** *Textbook of Public Health and Community Medicine* (2nd Edition). Pune: Department of Community Medicine AFMC, 2012.
4. **Essentials of Community Medicine for Allied Health Sciences**, JSS University Publications, 2015.

II **Semester**

Allied -2- Psychology

Applied Psychology for Healthcare

Objective:
By the end of this semester, students will develop the skills to better understand patients, especially in the context of psychological health. The course aims to equip students with a foundational knowledge of psychology, psychological disorders, stress, and therapeutic techniques.

Unit I: Introduction to Psychology (12 hours)

1. **Meaning and Definitions of Psychology:**
   - **Psychology**: The scientific study of the mind and behavior.
   - Explores how humans think, feel, and act both individually and in groups.
2. **Evolution of Modern Psychology:**
   - **Early Roots**: Philosophy, biology, and early psychology.
   - **Wilhelm Wundt**: The founder of experimental psychology, established the first psychology laboratory.
   - **Psychology as a Science**: Transition from philosophy to a distinct scientific field in the late 19th century.
3. **Scope of Psychology:**
   - **Research and Applied Psychology**: Covers a wide range of human behaviors, emotions, and cognitive processes.
   - Includes areas like clinical, educational, industrial, forensic, and health psychology.
4. **Branches of Psychology:**
   - **Clinical Psychology**: Focuses on diagnosing and treating psychological disorders.
   - **Cognitive Psychology**: Studies mental processes like thinking, memory, and decision-making.
   - **Developmental Psychology**: Examines human growth and changes over the lifespan.
   - **Health Psychology**: Explores the role of psychological factors in physical health.
5. **Concept of Normality and Abnormality:**
   - **Normality**: Behaviors and patterns that are typical within a specific society or culture.
   - **Abnormality**: Deviations from societal norms that may indicate a psychological disorder.
   - Psychological disorders are often defined by distress, dysfunction, and deviance.

Unit II: Identifying Psychological Disorders (12 hours)

1. **Anxiety Disorders**:
   - **Panic Disorder**: Recurrent panic attacks characterized by intense fear and physical symptoms like palpitations and shortness of breath.

- **Phobias**: Extreme fear of specific objects or situations, such as heights or spiders.
- **Obsessive-Compulsive Disorder (OCD)**: Recurrent, intrusive thoughts (obsessions) and compulsive behaviors to reduce anxiety.
- **Post-Traumatic Stress Disorder (PTSD)**: Triggered by a traumatic event, leading to flashbacks, nightmares, and heightened anxiety.

2. **Signs, Symptoms, and Management**:
   - Early identification and intervention are key.
   - Treatments may include therapy (e.g., CBT) and medications (e.g., antidepressants or anti-anxiety drugs).

Unit III: Stress (12 hours)

1. **Hans Selye's Model of Stress**:
   - **General Adaptation Syndrome (GAS)**: Describes the body's physiological response to stress in three stages: Alarm, Resistance, and Exhaustion.
   - **Acute vs. Chronic Stress**: Acute stress can be short-term and adaptive, whereas chronic stress is harmful and long-term.
2. **Lazarus and Folkman's Model of Stress**:
   - Focuses on the process of appraisal and coping. Stress is a result of an individual's perception of a situation as threatening or overwhelming.
   - **Coping Strategies**: Problem-focused vs. emotion-focused coping mechanisms.
3. **Sources of Stress**:
   - External (e.g., work, relationships, financial pressures) and internal (e.g., self-criticism, anxiety) sources of stress.
4. **Stress, Disease, and Health**:
   - Chronic stress is linked to numerous health problems such as heart disease, diabetes, and immune dysfunction.
   - The body's prolonged fight-or-flight response can weaken physical and mental health.
5. **Changing Health-Impairs Behavior**:
   - Chronic stress can lead to unhealthy behaviors such as smoking, overeating, and poor sleep habits.

Unit IV: Learning (12 hours)

1. **Meaning and Definition of Learning**:
   - **Learning**: A relatively permanent change in behavior or knowledge that occurs as a result of experience.
2. **Theories of Learning**:
   - **Pavlov's Classical Conditioning**:
     - **Example**: Pavlov's dogs learning to associate a bell sound with food.
     - Involves associating a neutral stimulus with a meaningful one to trigger a conditioned response.
   - **Skinner's Operant Conditioning**:

- **Example**: Skinner's pigeons or rats learning behaviors based on reinforcement or punishment.
- Operant conditioning involves strengthening or weakening a behavior through consequences.

Unit V: Therapeutic Techniques (12 hours)

1. **Counseling**:
   - **Meaning and Definition**: A therapeutic process where a trained professional helps individuals make decisions, solve problems, or address emotional issues.
   - **Techniques**: Active listening, empathetic response, and providing feedback.
2. **Psychotherapy**:
   - **Meaning and Definition**: A structured interaction between a therapist and a client aimed at alleviating psychological distress and promoting emotional well-being.
   - **Techniques**: Cognitive Behavioral Therapy (CBT), psychodynamic therapy, and humanistic therapy.
3. **Relaxation Techniques**:
   - Techniques such as **progressive muscle relaxation**, **guided imagery**, and **meditation** can help manage stress and anxiety.
   - **Breathing Exercises**: Focus on deep, slow breathing to trigger the body's relaxation response.
4. **Introduction to Psychoanalytical, Behavioral, and CBT Techniques**:
   - **Psychoanalytic Therapy**: Focuses on unconscious conflicts and early childhood experiences (developed by Freud).
   - **Behavioral Therapy**: Based on principles of conditioning, aiming to modify maladaptive behaviors.
   - **Cognitive Behavioral Therapy (CBT)**: Focuses on changing negative thought patterns to improve emotional regulation and behaviors.

Recommended Books (Recent Editions)

1. **C.P. Khokhar (2003)** *Textbook of Stress Coping and Management*, Shalab Publishing House.
2. **S.M. Kosslyn & R.S. Rosenberg (2006)** *Psychology in Context*, Pearson Education Inc.
3. **C.R. Carson, J.N. Bitcher, S. Mineka & J.M. Hooley (2007)** *Abnormal Psychology* (13th edition), Pearson Education Inc.
4. **D.A. Barlow & V.M. Durand (2004)** *Abnormal Psychology* (3rd edition), Wadsworth, Thompson Learning.
5. **R.J. Gerrig & P.G. Zimbardo (2006)** *Psychology and Life*, Pearson Education Inc.
6. **Pestonjee, D.M. (1999)** *Stress & Coping, The Indian Experience* (2nd edition), Sage India Publications.

B.Sc. Renal Dialysis Technology

III **Semester**

Core 7- Applied pathology related to Renal DialysisTechnology

Unit I: Congenital and Cystic Diseases of the Kidney & Glomerular Diseases (12 hours)

1. **Congenital and Cystic Diseases of the Kidney:**
   - **Polycystic Kidney Disease (PKD)**: A genetic disorder characterized by the development of fluid-filled cysts in the kidneys, leading to progressive renal failure.
   - **Multicystic Dysplastic Kidney (MCDK)**: A congenital condition where the kidney is replaced by multiple cysts that impair kidney function.
   - **Cystic Renal Disease**: Involves various cystic abnormalities in the kidney, including simple cysts, which are often asymptomatic but may cause complications like infection or bleeding.
2. **Introduction and Clinical Manifestations of Glomerular Diseases:**
   - **Clinical Manifestations**: Proteinuria, hematuria, hypertension, edema, and reduced kidney function are common symptoms.
   - **Common Types of Glomerular Diseases**:
     - **Nephritic Syndrome**: Characterized by hematuria, hypertension, and edema.
     - **Nephrotic Syndrome**: Characterized by massive proteinuria, hypoalbuminemia, and edema.
3. **Pathogenesis of Glomerular Diseases (Brief Overview):**
   - **Immune Mechanisms**: The primary mechanism involves immune-mediated injury where the body's immune system attacks the glomeruli.
   - **Non-immune Mechanisms**: Can involve metabolic disorders, genetic mutations, or hypertension causing structural changes in the glomeruli.

Unit II: Nephritic and Nephrotic Syndromes (12 hours)

1. **Nephritic Syndrome:**
   - **Acute Post-Infectious Glomerulonephritis (APIGN)**: Often following a streptococcal infection, this type of glomerulonephritis presents with edema, hematuria, and reduced renal function.
   - **Rapidly Progressive Glomerulonephritis (RPGN)**: A severe form of glomerulonephritis that rapidly leads to kidney failure, characterized by crescent formation on biopsy.
2. **Nephrotic Syndrome:**
   - **Membranous Glomerulonephritis**: A common cause of nephrotic syndrome in adults, characterized by thickening of the glomerular basement membrane.
   - **Minimal Change Disease (MCD)**: The most common cause of nephrotic syndrome in children, marked by the absence of significant changes on light microscopy.
   - **Focal Segmental Glomerulosclerosis (FSGS)**: Characterized by segmental scarring of the glomeruli, leading to nephrotic syndrome and progressive renal failure.
   - **Membranoproliferative Glomerulonephritis (MPGN)**: A disorder involving both immune complex deposition and complement activation, leading to glomerular inflammation.

