

Diploma in Radiology & Imaging Technology

SEMESTER I

DRIT-101: Anatomy and Physiology & Related Pathology

Theory

Introduction to Radiology & Radiology Services.

Structure of the Body-cell-tissues.

Musculo-Skeletal System

- Skull-cerebral columns-shoulder girdle, Bones of upper extremities – Bones of Lower extremities, gornit muscles, pelvis girdle, thoracic Cage & Bony joints.

Cardiovascular System

- Heart, Blood, Arteries, Veins

Lymphatic System

- Circulation of Lymph, Lymph glands, Thoric duct.

Digestive System

- Mouth - oesophagus – stomach – small intestine – large intestine – spleen, liver Gall Bladder – Pancreas.

Respiratory System

- Nose & Larynx, Trachea – Lungs

Nervous System:

- Brain – Meanings – Ventricles – Spinal cord and nerves

Reproductive System:

- Female & Male Organs

Urinary System

- Kidney – Uterus – Bladders, Prostate

Skin

- Structure and its function

Endocrine System

- Pituitary glands – Pennel gland – Thymus gland – Thyroid and parathyroid gland Supra-renal glands

Eye

- Structure and its function

Ear

- Structure and its functions, surface anatomy

Practical:

- Introduction of the various parts and structure in human body on charts and models.

- Identification of Bones and skeleton

- Surface making of human body

- Identification of bones & parts on X ray films

- Visit to pathology museum for identification common pathology lesions

- Visit to antomy museum for identification of various parts of the human body.

SEMESTER I

DRIT-102: General and Radiation Physics

Theory

Heat and methods of transference of heat, Condensers, Inductance of Impendence.

A.C. D.C. current, RMS value, peak value

Electromagnetic Induction – laws , fields, influence

Transformer- Principal Construction and Losses of Step Down and High Tension Transformers

Diode valves and its use as rectifiers, solid- state rectifiers, its various rectifying circuits using X-ray machines.

Production of x-rays and its properties, X-ray tube- stationery anode anode and rotating anode & therapy tubes. X-ray

circuit, interlocking circuits, relays and timers

Various units used for measuring radiation roentgen, rad and rem.

Ionisation chambers, G.M. counter and scintillation counter, interaction of x-rays with matter.

(photo electric, compton and pair production)

Quality and quantity of X-rays, HVT, linear absorption, coefficient, Gird cones, filters, cylindersm

L.B.D. $F.F > D$, focal spot size

etc.

Inverse square law, scattered radiations and appliances used to reduce it.

Radioactivity: curie, half life, decay factor, Details about radium, cablt caesium, doses- dose and dose rate, exposure dose,

exit dose surface dose, depth dose, isodoes charts and their uses.

Radiation hazards protection against it, film badge pocket ionization chamber, maximum permissible does.

Gama X-ray film, X-ray tube caliberation, solrization, sensitometer and densitometer, radiation protection devices- Lead

shield, lead chair, lead apron, lead goggles, Thyroid and gonad shield, lead gloves etc.

Practical

- Verification of inverse square law
- Calibration of x-rays machines
- To check the lead apron for any crack
- Find out whether the glass in the screen is lead glass or ordinary glass
- study the characteristic curve of a diode value
- To survey the X-ray control for radiation
- Demonstrate that the intensifying effect of X-ray intensifying screen is due to light produced by fluorescent and not due to the x-ray
- Demonstrate the use of Gird/ potter-bucky diaphragm and radiographic contrast
- Verification of optical and radiation field coincidence

DRIT-103: Dark Room Techniques

Theory

Photographic Process

• Light image- image produce by radiation- light sensitive material – Latent image formation
Film materials

• The structure of X-ray films resolving power, orthochromatic and panchromatic film grains of film- sensitivity of

film contrast of films

X-ray Films Storage

• Storage of unexposed films and protection to exposed films

Screens

- Construction of intensifying screen-choice of fluorescent materials –intensifying factors details – sharpness-speed, screen contact-care of intensifying screen & rate each screens.

Cassettes

- Cassettes designs- care of cassette- mounting of intensifying screen in the cassette. Various types of cassettes,

definition, structure of cassettes

Factors affecting the developer

- Types of developer and fixer- factors affecting the use of fixer.
- Silver recovery methods. Components of PQ & MQ developer and fixers, replenisher etc.

Film rising and washing and drying, Intermediate rinse- washing and drying

Film processing and equipment

- Manual and automatic processing method

Dark Room Design

- Outlay and material used. Entrance, Safelight Ventilation, Construction of wall dry bench & wet bench etc.

The Radiographic Image

- The sharpness, contrast, details definition, viewing conditions.

Miscellaneous

- Trimming, identification of films legends-records filling- report distribution

Film Artefacts

- Photographic and radiation artifacts.

Factors affecting the quality control of a radiograph

Practical

Dark room:

- How the dark room light be tested for safety
- How intensifying screen be tested for uniform contact?
- How intensifying screen be tested for uniform contact?
- To prepare the developer and fixer
- Load unload and processing of X-rays film.
- Overdeveloped film reduction.
- Screen after glow test
- Manual and digital subtraction techniques
- Formation of duplicate and negative radiograph.

