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|  | **SYLLABUS FOR X-RAY TECHNICIAN**  **1st year** | |
|  | **ANATOMY AND PHYSIOLOGY** | |
|  | **XR-101** | |
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| 1 | Introduction scope of anatomy cell as a structural and fundamental unit, Organization of tissue organs and system, Anatomical position of the body, Anatomical terms. | |
| 2 | Skin and the appendages of the skin. | |
| 3 | Muscles: Voluntary and Involuntary and cardiac muscles, short description of the structure of different muscles. | |
| 4 | Muscles: Classification of voluntary muscles. Origin and Insertion, Tendon, Aponeurosis, Isometric and Isotonic contraction of muscles. | |
| 5 | Bones: composition and functions, classification of bones according to morphology and development, various terms and markings on the bones. | |
| 6 | Bones: Development of bones, parts of long bones and blood supply of bones, general remarks about bones of skull, thorax, vertebral column and bones of extremities indetail. | |
| 7 | Joints: Definition, classification of joints structure and cartilaginous joints. | |
| 8 | Joints: Structure of synovial joints, Movements of joints, blood supply of bones and joints and Bursae, close pack and loose pack position of the joints. | |
| 9 | Nervous system: Nerve cell, Synapse and reflex. | |
| 10 | Nervous system: organization of central nervous systems Spinal Nerves and nerve endings. | |
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| 11 | Cardiovascular system: Arteries Veins, Capillaries, and Collateral circulation. | |
| 12 | Cardiovascular system: Blood as a connective tissue, Gross anatomy of Heart, large blood Vessels. | |
| 13 | Respiratory system: General outline of respiratory passages, gross anatomy of Lung, Pleura. | |
| 14 | Respiratory system: Broncho-pulmonary segments, Inter-costal muscles and Mechanism of respiration. | |
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| 15 | Digestive system: General idea or outline of gastro- intestinal tract and associated glands. | |
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| 16 | Excretory system structure and function of kidney, general outline of Ureters Urinary bladder and Urethra. | |
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| 17 | Reproduction system: general outline of male and female general organs. | |
| 18 | Endocrines: Definition, Stricture in general. | |
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| 19 | Lymphatic system: Lympth circulartion, Lympth nodes and Lyphoid tissue. | |
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|  | (Neuranatomy) Emphosis)- Gross structure of | |
|  | I,Sulci and Gyri and various areas of cerebral hemispheres,Thalamus, Hypothalamus, Basal Ganglia. | |
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|  | (I) Cerebellum. | |
|  | (ii) Pons, Medeulla | |
|  | (iii) Spinal Cord. | |
|  | (iv) Ascending tracts. | |
|  | (v) Descending tracts | |
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|  | (iv) Clinical application of Knowledge of the tracts. | |
|  | (vii) Autonomic nervous system. | |
|  | (viii) Nervous control of the urinary Vander and bladder dysfuction. | |
|  | **REGIONAL ANATOMY** | |
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|  | **Superior Extremity:** | |
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|  | **Osteology:**Clavicle, Scapula, Humerus,Radius, Uina Carpals Metacarpals | |
|  | **Soft parts:**Breast, Pectoral region, Front of arm, Back of arm, Cubital fossa, front of forearm, back of foream, nerves and vessels of forearm, paim, Dorrsum of Hand, Shoulder gridle, joints of hand. | |
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|  | **Inferior Extremity** | |
|  | **Osteology:**Hip bone, Femur, Tibia, Fibula and Patella, Tarsals, Metatarsals. | |
|  | **Soft parts:**Front of thigh- Femoral canal and femoral hernia, Adductor canal, medical compartment of thigh, glutel region, Back of thigh Popliteal fossa, Anterior compartment of leg, posterior compartment of leg, sol of foot, venous drainage  leg, hip joint, ankle joint, tarsal joints. | |
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|  | **Trunk:** | |
|  | **Osteology:** Cervical, Thoracic and Lumbar Vertebra, Sacrum, Coccyx and Ribs. | |
|  | **Soft tissue:** Inter-vertebral joints, costo-vartebral joints, Inter-vertebral Disc; Ligaments and Muscles. | |
|  | Skull as a whole and mandible. | |
|  | Demonstration of Dissected parts. | |
|  | Parts of Limbs. Trunk, Brain, Thorax and Abdominal Contents. | |
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|  | **Lecture-Demonstration** | |
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|  | Muscles of the whole body. | |
|  | Demonstration of organs in thorax and abdomen. | |
|  | Demonstration of viscera in head, face and neck. | |
|  | Demonstration of all the glands in the body. | |
|  | Identification of bony prominences on inspection and palpation in the body, especially of extremities. | |
|  | Points to palpate nerves and arteries. | |
|  | Identification of prominent muscles. | |
|  | Extra-ocular muscles and salient points about the eye ball. | |
| Demonstration on Brain. | |