Unit III: IgA Nephropathy, Chronic Glomerulonephritis & Glomerular Lesions in Systemic Diseases (12 hours)

1. **IgA Nephropathy**:
   - **Clinical Features**: The most common primary glomerulonephritis worldwide, typically presenting with recurrent hematuria, often after respiratory or gastrointestinal infections.
   - **Pathogenesis**: Deposition of IgA immune complexes in the glomeruli causes inflammation and subsequent kidney damage.
2. **Chronic Glomerulonephritis**:
   - **Characteristics**: A progressive, often irreversible condition leading to fibrosis and scarring of the glomeruli, ultimately resulting in end-stage renal disease (ESRD).
   - **Clinical Manifestations**: Proteinuria, hematuria, hypertension, and progressive decline in kidney function.
3. **Glomerular Lesions in Systemic Diseases**:
   - **Diabetes**: Diabetic nephropathy is a major cause of kidney failure, characterized by glomerular basement membrane thickening and mesangial expansion.
   - **Amyloidosis**: Deposition of amyloid proteins in the glomeruli causes nephrotic syndrome and renal dysfunction.
   - **Systemic Lupus Erythematosus (SLE)**: Lupus nephritis involves immune-mediated damage to the glomeruli, leading to proteinuria, hematuria, and potential renal failure.
4. **Vascular Diseases**:
   - **Benign Hypertension**: Long-term hypertension leads to hyaline arteriosclerosis and glomerulosclerosis, contributing to chronic kidney disease (CKD).
   - **Malignant Hypertension**: A severe, life-threatening form of hypertension that leads to fibrinoid necrosis in arterioles and glomerular damage.
   - **Renal Artery Stenosis**: A narrowing of the renal arteries, which can lead to ischemia and hypertension.
   - **Thrombotic Microangiopathy**: Involves microvascular damage, leading to hemolytic anemia, thrombocytopenia, and renal failure.

Unit IV: Tubulo-Interstitial Diseases & Obstructive Uropathy (12 hours)

1. **Tubulo-Interstitial Diseases**:
   - **Acute Tubular Injury (ATI)**: Caused by ischemia or nephrotoxic agents, leading to kidney dysfunction and tubular cell death.
   - **Pyelonephritis**:
     - **Acute Pyelonephritis**: A bacterial infection of the kidneys that leads to fever, flank pain, and dysuria.
     - **Chronic Pyelonephritis**: Often associated with vesicoureteral reflux, leading to scarring and loss of renal function.
   - **Tubulointerstitial Nephritis Due to Drugs and Toxins**: Includes nephrotoxic reactions to medications (e.g., NSAIDs, antibiotics, and ACE inhibitors).

- **Others**: Can include autoimmune diseases and infections causing chronic interstitial inflammation and fibrosis.

2. **Obstructive Uropathy**:
   - **Causes**: Can be caused by stones, tumors, or strictures in the urinary tract that block urine flow, leading to hydronephrosis and potential kidney damage.
   - **Pathophysiology**: The obstruction leads to increased pressure within the renal pelvis, which can impair kidney function and cause tissue damage.

Unit V: Urolithiasis, Lower Urinary Tract Infections & Peritoneal Pathology (12 hours)

1. **Urolithiasis and Lower Urinary Tract Infections (UTIs)**:
   - **Urolithiasis**: Formation of stones in the kidneys, ureters, or bladder, often causing pain, hematuria, and urinary tract obstruction.
   - **UTIs**: Infections affecting the bladder, urethra, and kidneys. Chronic or recurrent UTIs can lead to scarring of the kidneys.
2. **Pathology of the Peritoneum**:
   - **Peritonitis**: Inflammation of the peritoneum due to bacterial or fungal infections, often secondary to ruptured organs or dialysis-related infections.
   - **Bacterial, Tubular & Sclerosing Peritonitis**: A progressive condition characterized by fibrosis and loss of peritoneal function, which may result from peritoneal dialysis.
   - **Dialysis-Induced Changes**: Peritoneal dialysis can cause long-term changes in the peritoneal membrane, leading to sclerosing peritonitis.

Practicals: (2nd B.Sc. RDT)

1. **Urine Examination**:
   - Physical (color, appearance), Chemical (pH, specific gravity, glucose, proteins), and Microscopic (cells, casts, crystals) examination.
2. **Blood Grouping & Rh Typing**: Determining ABO and Rh blood types for transfusion purposes.
3. **Hemoglobin Estimation, PCV, ESR**: Estimation of hemoglobin levels, packed cell volume, and erythrocyte sedimentation rate as indicators of anemia and inflammation.
4. **Histopathology**:
   - **Fixatives & Preservation of Tissues**: Methods for preserving tissues for microscopic examination.
   - **Staining Techniques**: Hematoxylin and eosin (H&E), PAS (Periodic Acid-Schiff), MTS (Masson's Trichrome Staining), Jones methenamine silver for specific tissue and kidney pathology.
   - **Direct Immunofluorescence Staining**: Used to detect immune complex deposition in kidney tissues, particularly in glomerulonephritis.

1. Charts:

1 Nephritic syndrome
2 Nephrotic syndrome
3 Pyelonephritis
4 Lower urinary tract infection
5 Acute renal failure
6 Chronic renal failure
7 Diabetic nephropathy
8 Peritoneal fluid analysis
9 Neutrophilia
10 Bleeding disorders
11 Clotting disorders

2. Specimens:

1 Small contracted kidney
2 Cystic diseases
3 Pyelonephritis
4 Hydronephrosis

Final examination (practicals)

1. Hemoglobin - 10 marks
2. Blood group - 10 marks
3. Charts + Specimens - 10 marks (5 marks each)
4. Urinalysis - 10 marks

Reference Books (latest edition)

1 Basic Pathology Robbins Saunders an imprint of Elsevier Inc., Philadelphia, USA
2 Text book of Pathology Harsh Mohan Jaypee Brothers, New Delhi
3 Practical Pathology P. Chakraborty, Gargi Chakraborty New Central Book Agency, Kolkata
4 Text Book of Haematology Dr. Tejinder Singh Arya Publications, Sirmour (H.P)
5 Text Book of Medical Laboratory Technology Praful Godkar, Bhalani Publication House, Mumbai
6 Text Book of Medical Laboratory Technology RamanikSood
7 Practical Haematology Sir John Dacie Churchill Livingstone, London.
8 Todd & Sanford, Clinical Diagnosis & Management by Laboratory Methods John Bernard Henry All India Travellar Booksellar
9 Histopathology Techniques. Culling
10 Histopathology Techniques Bancroft
11 Diagnostic Cytopathology Koss
12 Diagnostic Cytopathology Winifred grey
13 Hand-Book of Medical Laboratory Technology CMC Vellore
14 Basic Haematological Techniques Manipal Manual

III Semester

Core 8- Applied Microbiology Related to Renal DialysisTechnology

Unit I: Sterilization and Disinfection (12 hours)

1. **Sterilization and Disinfection - Classification, Principle, Methods:**
   - **Sterilization** is the complete elimination or destruction of all forms of microbial life, including bacterial spores.
   - **Disinfection** refers to the process of reducing the number of viable pathogens to a level that does not pose a risk of disease transmission.

   Classification of Sterilization and Disinfection Methods:

   - **Physical methods**: Heat (steam, dry heat), radiation (UV radiation), filtration.
   - **Chemical methods**: Chemical disinfectants (alcohol, chlorine compounds, hydrogen peroxide).

   Principles:

   - **Sterilization**: Uses heat, chemicals, or filtration to kill all forms of microorganisms. Key methods include autoclaving, dry heat sterilization, and chemical sterilization.
   - **Disinfection**: Involves the use of chemicals (e.g., bleach, alcohol) or physical processes (e.g., boiling) to destroy pathogens, but does not eliminate all microbial forms like sterilization.
2. **Central Sterile Supply Department (CSSD):**
   - **Role**: Centralized unit responsible for receiving, cleaning, disinfecting, sterilizing, packaging, and distributing sterile medical supplies and equipment.
   - **Key Functions**:
     - Sterilization of reusable medical instruments and devices.
     - Maintaining records of sterilization cycles and effectiveness.
     - Ensuring proper packaging to maintain sterility until use.

Unit II: Importance of Sterilization and Disinfection (12 hours)

1. **Disinfection of Instruments Used in Patient Care:**
   - Instruments used for patient care, such as **scalpels**, **forceps**, and **catheters**, need to be disinfected or sterilized to prevent cross-contamination and the spread of infections.
   - Methods: Immersion in chemical disinfectants (e.g., glutaraldehyde), autoclaving, or boiling depending on the material's tolerance.
2. **Disinfection of Patient Care Units:**
   - **Disinfection protocols** must be followed for patient care units, such as **ICUs**, **wards**, and **operating rooms**. Surfaces (e.g., beds, floors, and equipment) are routinely disinfected with hospital-grade disinfectants.

- **High-touch surfaces** and equipment (e.g., IV poles, monitors) should be disinfected frequently to reduce the risk of hospital-acquired infections (HAIs).

3. **Infection Control Measures for ICUs:**
   - **Barrier precautions**: Personal protective equipment (PPE) such as gowns, gloves, masks, and face shields.
   - **Hand hygiene**: Proper handwashing or use of alcohol-based hand sanitizers before and after patient contact.
   - **Environmental cleaning**: Routine disinfection of patient areas and high-touch surfaces in ICUs to prevent cross-contamination.
   - **Isolation practices**: For patients with contagious infections, appropriate isolation precautions must be implemented.

