

MPH 451R1: HUMAN ANATOMY AND PHYSIOLOGY

Teaching hours: Each Unit – 12 h

Objective:

Familiarising the students with the causes and mechanism of cancer induction, diagnosis and staging of cancer and modalities of treatment.

Outcomes:

- Students will learn basics of cancer biology and different processes involved in it and have knowledge regarding the process of cancer initiation, promotion, progression and malignancy.
- They acquire the knowledge in classifying the type of cancer and various risk factors involved development of cancerous cells.
- They will have knowledge of pathogenesis involving infiltration of cancers into lymph nodes and migration of tumour cells into distant organs.
- They will understand the optimisation of therapy techniques.
- They will understand the comprehensive treatment protocols involving multimodal treatment protocols.

Unit 1: Basic Biology, Anatomy and Radiographic Anatomy

Structural hierarchy: atoms, molecules, macromolecules, organelles, cells, tissues, organs, systems, human being. Cell structure-cell membrane, cytoplasm, cell nucleus, organelles present in cytoplasm and nucleus. Functions of different organelles - cell membrane, cell nucleus, endoplasmic reticulum, mitochondria, lysosomes, vacuoles centrioles etc.

Molecular composition of the cell-Macromolecules in cells proteins, nucleic acids, carbohydrates and lipids; structural and functional role; cell membrane and transport of materials by passive transport, active transport and facilitated diffusion.

Structure of the genetic material - chromosomes and DNA and DNA replication. Cell Division -mitosis and meiosis; cell differentiation during prenatal development; primitive stem cells and functional cells. Cell Metabolism-Energy synthesis, glycolysis, TCA cycle, oxidative phosphorylation, production of ATP.

Genetic code - Genes, Transcription, Translation -Protein synthesis. Cellular Genetics- Cell Mutation, chromosomal – deletions, translocations and inversions, duplications; and point mutations-transition, transversion, frame shift.

Germ cell Mutations and Genetic Disorders- Recessive genetic disorders, Dominant genetic disorders and Sex-linked genetic disorders; Multifactorial genetic disorders. Chromosomal genetic disorders- Structural and numerical; Chromosomal deletions, Monosomy and Trisomy, Polyploidy.

Division of Anatomy, Anatomical Organization, Common Terminologies used in Anatomy, Body Cavities and Surface Anatomy of Various Organs and Anatomical Landmarks, Cellular structure and functions, Various Radiological Imaging Techniques: X-Rays, Specials X-Rays such as Barium Swallow, Barium meal, IVU, Lymphangiography, Ultrasound, CT Scans, MRI Scan, PET Scans, Radionuclide Scans. Roentgenographic images: X-Ray: Skull, Chest X-Ray, Pelvis and Extremities; Contrast studies: Barium Swallow, Barium meal follow through, IVU, Angiography. CT: Brain and spinal cord; Head and Neck; Thorax and Abdomen Pelvis and Extrimeties. MRI: Brain and spinal cord; Head and Neck; Thorax and Abdomen Pelvis and Extrimeties. PET CT Scan, Radionuclide Scan.

Unit 2: Circulatory system and Digestive system

Blood and Circulatory System, Structure and Function of Heart, Cardiac dynamics: Blood Pressure and ECG, Composition of Blood, Blood Grouping and Rh typing, Coagulation of Blood, Structure of Digestive Tract, Oral Cavity and Pharynx, Esophagus and Stomach, Liver and Hepatobiliary System and Pancreas, Small intestines and Large Intestines, Rectum and Anal Canal.

Unit 3: Respiratory and Musculoskeletal system

Anatomy of Respiratory System, Structure of Lungs, Physiology of Respiration and Gas Exchange, Lung Volume and Capacity, Muscles and Tendons, Structure and Functions of Muscles, Bones, Joints and Cartilages, Ossification Centre, The Skull, Vertebral Column, Thoracic Cage and Sternum, Pelvis and Extremities.

Unit 4: Genitourinary and Reproductive System

Male Reproductive System: Prostate and Seminal Vesicles; Penis and Testes, Female Reproductive System: Uterus; Ovaries; Tubes; Vagina; Vulva; Breast, Gonads and their

function, Menstrual Cycle and its Physiology, Infertility, Reproductive Cycle, Fertilization, Embryology: Germ cells and Prenatal development, Anatomy of Kidney, Ureter, Urinary Bladder and Urethra, Formation and Excretion of Urine, Micturition, Skin and Appendages.

Unit 5: Endocrine system and Nervous system

Division of Endocrine System, Pituitary Gland and its function, Thyroid Gland and its function, Pancreas and its function, Adrenal Glands and their function, Division of Nervous System, Brain: Structure and Function, Spinal Cord: Structure and Function, Central Nervous System, Autonomous Nervous System, Eyes and Physiology of Vision; Nose and Physiology of Smell, Ear and Physiology of hearing; Tongue and Physiology of Taste; Skin and Physiology of Touch.

Reference Books:

1. C.H. Best and N.B. Taylor, A Text in Applied Physiology, Williams and Wilkins Company, Baltimore, 1986.
2. C.K. Warrick, Anatomy and Physiology for Radiographers, Oxford University Press, 1988.
3. J.R. Brobek, Physiological Basis of Medical Practice, Williams and Wilkins, London, 1995
4. Tortora, Gerard, "Principles of anatomy and physiology", John Wiley and Sons Inc., New York, 2000.
5. Ross and Wilson, "Anatomy and Physiology", Churchill Livingstone; 2005.
6. Campbell: Biology textbook