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| |  | | --- | |  | | **Paper ll** | |  | | **Radiographic, Photography** | | **XR-102** | |  | | **(i) The photographic process**:introduction, visible light, image, produced by radiation, light sensitive photographic materials**.** | |  | | **(ii) Photographic emulsions:**The photographic latent image. Positive process. | |  | | **(iii)**Film materials in x-ray department. History, structure of an x-ray film, single sided films, types of films. | |  | | **(iv)**Spectral sensitivity of film material, graininess of film material, speed and contrast of photographic material. | |  | | **(v) Sensitometry:** photographic density, characteristic curve features of the characteristic curve. | |  | | **(vi)**Variation in the Characteristic curve with the development. Comparison of emulsions by their characteristic curves. Information from the characteristic curve. | |  | | **(vii) The storage of film materials and radiograph:** Storage of unprocessed films, storing of radiographs. | |  | | **(viii) Intensifying screens and cassettes. Luminescence:**fluorescence and phosphorescence. Construction of an intensifying screen. | |  | | **(ix)** The fluorescent materials. Types of intensifying screens. Intensification factor. The influence of KV, scattered radiation. Detail, sharpness and speed, size of the crystals, reciprocity failure. | |  | | **(x)**Cassette design, care of cassettes, mounting of intensifying screens. | |  | | **(xi)** Care of intensifying screens, tests to check screen film contact and light leakage. | |  | | **(xii) Film processing:** Development: The nature of development, manual, automatic. The PH scale. | |  | | **(xiii)**The constitution of developing solutions and properties of development chemicals. | |  | | **(xiv)** The development time, factors in the use of a developer. Developers in processing systems. | |  | | **(xv) Film processing:** fixing and role of a fixing solution. Constitution of the fixing solutions and properties of the Constituents. | |  | | **(xvi)** Fixers used in automatic processors. Factors affecting the use of the fixer. **(xvii)** Regeneration of fixing solution. Silver recovery and its various methods. **(xviii)**Rinsing, washing and drying. Objects of rinsing and washing, methods employed. Methods of drying films. | |  | | **(xix)**Preparation of solutions and making stock solution. | |  | | **(xx) Processing equipment:** Materials for processing equipment, processors for manual operation, hangers, and control of chemical temperature by heating and thermostat, immersion heaters as well as cooling methods. | |  | | **(xxi)** Maintenance of automatic processors and common faults. | |  | | **(xxii) Dark room:**Layout and planning. Dark room construction nature of floor, walls, ceiling and radiation protection. | |  | | **(xxiii)**Type of entry door design. Dark room illumination. | |  | | **(xxiv)**Dark room equipment and its layout. Location of pass through boxes or cassettes hatches. | |  | | **(xxv) Systems for daylight film handling:**Daylight systems using cassettes and without cassettes. | |  | | **(xxvi) The radiographic image:**Components in image quality- density, contrast and details. | |  | | **(xxvii)**Unsharpness in the radiographic image. Various factors contributing towards unsharpness. | |  | | **(xxviii)**The presentation of the Radiograph. Identification markers and orientation. Documentary preparation. | |  | | **(xxix) Viewing accessories:** Viewing boxes, magnifiers, viewing conditions. **(xxx)**Light images and their recording. The formation of light images. Images formation by mirror, by a lens and aberrations of lenses. | |  | | **(xxxi) Fluorography:**An optical system for image intensifier fluorography. **(xxxii)**Camerasfor fluorography. Sensitometric response of fluorography film. **(xxxiii)**Processing equipment and procedures, graininess in fluorograms. **(xxxiv)**Some special imaging processes. Xero radiography, it meaning technique and applications. | |  | | **(xxxv)** Copying radiograph. Its technique and application. | |  | | **(xxxvi) Subtraction:** Its techniques as applied to radiography as well as its applications. | |  | | **(xxxvii)**Common film faults due to manufacturing as well as due to chemical processing. | |  | | **(xxxviii)**Management of the quality of the Radiographic image. | |  | | **(xxxix) Practicals:** | |  | | A.Test to check the X-ray films and screen contact in the cassette. | |  | | B. Test to check light leakage in the cassette. | |  | | C.To prepare a characteristic curve of a radiographic film. | |  | | D. To check the effect of safe light on exposed as well as unexposed X-ray film. | |  | |  | |  | |  | |  | |  | |  | | |  |  | | --- | --- | |  | **PAPER-III** | |  | **ELEMENTARY RADIATION PHYSICS** | |  | **XR-103** | |  |  | |  |  | |  | Structure of matter and principles of machines | |  | Electricity and electromagnetism applied in radiological instruments. | |  | Physics principles in design and working of X-ray tube technology. | |  | Construction and working principles of transformers and autotransformers usd in X-ray circuits | |  | Measurements of voltage special KV meters | |  | Measurements of tube current in milli and microamperes. | |  | Principles of thermionic emission and rectification in X-ray technology. | |  | High voltage D.C circuits in imaging and therapy tube circuits | |  | Electrical hazards and safety X-ray tube rating in imaging and therapy x-ray tubes and theramal safety | |  | Introduction to electroma-genetic spectrum | |  | Definition of wavelength and its quantum relationship with peak kilovoltage | |  | Physical principle of radiation and optical field coverage and the factor affecting the field projected on patient during x-ray imaging and radiotherapy exponential and trigonometric functions used in radiological calculation | |  |  | |  | **Skeletal system:**Radiography techniques for x-ray of: | |  |  | |  | (a) Upper limb with special reference to hand, wrist joint, and elbow joint, supplementary techniques for carpal tunnel, scaphoid bone fracture, head of radius and supra-condylar projections. | |  |  | |  | (b) Lower limb which includes all the bones with special reference to ankle joint, knee joint, patella, techniques for calcaneum bone, supplementary techniques for flat, intercondylar notch and femur and metatarsals, etc. | |  | (c) Shoulder girdle and thorax. | |  | (d) Vertebral column with special techniques for cervical spine, intervertebral joints and formina. Limbo-sacral joint. | |  |  | |  | (e) Pelvic girdle and hip region. | |  |  | |  | (f) Respiratory system chest radiography for both the lungs, apical, lordotic and oblique views, techniques to decubitus AP and lateral views. | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | |
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