Unit III: Healthcare-Associated Infections (HAIs) (12 hours)

1. **Surgical Site Infections (SSI):**
   - **Definition**: Infections that occur at or near the site of surgery within 30 days of the operation (or up to 1 year if a prosthetic device was implanted).
   - **Risk Factors**: Poor hygiene, prolonged surgery, contamination during surgery, and immunocompromised conditions.
   - **Prevention**: Proper surgical sterilization, antibiotic prophylaxis, maintaining sterile techniques during surgery, and post-operative care to prevent infection.
2. **Ventilator-Associated Pneumonia (VAP):**
   - **Definition**: Pneumonia that develops in a patient who has been on mechanical ventilation for more than 48 hours.
   - **Risk Factors**: Prolonged mechanical ventilation, improper handling of ventilation equipment, aspiration, and presence of underlying chronic lung disease.
   - **Prevention**:
     - Maintain proper hygiene and disinfection of ventilator equipment.
     - Elevate the head of the bed to prevent aspiration.
     - Implement strict infection control practices in the ICU.
     - Regular oral care to reduce the risk of bacterial colonization.
3. **Catheter-Associated Bloodstream Infections (CABSI):**
   - **Definition**: Infections caused by the introduction of bacteria or fungi into the bloodstream through central venous catheters or peripheral catheters.
   - **Risk Factors**: Prolonged catheter use, poor aseptic technique during catheter insertion, and inadequate catheter care.
   - **Prevention**:
     - Use of sterile technique during insertion.
     - Regular catheter site cleaning and dressing changes.
     - Minimizing the duration of catheter use and avoiding unnecessary catheterization.

12 hours

Morphology pathogenesis, clinical features, laboratory diagnosis and prophylaxis offollowing viral infections

Hepatitis B, D and C virus

Practical Sessions:

1. **Sterilization and Disinfection Practices in Tertiary Care Hospital:**
   - Understanding the essential practices in a hospital setting, including sterilization techniques for various instruments and environments.
   - Focus on **autoclaving**, **chemical sterilization**, and **UV sterilization**.
2. **Quality Control of Sterilization and Interpretation of Results of Sterility Testing:**
   - Learn how to monitor and control sterilization processes, ensuring all procedures are effective.
   - Practice interpreting sterility test results to confirm the safety of the sterilization process.
3. **Collection of Specimens from Different Units for Sterility Testing:**
   - Collect samples from various hospital settings like outpatient departments (OPDs), inpatient units, operation theatres (OT), and ICUs for sterility testing.
   - Understand the procedure for ensuring that collected samples are sterile.
4. **Preparation of Materials for Autoclaving:**
   - Learn the correct procedure for preparing materials for autoclaving, including **packing**, **loading**, **holding time**, and **unloading**.
   - The aim is to ensure that all materials are safely sterilized without contamination.
5. **Disinfection of Wards, OT, Dialysis Units, and Laboratories:**
   - Study the proper disinfection methods for **operation theatres**, **dialysis units**, **ICUs**, and other **critical areas** of the hospital.
   - Learn **air sampling methods** to monitor air quality for potential pathogens.
6. **Sterility Testing and Interpretation for Various Types of Water:**
   - **Hemodialysis Water**, **Distilled Water**, and **Deionized Water** must meet certain sterility standards.
   - Learn the testing procedures for sterility and interpret the results to ensure safe water quality for patient care.

Practical Examination Pattern:

1. **Sterilization Practices - Principle, Packing, Operation (10 Marks):**
   - Demonstrate the **principles of sterilization** and the process of **packing** materials for autoclaving.
   - Show the operation of sterilization equipment, ensuring correct procedures are followed for effective sterilization.
2. **Quality Control of Sterilization Methods/Disinfectants (10 Marks):**
   - Evaluate and monitor the effectiveness of sterilization techniques and disinfectants.
   - Demonstrate the use of **biological indicators** and other quality control measures to validate sterilization.
3. **Methods of Collection & Processing of Specimens from Various Wards/OTs/ICUs for Sterility Testing (5 Marks):**
   - Showcase proper methods of specimen collection from **outpatient units**, **inpatient units**, **minor/major operation theatres**, and **ICUs**.

- Demonstrate the process of processing these specimens for sterility testing.

4. **Disinfection Procedures for Various Wards/OTs/ICUs (5 Marks):**
   - Show disinfection procedures for **wards**, **operation theatres**, **dialysis units**, and **ICUs**, ensuring all surfaces and equipment are safely sanitized.
5. **Sterility Testing of Hemodialysis Water/Distilled Water/Deionized Water (10 Marks):**
   - Perform sterility tests on **hemodialysis water**, **distilled water**, and **deionized water**.
   - Interpret the results to ensure compliance with safety standards for water used in medical treatments.

Recommended Books:

1. **Textbook of Microbiology** by Ananthnarayan & Paniker
2. **Textbook of Hospital Infection Control** by Purvamathur
3. **Textbook of Microbiology** by Baveja
4. **Hospital Infection Control Manual** by Mayhall
5. **Guidelines for Maintenance of Hemodialysis in India**

III Semester

Core-9: Introduction to Renal Disease Treatment (RDT)

Unit I: Epidemiology of Kidney Disease - 12 hrs

- **Magnitude of the Problem in the Community:**
  - Kidney disease has become a global health issue with increasing prevalence.
  - Understanding the impact on populations, including age, gender, and socioeconomic factors.
- **Demographics of ESRD Population:**
  - ESRD (End-Stage Renal Disease) patients are growing in numbers globally.
  - Focus on the social, economic, and medical burden on healthcare systems.
- **Global Epidemiology of RRT (Renal Replacement Therapy) Options:**
  - Overview of RRT options such as dialysis (hemodialysis, peritoneal dialysis) and kidney transplantation.
  - Differences in treatment access and availability worldwide.

Unit II: Applied Renal Anatomy and Physiology - 12 hrs

- **Applied Anatomy of the Kidney:**
  - Structure and function of kidneys, nephron structure, and filtration processes.
  - Kidney blood supply: renal arteries, veins, and the role of glomerular filtration.
- **Anatomy of Neck, Upper Limb, and Lower Limb Vessels:**
  - Vascular anatomy related to dialysis access sites.
  - Central venous catheters (CVCs), arteriovenous fistulas (AVF), and grafts (AVG) for dialysis.

Unit III: Clinical Presentation of Renal Disease & History Taking - 12 hrs

- **Clinical Presentation of Renal Disease:**
  - Common symptoms of kidney diseases: edema, hypertension, hematuria, proteinuria, etc.
  - Signs of renal failure: fluid imbalance, electrolyte disturbances, and uremic symptoms.
- **History Taking:**
  - Detailed patient history related to kidney disease (family history, previous conditions, medication use).
  - Key questions to ask: onset of symptoms, comorbidities (e.g., diabetes, hypertension), and exposure to nephrotoxic agents.

Unit IV: Investigations in Nephrology - 12 hrs

- **Urine Examination:**
  - Routine urine tests (urinalysis) to assess proteinuria, hematuria, and kidney function.
  - Spot urine tests like albumin-to-creatinine ratio (ACR) for early detection of kidney disease.
- **Hemogram and Serology:**
  - Blood tests to assess renal function: urea, creatinine, electrolytes, and hemoglobin.
  - Serological markers for kidney diseases (e.g., ANA for lupus nephritis).
- **Biochemical Tests:**
  - Kidney function tests: Blood Urea Nitrogen (BUN), creatinine clearance, and glomerular filtration rate (GFR).
- **Radioimaging in Nephrology:**
  - Renal ultrasound, CT scan, and MRI to assess kidney structure and pathology.
  - Contrast-enhanced imaging for detecting renal masses or obstructions.
- **Renal Biopsy:**
  - Indications: unexplained renal failure, nephrotic syndrome, or renal masses.
  - Prerequisites: informed consent, preparation, and patient monitoring.
  - Complications: bleeding, infection, and injury to adjacent structures.
- **Investigations Required Before Starting Dialysis:**
  - Blood work, imaging, and vascular access planning (e.g., fistula creation or catheter insertion).

Unit V: Screening for Chronic Kidney Disease & Preventive Nephrology - 12 hrs

- **Screening for Chronic Kidney Disease (CKD):**
  - Identification of high-risk populations for CKD, such as those with diabetes, hypertension, and family history.
  - Use of biomarkers (e.g., serum creatinine, eGFR, urine albumin) to detect early kidney dysfunction.
- **Preventive Nephrology:**
  - Preventive measures to slow CKD progression: blood pressure control, glycemic control, and lifestyle changes.
  - Role of nephrology in managing risk factors like smoking, obesity, and hyperlipidemia.

Practicals (40 Marks)

- **Case Discussion (Nephrotic Syndrome, Nephritic Syndrome, Acute Renal Failure, Chronic Renal Failure):**
  - Present and discuss clinical cases of these renal conditions.
  - Focus on pathophysiology, diagnostic tests, clinical features, and management strategies.

University Practical Examinations:

1. **History Taking (20 Marks):**
   - Demonstrate how to take a thorough medical history for a renal disease patient, including family history, medication use, and symptom timeline.
2. **General Physical Examination (20 Marks):**
   - Perform and demonstrate key components of a physical exam (pulse, BP, temperature, pallor, icterus, edema).

Recommended Books (Recent Editions):

1. **Dialysis Therapy** – Nissenson & Fine
2. **Handbook of Dialysis** – Daugirdas, Blake & Todd
3. **Principles and Practice of Dialysis** – Heinrich
4. **Primer to Kidney Disease**
5. **CKD, Dialysis, and Transplant** – A Companion to Brenner & Rector's The Kidney
6. **Comprehensive Clinical Nephrology** – John Feehally
7. **Handbook of Nutrition and Kidney** – Lippincott Williams & Wilkins

1. Overview

- **Functionalities of a Computer:**
  - A computer is an electronic device that processes data and performs tasks based on instructions (software).
  - **Definition:** A system that takes input, processes data, and outputs results.
  - **Advantages:**
    - Fast computation and processing
    - Accuracy in data handling
    - Ease of communication and information sharing
    - Automation of repetitive tasks
  - **Disadvantages:**
    - Requires electricity to operate
    - Dependent on software and hardware quality
    - Vulnerability to technical failures and cyber threats

2. Applications of Computers

- **Banking:**
  - Automated banking systems for transactions, record-keeping, and customer management
  - Online banking and ATMs
- **Insurance:**
  - Data management, claim processing, and risk assessment
  - Online policy management and sales
- **Education:**
  - E-learning platforms, virtual classrooms, and online assessments
  - Learning management systems (LMS)
- **Marketing:**
  - Digital marketing, social media marketing, and customer data analysis
  - Automated customer relationship management (CRM)
- **Health Care:**
  - Electronic health records (EHR), diagnostic tools, and telemedicine
  - Patient management and health data analysis
- **Engineering Design:**
  - CAD (Computer-Aided Design), CAM (Computer-Aided Manufacturing)
  - Simulation and modeling for various industries
- **Military:**
  - Simulations, communications, and data encryption
  - Weapon systems, defense analysis, and surveillance
- **Communication:**
  - Email, instant messaging, video conferencing, and social media
  - Telecommunications infrastructure management
- **Government:**
  - E-Government services, digital record-keeping, and public service management
  - Taxation, law enforcement, and policy enforcement systems

3. Generations of Computers

- **First Generation (1940–1956):**
  - Vacuum tubes for processing and storage
  - Large, expensive, and consumed a lot of electricity
  - Example: ENIAC (Electronic Numerical Integrator and Computer)
- **Second Generation (1956–1963):**
  - Use of transistors instead of vacuum tubes
  - Smaller, faster, and more reliable
  - Example: UNIVAC (Universal Automatic Computer)
- **Third Generation (1964–1971):**
  - Introduction of integrated circuits (ICs)
  - Reduced size, improved efficiency, and more affordable
  - Example: IBM 360
- **Fourth Generation (1971–Present):**
  - Microprocessors, personal computers (PCs), and modern computing
  - Increased speed, storage, and accessibility
  - Example: Intel 4004, Apple Macintosh
- **Fifth Generation (Future):**
  - Artificial Intelligence (AI) and Quantum Computing
  - Neural networks, advanced robotics, and advanced machine learning

4. Types of Computers

- **PC (Personal Computer):**
  - Designed for individual use, commonly used for tasks like word processing, internet browsing, and gaming
- **Workstation:**
  - High-performance computers used for specialized tasks, such as graphic design, scientific simulations, and 3D modeling
- **Minicomputer:**
  - Medium-sized computers used by small businesses or departments
  - Handle multiple users simultaneously
- **Mainframe:**
  - Large, powerful systems used by large organizations to handle massive amounts of data and support hundreds or thousands of users simultaneously
- **Supercomputer:**
  - The most powerful computers, used for complex simulations, research, and large-scale data analysis
  - Used in fields like weather forecasting, cryptography, and physics

5. Components of a Computer

- **Input Unit:**
  - Devices that allow data to enter the computer (e.g., keyboard, mouse, scanner)
- **CPU (Central Processing Unit):**
  - The "brain" of the computer where data processing takes place
  - Consists of several key components, including memory, control unit, and ALU
- **Output Unit:**

- Devices that allow data to be displayed or printed, such as monitors, printers, and speakers

6. CPU ~~(Central Processing Unit)~~

- **Memory or Storage Unit:**
  - Stores data and instructions temporarily (RAM) or permanently (Hard Drive, SSD)
- **Control Unit (CU):**
  - Directs the operations of the processor by fetching, decoding, and executing instructions
- **ALU (Arithmetic Logic Unit):**
  - Performs mathematical and logical operations, such as addition, subtraction, and comparison
  - **Arithmetic Section:**
    - Handles all arithmetic operations, such as addition, subtraction, multiplication, and division
  - **Logic Section:**
    - Handles logical operations, such as comparison and decision-making operations (AND, OR, NOT)

7. Input Devices

- **Keyboard:**
  - Primary device for entering text and commands into a computer
  - Various types (e.g., QWERTY, ergonomic, virtual)
- **Mouse:**
  - Pointing device used to interact with the computer's graphical user interface (GUI)
  - Types: Optical, Mechanical, Wireless
- **Advantages of Mouse:**
  - Easy navigation and control of the GUI
  - Allows precise movement and selection
- **Joystick:**
  - Used mainly for gaming and simulations
  - Provides two-dimensional input
- **Light Pen:**
  - A pointing device used to interact directly with the display screen
- **Track Ball:**
  - A ball on a device used to control the movement of the cursor on the screen
- **Scanner:**
  - Used to digitize documents or images into the computer
  - Types: Flatbed, Handheld, Drum
- **Digitizer:**
  - Converts physical objects (like drawings) into digital form for input into the computer
- **Microphone:**
  - Input device that converts sound into digital data for processing
- **Magnetic Ink Card Reader (MICR):**
  - Primarily used in banks to read paper documents with magnetic ink (e.g., checks)
- **Optical Character Reader (OCR):**
  - Converts typed, printed, or handwritten text into machine-readable data
- **Bar Code Readers:**
  - Scans barcodes to retrieve information (commonly used in retail for inventory management)
- **Optical Mark Reader (OMR):**
  - Used to read marked answers on forms, such as in multiple-choice tests

8. Output Devices

- **Monitors:**
  - Displays information visually to the user
  - Types: CRT (Cathode-Ray Tube), LCD (Liquid Crystal Display), LED (Light Emitting Diode)
- **Cathode-Ray Tube (CRT) Monitor:**

- Older type of monitor that uses electron beams to create images on the screen
- **Flat-Panel Display Monitor:**
  - Lightweight and energy-efficient monitors such as LCD, LED, or OLED displays
- **Printers:**
  - Devices used to produce hard copies of digital documents
  - **Impact Printers:**
    - Print by physically striking a ribbon onto paper
    - **Character Printers:** Print one character at a time (e.g., dot matrix printers)
    - **Dot Matrix Printer:** Print text using a grid of dots, relatively low-quality prints
    - **Daisy Wheel Printer:** Uses a wheel of characters to print, relatively slow but high-quality text prints
    - **Line Printers:** Print an entire line of text at a time
    - **Drum Printer:** Uses a rotating drum to print on paper
    - **Chain Printer:** Uses a chain of characters to print an entire line
  - **Non-Impact Printers:**
    - Print without physical impact on paper (e.g., inkjet and laser printers)
    - **Laser Printers:** Use laser beams to produce high-quality prints
    - **Inkjet Printers:** Use ink droplets to create prints

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9. Memory

- **Cache Memory:**
  - A small, high-speed memory located near the CPU to store frequently accessed data
- **Primary Memory (Main Memory):**
  - Temporarily stores data currently being used by the CPU
  - Types: RAM (Random Access Memory) and Cache
- **Secondary Memory:**
  - Permanent storage for data not actively in use
  - Examples: Hard Drives (HDD), Solid-State Drives (SSD), Optical Discs (CDs, DVDs), USB drives

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10. Random Access Memory (RAM)

- **Static RAM (SRAM):**
  - Faster than Dynamic RAM (DRAM)
  - Retains data as long as power is supplied but requires more space and power
- **Dynamic RAM (DRAM):**
  - Slower than SRAM
  - Needs to be periodically refreshed to retain data

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11. Read Only Memory (ROM)

- **MROM (Masked ROM):**
  - Pre-programmed during manufacturing and cannot be modified
- **PROM (Programmable Read-Only Memory):**
  - Can be programmed once after manufacturing
  - Used for storing firmware
- **EPROM (Erasable Programmable Read-Only Memory):**
  - Can be erased and reprogrammed using ultraviolet light
  - Used for firmware updates
- **EEPROM (Electrically Erasable and Programmable Read-Only Memory):**
  - Can be erased and reprogrammed using electrical signals
  - Commonly used for storing small amounts of data like BIOS settings
- **Advantages of ROM:**
  - Non-volatile (data is not lost when the power is turned off)
  - Secure storage for critical system software (e.g., BIOS)
  - Faster read access compared to RAM

12. Motherboard

- **Features of Motherboard:**
  - Central component of the computer
  - Houses the CPU, memory, and other critical hardware components
  - Provides connectivity between components
- **Popular Manufacturers:**
  - ASUS, Gigabyte, MSI, Intel, ASRock
- **Description of Motherboard:**
  - The main circuit board that connects and allows communication between all computer components
  - Contains slots for CPU, RAM, and expansion cards
  - Provides power and data pathways

13. Memory Units

- Memory is used to store data and instructions temporarily or permanently.
- **Types of Memory:**
  - **Primary Memory (RAM):** Temporary memory used by the processor
  - **Secondary Memory (Hard Drive, SSD):** Long-term storage

14. Ports

- **Serial Port:**
  - Transfers data one bit at a time
  - Commonly used for older peripherals like mice and modems
- **Parallel Port:**
  - Transfers multiple bits of data at once
  - Used for printers and scanners
- **PS/2 Port:**
  - A small 6-pin connector for keyboards and mice
- **VGA Port:**
  - Used to connect monitors to the computer
- **Power Connector:**
  - Supplies power to the motherboard and components
- **Firewire Port:**
  - Used for high-speed data transfer, typically for cameras and external drives
- **Modem Port:**
  - Connects to the telephone line for internet connectivity
- **Ethernet Port:**

  - Used for wired network connections (LAN)
- **Game Port:**
  - Used for connecting gaming devices such as joysticks
- **Digital Video Interface (DVI) Port:**
  - Used to connect digital monitors with high-definition output
- **Sockets:**
  - Locations on the motherboard for connecting chips or cards

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15. Hardware

- **Relationship Between Hardware and Software:**
  - Hardware refers to the physical components of the computer (e.g., motherboard, CPU, RAM, hard drives)
  - Software refers to the programs and operating systems that run on the hardware
  - Software needs hardware to function, and hardware needs software to operate

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16. Software

- **System Software:**
  - Essential for running the hardware and applications (e.g., operating systems like Windows, macOS, Linux)
- **Application Software:**
  - Programs designed to perform specific tasks for users (e.g., Microsoft Word, Photoshop, web browsers)

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17. Number System

- **Decimal Number System:**
  - Base-10 system, uses digits 0–9
- **Binary Number System:**
  - Base-2 system, uses digits 0 and 1
  - Fundamental in computer science
- **Octal Number System:**
  - Base-8 system, uses digits 0–7
  - Occasionally used in computing
- **Hexadecimal Number System:**
  - Base-16 system, uses digits 0–9 and letters A–F
  - Commonly used in programming for compact representation of binary numbers

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18. Data and Information

- **Data Processing Cycle:**
  - **Input:** Data entry
  - **Process:** Manipulating or calculating the data
  - **Output:** Displaying or saving the processed data
  - **Storage:** Saving data for future use

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19. Networking

- **Characteristics of a Computer Network:**
  - **Connectivity:** Allows devices to communicate and share resources
  - **Data Sharing:** Facilitates easy exchange of data across devices
  - **Scalability:** Network can be expanded to connect more devices
  - **Security:** Ensures safe data transmission through encryption and access control
- **Cables:**
  - Various types include Ethernet cables (Cat 5, Cat 6), fiber optics, etc., used for data transmission
- **Router:**
  - A device that forwards data packets between networks, allowing devices to connect to the internet
- **Network Card (NIC):**
  - A hardware component that connects a computer to a network
- **Internal Network Cards:**
  - Located inside the computer, typically integrated with the motherboard
- **External Network Cards:**
  - External devices that connect via USB or other ports to allow network connectivity

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20. Operating System

- **Objectives of Operating System:**
  - Manage hardware resources
  - Provide a user interface
  - Enable multitasking and application management
- **Characteristics of Operating System:**
  - **Multitasking:** Run multiple applications at once
  - **Resource Management:** Allocates resources like CPU time, memory, and storage
  - **Security:** Protects data and privacy
  - **User Interface:** Allows users to interact with the system (command line or GUI)

21. Internet and Intranet

Similarities between Internet and Intranet:

- Both are used for communication and information sharing
- Both involve networking technologies
- Both can use web browsers and similar protocols

Differences between Internet and Intranet:

- **Internet:** A global network that connects millions of computers worldwide
- **Intranet:** A private network used within an organization for internal communication
- **Internet:** Open and public
- **Intranet:** Restricted access, usually password-protected

22. Computer Viruses

Types of Computer Viruses:

- **File infector viruses:** Attach to programs or files
- **Macro viruses:** Infect documents with macros (e.g., Word or Excel files)
- **Boot sector viruses:** Affect the boot sector of hard drives or USB drives
- **Polymorphic viruses:** Change their appearance to avoid detection

Use of Antivirus Software:

- Scans and removes viruses from files and programs
- Protects the system in real-time
- Updates regularly to protect against new viruses
- Schedules scans to ensure ongoing protection

Practicals

Operating System Practical Exercises:

1. **Starting Windows and Running Programs:**
    - Starting a program, running multiple programs
    - Switching between windows
    - Customizing the taskbar
    - Restoring deleted files from the Recycle Bin

2. **Managing Folders:**
    - Creating and removing folders
    - Adjusting the taskbar, arranging desktop icons
    - Displaying/hiding the taskbar clock
    - Creating shortcuts
3. **Customizing Desktop:**
    - Adding a program to the Start menu
    - Creating program shortcuts on the desktop
    - Customizing mouse settings
4. **File Management in Explorer:**
    - Expanding and collapsing folders
    - Recognizing file types using icons
    - Renaming, sorting files/folders
    - Using cut, copy, and paste operations to manage files
    - Searching for a file/folder
5. **Disk Management and Audio:**
    - Defragmenting the disk using Disk Defragmenter
    - Controlling speaker volume
    - Recording and saving an audio file
    - Connecting a printer to the PC

Word Processing Practical Exercises:

1. **Creating Letters and Circulars:**
    - Preparing a government order, official/business letter, circular letter
    - Formatting commands: font size/styles, bold, underline, uppercase, lowercase, superscript, subscript, indenting paragraphs, tab settings
2. **Creating a Newsletter:**
    - Preparing a newsletter with borders, two-column text, header/footer
    - Inserting graphic images and adjusting page layout
3. **Using Styles and Templates:**
    - Creating a style and applying it to a document
    - Creating a template with styles and assembling them
4. **Creating and Editing Tables:**
    - Using the table menu to create a table
    - Monthly calendar creation with cell editing operations (insert, join, delete, split, merge cells)
    - Simple calculations (e.g., totaling columns)
5. **Numbered and Bulleted Lists:**
    - Creating numbered lists with various formats (numbers, alphabets, Roman numerals)
    - Creating bulleted lists with different bullet characters
6. **Printing Envelopes and Mail Merge:**
    - Printing envelopes with "From" and "To" addresses
    - Using mail merge for sending personalized letters

Word Processing

1. **Mail Merge:**
   - Sending a circular letter to multiple persons
   - Printing mailing labels
2. **Special Features of Word:**
   - Find and replace text
   - Spell check and correction
   - Generate Table of Contents for a document
   - Prepare index for a document
3. **Document Preparation:**
   - Create an advertisement
   - Prepare a resume
   - Prepare a corporate circular letter inviting shareholders to the Annual Meeting

Worksheet / Spreadsheet

1. **Using Formulas and Functions:**
   - Prepare a worksheet showing monthly sales of a company in different branch offices (calculate total sales, average sales)
   - Prepare a student results statement (10 students, 5 subjects) using formulas to classify results: Distinction, I Class, II Class, Fail
2. **Operating on Sheets:**
   - Finding, deleting, and adding records
   - Formatting columns, adjusting row height, merging and splitting columns
   - Connecting worksheets and entering data
3. **Creating Charts:**
   - Compare monthly sales of a company across different branch offices
4. **Data Consolidation:**
   - Calculate total and average budgets for all departments (wages, travel, office supplies, etc.) using the data consolidate command
5. **Data Analysis:**
   - Sorting data
   - Filtering data
   - Creating Pivot Tables

Presentation Skills

1. **Creating Presentations:**
   - Using templates, Auto Content Wizard, design templates, and plain blank presentations

2. **Slide Transitions:**
    - Automatic and manual transitions with different effects
3. **Custom Animation:**
    - Apply multiple animation effects to the same object
    - Modify or remove effects
4. **Inserting Objects and Handouts:**
    - Insert objects
    - Create and print handouts
5. **Publishing Presentations:**
    - Export presentations

Internet Skills

1. **Browser and File Types:**
    - Understanding different types of browsers
    - Internet file types: .html, .pdf, etc.
2. **Searching and Downloading:**
    - Search for websites, applications, and text documents
    - View and download content
3. **Email:**
    - Create an email account
    - Retrieve messages, reply, attach files, filter, and forward messages
4. **Tablet / Smartphone Applications:**
    - Browsing and practicing applications: UC Browser, Skype
    - Internet usage: sending messages/emails using WhatsApp, WeChat
    - Downloading text, media files, and video conferencing using Skype

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III **Semester**

Allied-3- Environment Science and Health

Environmental Health

Learning Objectives:

1. To know various environmental factors affecting health
2. To learn the modes of disease transmission and various control measures

Unit I – Introduction to Environment and Health, and Water

1a. Introduction to Environment and Health:

- Ecological definition of health
- Population perspective of health-environment relationships
- Health & environment perspective of relations
- Environmental factors
- Environmental sanitation
- Need to study environmental health
- Predominant reasons for ill health in India

1b. Water:

- Safe and wholesome water: requirements and uses
- Sources: sanitary wells, hand pumps
- Water pollution
- Purification of water:
    - Large-scale: slow sand filters, rapid sand filters
    - Small-scale: household purification, disinfection of wells
- Water quality criteria and standards

Unit II – Air, Light, Noise, Radiation

2a. Air:

- Composition of air
- Indices of thermal comfort
- Air pollutants
- Health effects of air pollution
- Environmental effects of air pollution
- Greenhouse effect
- Social and economic effects

- Monitoring, prevention, and control of air pollution

2b. Light, Noise, Radiation:

- Natural and artificial light: properties and sources
- Noise pollution: types, sources, biological effects, and control
- Radiation: sources, biological effects, and protection

Unit III – Waste and Excreta Disposal

3a. Disposal of Wastes:

- Solid wastes: health hazards
- Methods of disposal:
  - Dumping
  - Controlled tipping / sanitary landfill
  - Incineration
  - Composting

3b. Excreta Disposal:

- Public health importance
- Health hazards
- Sanitation barrier
- Methods of excreta disposal in unsewered and sewered areas
- Sewage and modern sewage treatment

Unit IV – Housing, Health, and Medical Entomology

4a. Housing and Health:

- Human settlement
- Social goals of housing
- Criteria for healthful housing (WHO Expert Committee)
- Housing standards: Environmental Hygiene Committee, Rural Housing Standards
- Overcrowding
- Indicators of housing

4b. Medical Entomology:

- Classification of arthropods
- Routes of disease transmission
- Control measures

Unit V
Insecticides and Rodents

5a. Insecticides

- Types of insecticides
- Mechanism of action
- Dosage and application for control of insects

5b. Rodents

- Importance of rodents in disease transmission
- Anti-rodent measures and control strategies

Reference Books (Latest Edition)

1. Park K. *Park's Textbook of Preventive and Social Medicine*, 23rd ed., Jabalpur: Banarsidas Bhanot Publishers, 2015, pp. 135–141
2. Suryakantha. *Textbook of Community Medicine with Recent Advances*, 4th edition
3. Bhalwar R. *Textbook of Public Health and Community Medicine*, 2nd edition, Pune: Department of Community Medicine AFMC, 2012
4. *Essentials of Community Medicine for Allied Health Sciences*, JSS University Publications, 2015

IV Semester

Core-10 – Patient Care and Basic Nursing

Objectives:

- To learn about patient care and basics of nursing activities
- Communication and documentation
- Infection control
- Medication administration
- Wound care

Unit I – Introduction, Communication, and Documentation – 12 hours

1. Introduction to Patient Care:

- Principles of patient care
- Types of patients: gender, age, diseases, severity of illness, triage

2. Communication & Documentation:

- Communication with doctors, colleagues, and other staff
- Non-verbal communication
- Interpersonal relationships
- Patient contact techniques
- Communication with patients and their relatives

3. Documentation:

- Importance of documentation
- Initial and follow-up notes
- Documentation of therapy, procedures, and communication

Unit II – Universal Precautions and Infection Control – 10 hours

4. Universal Precautions and Infection Control:

- Hand washing and hygiene
- Injuries and personal protection
- Isolation and safety procedures
- Aseptic techniques
- Sterilization and disinfection
- Disinfection and sterilization of devices and equipment

- Central Sterilization and Supply Department (CSSD)
- Biomedical waste management

Unit III – Medication Administration and Transport of Patient – 14 hours

5. Medication Administration:

- Oral route
- Parenteral routes: Intravenous (IV), Intramuscular (IM), Subcutaneous (SC), Intradermal (ID)
- IV infusion
- Aerosol medication administration
- Oxygen therapy
- Intravenous fluids
- Blood and blood component transfusion

6. Position and Transport of Patient:

- Patient positioning: prone, lateral, dorsal, dorsal recumbent, Fowler's positions
- Comfort measures
- Bed making
- Rest and sleep

Unit IV – Patient Handling, Bedside Care, and Monitoring – 14 hours

Patient Handling and Transport

1. **Lifting and transporting patients:**
   - Lifting patients up in bed
   - Transferring from bed to wheelchair
   - Transferring from bed to stretcher
2. **Transport of ill patients:**
   - Patients on inotropes
   - Intubated / ventilated patients

Bedside Care

1. **Methods of giving nourishment:**
   - Oral feeding
   - Tube feeding
   - Drips and transfusions
2. **Recording vital signs:**
   - Pulse
   - Blood pressure
   - Respiration
   - Oxygen saturation
   - Temperature
3. **Bedside management:**
   - Use of bed pan and urine container
4. **Observation:**
   - Stools, urine, sputum
   - Drains
5. **Care of catheters and rubber goods**
6. **Care of immobile / bedridden patients:**
   - Prevention of bedsores
   - Aspiration prevention

Monitoring of Patient

1. **Basic monitoring:**
   - Pulse, ECG (cardiac monitor), oxygen saturation, blood pressure, respiration
2. **Advanced monitoring:**
   - Multi-parameter monitors
   - Capnography and End-Tidal CO_2 ($ETCO_2$)
3. **Hydration monitoring:**
   - Intake and output monitoring

4. **Ventilator monitoring:**
    - Respiratory rate
    - Volumes
    - Pressures
    - Compliance
    - Resistance

Unit IV – Wound Care and First Aid – 10 hours

Dressing and Wound Care

1. **Bandaging:**
    - Basic turns
    - Bandaging extremities
    - Triangular bandages and their applications
2. **Surgical dressing:**
    - Observation of dressing procedures
3. **Sutures:**
    - Suture materials
    - Suturing techniques
4. **Splinting**
5. **Basic care of patients with burns**

First Aid and Basic Life Support (BLS)

- Basic first aid techniques
- BLS procedures

Practical Skills / Demonstrations

1. **Patient Care Procedures:**
    - Positioning and transport of patients
    - Dressing and bandaging
    - Care of intercostal drain tube
    - Insertion of nasogastric tube and feeding
2. **Blood Sampling:**
    - Phlebotomy
    - Arterial blood sampling for ABG
3. **Injections:**
    - Intramuscular (IM)
    - Intravenous (IV)
    - Subcutaneous (SC)
    - Intradermal (ID)

4. **IV Catheter and Infusion:**
    - Insertion of IV catheter
    - Medication infusion and blood transfusion
5. **Patient Monitoring:**
    - Recording ECG
    - Monitoring vitals
6. **Oxygen and Aerosol Therapy:**
    - Oxygen therapy: cannula, masks
    - Aerosol therapy: nebulization, inhalers

Patient Care Procedures and Critical Nursing Skills

Procedures

1. **Suctioning and care of artificial airway**
2. **Insertion of urinary bladder catheter**

Instruments and Devices in Patient Care

- Uses of instruments and devices
- Principles of operation
- Advantages
- Disadvantages

First Aid and Basic Life Support (BLS)

- Principles and techniques of **first aid**
- **Basic Life Support (BLS)** procedures

Practical Exam Pattern

- Spotters
- Drugs, instruments, and devices – identification and usage
- Demonstration of patient care procedures

Reference Books

1. *Principles and Practice of Nursing* – Sr Nancy
2. *Introduction to Critical Care Nursing* – Mary Lou Sole
3. *First Aid* – Red Cross Society Guidelines

4. *Basic Life Support (BLS)* – American Heart Association Guidelines

IV Semester

Core -11- Basic Concepts of Renal Disease

Fluid, Electrolyte, and Renal Disorders

Unit I – Fluid and Electrolyte Disorders – 15 hrs

- **Sodium disorders:**
  - Hyponatremia
  - Hypernatremia
  - Etiology, clinical presentation, and management
- **Potassium disorders:**
  - Hypokalemia
  - Hyperkalemia
  - Etiology, clinical presentation, and management
- **Disorders of other ions:**
  - Calcium, phosphorus, magnesium
- **Acid-Base Disorders:**
  - Basics of Arterial Blood Gas (ABG) analysis
  - **Metabolic acidosis:** Pathophysiology, etiology, clinical features, management
  - **Metabolic alkalosis:** Pathophysiology, etiology, clinical features, management

Unit II – Urinary Tract Infections (UTI) – 10 hrs

- Definition of UTI
- Types of UTI
- Risk factors
- Diagnosis
- Treatment

Unit III – Renal Stone and Inherited/Cystic Renal Diseases – 10 hrs

- Composition of kidney stones
- Risk factors for recurrent stones
- Clinical presentation
- Prevention of recurrent stones
- Treatment

Unit IV – Hypertension – 10 hrs

- Normal BP control
- Definition and evaluation of hypertension
- Primary and secondary hypertension
- Complications
- Antihypertensive drugs

Unit V – Nephrotic and Glomerular Syndromes – 15 hrs

- **Nephrotic syndrome (NS):**
  - Definition
  - Clinical features
  - Causes: Minimal Change Disease (MCNS), Focal Segmental Glomerulosclerosis (FSGS), Membranous Glomerulonephritis (MGN), etc.
  - Primary vs. secondary NS
  - Complications
  - Management
- **Acute glomerulonephritis / Rapidly Progressive Glomerulonephritis (RPGN):**
  - Definition
  - Causes: Post-Streptococcal GN (PSGN), vasculitis, anti-GBM disease, SLE, Henoch-Schonlein Purpura (HSP), etc.
  - Clinical features
  - Management

Practical Examinations – 40 Marks

1. **Priming of dialysis apparatus** or **Demonstration of dialyser reuse** – 20 marks
2. **Charts / Spotters – 20 marks:**
   - Nephrotic syndrome
   - Nephritic syndrome
   - AKI
   - CKD
   - BP apparatus
   - Stethoscope
   - Pulse oximeter
   - Cardiac monitor
   - Thermometer

Recommended Books (Recent Editions)

1. *Dialysis Therapy* – Nissenson & Fine

2. *Handbook of Dialysis* – Daugirdas, Blake & Todd
3. *Principles and Practice of Dialysis* – Heinrich
4. *Primer to Kidney Disease*
5. *CKD, Dialysis and Transplant: A Companion to Brenner & Rector's The Kidney*
6. *Comprehensive Clinical Nephrology* – John Feehally
7. *Handbook of Nutrition and Kidney* – Lippincott Williams & Wilkins

IV Semester

Core-12: Acute and Chronic Kidney Diseases and Nutrition

Unit I – Acute Kidney Injury (AKI) – 15 hrs

- Definition of AKI
- Classification of AKI
- Etiology of AKI
- Strategies for reducing risk of AKI
- Complications of AKI
- Non-dialysis management of AKI
- Dialysis therapy for AKI
- Dialysis in ICU setting

Unit II – Chronic Kidney Disease (CKD) – 15 hrs

- Definition of CKD
- Staging of CKD
- **GFR calculation**
- Causes of CKD
- Steps to retard progression of CKD
- Complications of CKD:
    - Cardiovascular
    - Hematologic
    - Mineral bone disorders
    - Dermatologic
    - Neuropsychiatric
- Evaluation of CKD
- Management and **Renal Replacement Therapy (RRT) options**

Unit III – Nutritional Requirements – 10 hrs

- Nutritional requirements of healthy adults
- **Recommended Dietary Allowance (RDA)**
- Effects of renal failure on nutrient metabolism
- Lipid abnormalities in renal disease
- Overview of calcium-phosphorus metabolism
- Trace elements and vitamins

Unit IV – Macronutrients and Diet Planning – 10 hrs

- Sources and types of:
  - Proteins
  - Fats
  - Carbohydrates
- Planning a **balanced diet**

Unit V – Nutrition in Kidney Disease – 10 hrs

- Diet in **nephrotic syndrome**
- Diet in **AKI**
- Diet in **predialysis CKD**
- Nutrition in **dialysis patients**
- Foods to be avoided in CKD
- **Fluid restriction**

Practicals

1. **Priming of dialysis apparatus** or **Demonstration of dialyser reuse** – 20 marks
2. **Spotters (20 marks):**
   - HD catheters
   - Dialysers
   - AV needle
   - Tubings
   - Dialysis machine
   - PD set
   - Perm catheters
   - Dialysis solutions
   - Chemicals used in hemodialysis

Recommended Books (Recent Editions)

1. *Dialysis Therapy* – Nissenson & Fine
2. *Handbook of Dialysis* – Daugirdas, Blake & Todd
3. *Principles and Practice of Dialysis* – Heinrich
4. *Primer to Kidney Disease*
5. *CKD, Dialysis and Transplant: A Companion to Brenner & Rector's The Kidney*
6. *Comprehensive Clinical Nephrology* – John Feehally
7. *Handbook of Nutrition and Kidney* – Lippincott Williams & Wilkins

IV Semester Skill Enhancement-2

Biostatistics and Research Methodology

Learning Objectives

1. To have a basic knowledge of **biostatistics** and its applications in medicine.
2. To know various types of **data presentation** and **data summarization** in the medical field.
3. To have an overview of **data analysis** and **sampling techniques**.
4. To understand various **study designs** in the medical field.
5. To know applications of various **study designs** in medical research.

Biostatistics

Unit I – Introduction and Presentation of Data

- Meaning of statistics
- Branches of statistics
- Uses of statistics in medicine
- Basic concepts
- Scales of measurement
- Collection of data
- **Presentation of data:**
  - Tabulation
  - Frequency distribution
  - Diagrammatic representation
  - Graphical representation

Unit II – Measures of Central Tendency and Measures of Variation

- **Central Tendency:**
  - Arithmetic mean (Mean)
  - Median
  - Mode
  - Partition values
- **Variation:**
  - Range
  - Interquartile range
  - Mean deviation
  - Standard deviation
  - Coefficient of variation

Unit III – Probability and Standard Distributions

- Definition of commonly encountered probability terms
- **Probability distributions:**
  - Binomial distribution
  - Poisson distribution
  - Normal distribution
- Divergence from normality:
  - Skewness
  - Kurtosis

Unit IV – Census and Sampling Methods

- **Census vs. Sample survey**
- Common terms in sampling theory
- **Non-probability (Non-random) sampling methods:**
  - Convenience sampling
  - Consecutive sampling
  - Quota sampling
  - Snowball sampling
  - Judgmental/Purposive sampling
  - Volunteer sampling
- **Probability (Random) sampling methods:**
  - Simple random sampling
  - Systematic sampling
  - Stratified sampling
  - Cluster sampling
  - Multi-stage sampling
- Sampling errors and Non-sampling errors

Unit V – Inferential Statistics

- Parameter vs. statistic
- **Estimation of parameters:**
  - Point estimation
  - Interval estimation
- **Testing of hypothesis:**
  - Null and alternative hypotheses
  - Type I and Type II errors

Unit I – Introduction to Research Methodology

- **Types of research:**
  - Descriptive vs. Analytical
  - Applied vs. Fundamental
  - Quantitative vs. Qualitative
  - Conceptual vs. Empirical

Unit II -
Study Designs-Observational Studies
Epidemiological study designs; Observational studies, Descriptive studies; Case reports, Case series, Analytical studies; Case control studies, Cohort studies, Cross sectional

Unit III-
Experimental Studies
Experimental studies (Interventional studies); Randomized control Trials (Clinical trials), Field trials, Communitytrials, Nm-Randomized Trials

Unit IV-
Uses of Epidemiology

Unit V-
Application of study Designs in Medical Research

References

1. K.R.Sundaram, S.N.Dwivedi and V Sreenivas (2010), Medical statistics, Principles and Methods, BI Publications Pvt Ltd, New Delhi
2. NSN Rao and NS Murthy (2008), Applied Statistics in Health Sciences, Second Edition, Jaypee Brothers Medical Publishers (P) Ltd.
3. J.V.Dixit and L.B.Suryavanshi (1996), Principles and Practice of Biostatistics, First Edition, M/S Banarsidas Bhanot Publishers.
4. GetuDegu and Fasil Tessema (2005), Biostatistics, Ethiopia Public Health Training Initiative.
5. Essentials of Community Medicine for Allied Health Sciences, JSS University Publications, 20.
6. Park K. Park's Textbook of Preventive and Social Medicine. 23rd ed. Jabalpur: Banarsidas Bhanot Publishers, 2015. p.135-141.
7. Suryakantha. Textbook of Community medicine with recent advances. 4th edition.
8. Bhalwar R. Textbook of Public Health and Community Medicine. 2nd Edition. Pune, Department of Community Medicine AFMC, 2012.
9. Leon Gordis. Epidemiology Fourth Edition - Elsevier Saunders Publication.

IV Semester
Allied-4 Constitution of India

Unit - I:
Meaning of the term 'Constitution'. Making of the Indian Constitution 1946-1950.

Unit - II:
The democratic institutions created by the constitution, Bicameral system of Legislature at the Centre and in the States.

Unit - III:
Fundamental rights and duties their content and significance.

Unit - IV:
Directive principles of States, policies the need to balance fundamental rights with directive principles.

Unit - V:
Special rights created in the Constitution for dalits, backwards, women and children and the religious and linguistic minorities.

Unit - VI:
Doctrine of Separation of Powers, legislative, executive and judicial and their functioning in India.

Unit - VII:
The Election Commission and State Public Service commissions.

Unit - VIII:
Method of amending the Constitution.

Unit - IX:
Enforcing rights through writs.

Unit - X:
Constitution and sustainable development in India.

Recommended Books:

1. J.C. Johari. The Constitution of India. A Politico-Legal Study. Sterling Publication, Pvt. Ltd. New Delhi.
2. J.N . Pandey. Constitution Law of India, Allahbad, Central Law Agency, 1998.
3. Granville Austin. The Indian Constitution. Corner Stone of a Nation-Oxford, New Delhi, 2000.

V Semester

Core-13- Hemodialysis part 1

Unit I: 15hrs

Treatment options of RRT, decision to start dialysis and withdrawal of dialysis, predialysis patient education, choosing the RRT option , home hemodialysis

Unit II: 10hrs

Basics of hemodialysis and urea kinetic modelling. Mechanisms of solute transport, dialyser clearance, kt/v and urea reduction ratio, adequacy in hemodialysis

Unit III 15hrs

Vascular access for hemodialysis- venous catheters (type, design, location of insertion and methods used, complications of CVC, maintenance of dialysis catheters)

Arteriovenous access AVF/AVG (presurgical evaluation, advantages, complications and their management, cannulation techniques, measuring access flow, general measures to reduce infection)

Unit IV: 10hrs

HD apparatus- blood circuit, dialysate circuit, monitors and alarms, pumps. Dialysers -types /structure/membrane/clearance/ high flux &low flux

Unit V: 10 hrs

Product water and hemodialysis solution preparation- Contaminants in raw water, water and dailysis solution quality standards , dialysis solution composition, Preparation of RO water and distribution.

Practicals Examination

1. Demonstrate priming of dialysis apparatus-10 M
2. Demonstrate reuse of dialysers- 10 M
3. Spotters- HD catheters, dialysers, AV needle, tubings, dialysis machine, PD set, perm catheters, dialysis solutions, chemicals used in hemodialysis. 20 marks

Recommended Books Recent edition

1. Dialysis therapy- Nissenson & Fine
2. Handbook of dialysis- Daugirdas ,Blake & Todd
3. Principles and practice of dialysis- Heinrich
4. Primer to kidney disease
5. CKD, Dialysis and transplant- A companion to Brenner & Rectors- The Kidney
6. Comprehensive Clinical nephrology -John Feehaly
7. Handbook of nutrition and kidney- Lippincott Williams & Wilkins

V Semester

Core-14- Hemodialysis part 2

Unit I: **10 hrs**

Disinfection of HD machines and maintenance of RO plant- chemicals used and technique of disinfection, advantages

Unit II:
10hrs

Dialyser reuse- definition, methods, advantages and disadvantages of reuse

Unit III: **15hrs**

Hemodialysis for acute renal failure- indications, vascular access, HD prescription, common problems encountered, dialysis for critically ill patients.

Unit IV: **15hrs**

Chronic hemodialysis- indications, residual renal function, clearance targets and adequacy, chronic HD prescription, dry weight, complications, access recirculation, dialysis disequillibrium.

Unit V: **10hrs**

Anticoagulation- factors influencing clotting of extracorporeal circuit, signs of circuit clotting, drugs used for anticoagulation, various protocols, monitoring of anticoagulation, regional anticoagulation

Practicals Examination:

1. Demonstrate priming of dialysis apparatus-10 marks
2. Demonstrate reuse of dialysers- 10 marks
3. Spotters- HD catheters, dialysers, AV needle, tubings, dialysis machine, PD set, perm catheters, dialysis solutions, chemicals used in hemodialysis. 20 marks

Recommended Books Recent edition

1. Dialysis therapy- Nissenson & Fine
2. Handbook of dialysis- Daugirdas, Blake & Todd
3. Principles and practice of dialysis- Heinrich
4. Primer to kidney disease
5. CKD, Dialysis and transplant- A companion to Brenner & Rectors- The Kidney
6. Comprehensive Clinical nephrology -John Feehaly
7. Handbook of nutrition and kidney- Lippincott Williams & Wilkins

Core-15- Hemodialysis part 3

Unit I: **10hrs**

Complications of HD- Hypotension(causes and management) , Headaches, Chest pain and back pain, Leg cramps, Dialyser reactions , itching, nausea, Dialysis Disequillibrium(etiology and management) , seizures, cardiac arrythmias, air embolism.

Unit II: **10hrs**

Renal anemia and its management- etiology, symptoms, treatment, indications for ESA and target Hb levels, dosing of erythropoietin and its side effects.

Unit III: **10hrs**

Hemofilteration/ Hemodiafilteration/ SCUF

Unit IV: **15 hrs**

SLED/SLED-f: advantages of SLED, protocols, anticoagulation.

CRRT- about CRRT machine and tubings, schematic desription of circuit, advantages and disadvantages, indications for CRRT, anticoagulation, replacement fluid(dose, pre Vs post filter)

Unit V: **15hrs**

Plasmapheresis- rationale, methods of plasma separation, indications, common diseases for which used, protocols, complications, anticoagulation for PP.

Practicals Examination: 10 Marks x 4 Exercises

1. Setting up dialysis machine for dialysis
2. AVF/ AVG cannulation
3. Packing and sterilisation of dialysis trays
4. Preparation of concentrates
5. First assistant in central line insertions, PD catheter insertion and renal biopsy
6. Performance of PD exchanges
7. Setting up of APD machine
8. Performing isolated ultrafilteration
9. Priming of dialysis apparatus
10. Reuse of dialyser

Recommended Books Recent edition

1. Dialysis therapy- Nissenson & Fine
2. Handbook of dialysis- Daugirdas ,Blake & Todd
3. Principles and practice of dialysis- Heinrich
4. Primer to kidney disease
5. CKD, Dialysis and transplant- A companion to Brenner & Rectors- The Kidney
6. Comprehensive Clinical nephrology -John Feehaly
7. Handbook of nutrition and kidney- Lippincott Williams & Wilkins

V Semester

Elective-1 Hands on training in Continuous ambulatory peritoneal dialysis

1. Setting up Acute PD- catheter insertion, connections , performing and monitoring of PD
2. Setting up CAPD, performing and monitoring of CAPD, seeing CAPD catheter insertion.
3. Technical aspects of APD machine and performing and monitoring of APD
4. Introduction to PD solutions
5. Performing PET test

V **Semester**

Allied-5-Medical Ethics

General considerations of Medical Ethics

1. Medical Ethics - Introduction
2. Three cor contents in Medical Ethics - Best interest, autonomy unrights
3. Doctors, patient & Profession

Special considerations of Medical Ethics

1. Consent
2. Confidentiality
3. Genetics
4. Reproductive Medicine
5. Mental Health
6. End of life and organ transporentation
7. Research & clinical Trials

Reference Books

Medical Ethics & Law, The Cor Curriculum, Author- Tony Hope Atla
Reference book No:- 16715 Center Library

VI **Semester**

Core 16 - Peritoneal dialysis

Unit I: **12hrs**

Functional anatomy of peritoneum, models of peritoneal transport, physiology of peritoneal transport, PET test, peritoneal clearance and clearance targets.

Unit II: **12hrs**

Apparatus for PD, peritoneal Dialysis solutions, PD catheter designs and placement, catheter break in procedures, complications of PD catheters(leaks, outflow failure, catheter infections, hernias)

Unit III: **12hrs**

Common APD and CAPD prescriptions, advantages of cyclers, hybrid forms of PD, how to improve peritoneal kt/v, nutrition in CAPD.

Unit IV: **12hrs**

Causes of fluid overload in CAPD, ultrafilteration failure, preserving residual renal function, Peritonitis and exit site infections -potential routes of infection,diagnosis, common organisms, drugs used and drug delivery methods.

Unit V: **12hrs**

Mechanical complications (hernias, abdominal wall edema,hydrothorax,) metabolic complications (glucotoxicity, lipid abnormalities, electrolyte abnormalities, protein loss)

Practical Examination: 40 marks

1. Case discussion (a patient on peritoneal dialysis) 20 marks
2. Spotters- cycler device, transfer sets, adaptor, minicaps, drain bags, PD solutions, catheters. 20 marks

Text books and reference books: Recent edition

1. Dialysis therapy- Nissenson & Fine
2. Handbook of dialysis- Daugirdas ,Blake & Todd
3. Principles and practice of dialysis- Heinrich
4. Primer to kidney disease
5. CKD, Dialysis and transplant- A companion to Brenner & Rectors- The Kidney
6. Comprehensive Clinical nephrology -John Feehaly
7. Handbook of nutrition and kidney- Lippincott Williams & Wilkins

VI Semester

Core-17-Dialysis in Special Situations

Unit I: **12hrs**

Use of hemoperfusion and dialysis for poisoning cases- common indications for HP/HD, drugs which can be removed (acetaminophen, salicylates, digoxin, barbiturates, toxic alcohols, lithium, anticonvulsants)

Unit II: **12hrs**

Dialysis in children - choice between Peritoneal dialysis and Hemodialysis, problems with vascular access, HD prescription in children ,nutrition and growth related issues.

Unit III: **12hrs**

Dilaysis in pregnancy-causes for AKI in pregnancy, dialysis regimen during pregnancy, indications for dialysis in pregnancy

Unit IV: **12hrs**

Dialysis in HIV/ HBsAg/ HCV positive patients - Guidelines, infection control practices in HD units, dedicated machines, vaccination for dialysis patients.

Unit V: **12hrs**

Dialysis in patients with congestive cardiac failure- special precautions

Practical Examination: (4 Exercises x 10 marks)

1. Starting / Termination of dialysis
2. AV cannulation
3. Initiating dialysis through central lines
4. Packing of dialysis trays
5. Preparation of concentrayes for dialysis purpose
6. Performing PD exchanges manually/cycler
7. CPR demonstration
8. Assisting minor procedures like central line insertions, renal biopsies
9. Performing isolated ultrafilteration
10. Priming and dialyser reuse

Recommended Books Recent edition

1. Dialysis therapy- Nissenson & Fine
2. Handbook of dialysis- Daugirdas, Blake & Todd
3. Principles and practice of dialysis- Heinrich
4. Primer to kidney disease
5. CKD, Dialysis and transplant- A companion to Brenner & Rectors- The Kidney
6. Comprehensive Clinical nephrology -John Feehaly
7. Handbook of nutrition and kidney- Lippincott Williams & Wilkins

VI Semester

Core-18 - Recent Advances in Dialysis Technology

Unit I **12hrs**

MARS dialysis/dialysis in advanced liver disease- indication, technique, anticoagulation.

Unit II **12hrs**

Nocturnal hemodialysis/ short daily dialysis -advantages

Unit III **12hrs**

Newer peritoneal dialysis solutions- advantages and disadvantages

Unit IV **12hrs**

Online dialysis

Unit V **12hrs**

Home Hemodialysis

Practical Examination: (4 x 10 marks)

1. Starting and Termination of dialysis
2. AVF/AVG cannulation
3. Initiating dialysis through central lines
4. Packing of dialysis trays
5. Preparation of concentrayes for dialysis purpose
6. Performing PD exchanges manually/cycler device
7. CPR demonstration
8. Assisting minor procedures like central line insertions, renal biopsies, PD catheter insertion
9. Performing isolated ultrafilteration
10. Priming and dialyser reuse

Recommended Books Recent edition

1. Dialysis Therapy- Nissenson & Fine
2. Handbook of Dialysis- Daugirdas, Blake & Todd
3. Principles and Practice of Dialysis- Heinrich
4. Primer to Kidney Disease
5. CKD, Dialysis and Transplant- A companion to Brenner & Rectors- The Kidney
6. Comprehensive Clinical Nephrology -John Feehaly
7. Handbook of Nutrition and Kidney- Lippincott Williams & Wilkins

VI Semester

Elective-2 Renal Transplantation

1. Options for patient with ESRD, basics in transplant immunology, donor selection, recipient evaluation

2. Science of deceased donor and living donor renal transplant- ischemia times and its impact on kidney function, brief introduction to immunosuppression used in transplant.

3. Problems encountered in transplant recipient- rejection, infection, drug toxicity, dyslipidemias, diabetes, cosmetic changes, impaired graft function.

4. Monitoring of patient on the waiting list for transplant.

5. Watching transplant inside the operation theatre

Books recommended

1 Dialysis therapy- Nissenson & Fine
2 Handbook of dialysis- Daugirdas ,Blake & Todd
3 Principles and practice of dialysis- Heinrich
4 Primer to kidney disease
5 CKD, Dialysis and transplant- A companion to Brenner & Rectors- The Kidney
6 Comprehensive Clinical nephrology -John Feehaly
7 Handbook of nutrition and kidney- Lippincott Williams & Wilkins
8 Handbook of kidney transplantation- Gabriel Danovitch

VI Semester

Allied-6-Hospital Management

1. **Quality Concepts:** Definition of Quality, Dimensions of Quality, Basic concepts of Total Quality Management, Quality Awards. Accreditations for hospitals: Understanding the process of getting started on the road to accreditation, National and International Accreditation bodies, overview of standards- ISO (9000 & 14000 environmental standards), NABH, NABL, JCI, JACHO.

2. **Hospital Information System:** Hospital Information System Management and software applications in registration, billing, investigations, reporting, ward management and bed distribution, medical records management, materials management and inventory control, pharmacy management, dietary services, management, information processing. Security and ethical challenges.

3. **Inventory Control:** Concept, various costs of inventory, Inventory techniques-ABC, SDE / VED Analysis, EOQ models. Storage: Importance and functions of storage. Location and layout of stores. Management of receipts and issue of materials from stores, Warehousing costs, Stock verification.

4. **Equipment Operations management:** Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS, outsourcing of maintenance services, quality and reliability, concept of failure, equipment history and documents, replacement policy, calibration tests, spare parts stocking techniques and polices

5. **Biomedical Waste Management:** Meaning, Categories of Biomedical Wastes, Colour code practices, Segregation, Treatment of biomedical waste-Incineration and its importance. Standards for waste autoclaving, microwaving. Packaging, Transportation & Disposal of biomedical wastes.