DRIT-104: Introductory Biology

Unit I

Living World

Biology & Its Branches; relationships with other sciences; scientific methods in Biology; historical breakthroughs; scope of biology and career options; role of Biology in dispelling myths and misbeliefs; characters of living organisms, (elementary idea of metabolism, transfer of energy at molecular level, open and closed systems, homeostasis, growth and reproduction, adaptation, survival, death).

Origin and evolution of life - theories of evolution; evidence of evolution; sources of variations

(mutation, recombination, genetic drift, migration, natural selection); concept of species; specification and isolation (geographical and reproductive); origin of species.

Unit II

Diversity of Life

Variety of living organisms, Systematic; need, history and types of classification (artificial, natural, polygenetic); biosystematics; binomial nomenclature; Two kingdom system, Five kingdom System, their merits and demerits, status of bacteria and virus; botanical gardens and herbia; zoological parks and museums.

Unit III

Cell and Cell Division

Cell as a basic unit of life - discovery of cell, cell theory, cell as a self - contained unit; procaryotic and eukaryotic cell; unicellular and multicellular organisms; tools and techniques (

compound microscope, electron microscope and cell fractionation); Ultrastructure of prokaryotic and eukaryotic cell - cell wall, cell membrane - unit membrane concept (fluid mosaic model); membrane transport; cellular movement (exocytosis, endocytosis); cell organelles and their functions

- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes.

Molecules of cell; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, nucleotides, nucleic acids (DNA and RNA);

Enzymes (Properties, chemical nature and mechanism of action); vitamins, hormones and steroids.

Unit IV

Genetics

Continuity of life - heredity, variation; mendel's laws of inheritance, chromosomal basis of inheritance; other patterns of inheritance - incomplete dominance, multiple allelism, quantitative inheritance.

Chromosomes - bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination; sex chromosomes; sex determination; sex linked inheritance; mutation and chromosomal aberrations; Human genetics - methods of study, genetic disorders.

DNA as a genetic material - its structure and replication; structure of RNA and its role in protein synthesis; Gene expression - transcription and translation in prokaryotes and eukaryotes; regulation of gene expression, induction and repression - housekeeping genes; nuclear basis of differentiation and development; oncogenes.

Basics of Recombinant DNA technology; cloning; gene bank; DNA fingerprinting; genomics - principles and applications, transgenic plants, animals and microbes.

Unit V

Morphology of Plants and Animals

Morphology - root, stem and leaf, their structure and modification; Inflorescence, flower, fruit, seed and their types; Description of Poaceae, Liliaceae, Fabaceae, Solanaceae, Brassicaceae and Asteraceae.

Morphology of animals - salient features of earthworm, cockroach and rat; tissue systems, structure and function of tissues - epithelial, connective, muscular and nervous.

Practical

1. Study of parts of Compound Microscope
2. Study of mitosis in onion root tip and animal cell (grasshopper)
3. Study of meiosis in onion flower buds, and testis of grasshopper.
4. Study of cyclosis in leaf cell of Hydrilla, or Tradescantia and in Paramecium.
5. Study of cell wall components (cellulose, lignin, suberin and mucilage).
6. Study of mitochondria by staining with a Janus Green.

7. Study of specimens and their identification with reason - Bacteria, Oscillator, Spirogyra, Rhizopus, mushroom/bracket fungi, yeast, liverwort, moss, fern, Pinus, one monocotyledon, one dicotyledon and lichens.
8. Study of characters of specimens and identification with reason - Amoeba, Hydra, Liver - Fluke, Ascaris, Leech, Earthworm, Prawn, Silk moth honey bee, snail, Starfish, Dogfish, Rohu, Frog, Lizards, Pigeon/ any other bird and rabbit/ any other mammal.
9. Study of squamous epithelium, muscle fibres, nerve cells and mammalian blood film through temporary/permanent slides.
10. Study of external morphology of earthworm, cockroach, frog and rat through models.

DRIT-105: Communication & Soft Skills

UNIT I

Essentials of Grammar:

- Parts of Speech
- Punctuation
- **Vocabulary Building**
- Phonetics

UNIT II

Office Management:

- Types of Correspondence
- Receipt and Dispatch of Mail
- Filing Systems
- Classification of Mail.
- Role & Function of Correspondence
- MIS
- Managing Computer

UNIT III

Letter & Resume Writing:

- Types of Letters-Formal / Informal
- Importance and Function
- Drafting the Applications
- Elements of Structure
- Preparing the Resume
- Do's & Don'ts of Resume
- Helpful Hints

UNIT IV

Presentation Skills:

- Importance of Presentation Skills
- Capturing Data
- Voice & Picture Integration
- Guidelines to make Presentation Interesting
- Body Language
- Voice Modulation
- Audience Awareness
- Presentation Plan
- Visual Aids
- Forms of Layout
- Styles of Presentation.

UNIT V

Interview Preparation:

- Types of Interview
- Preparing for the Interviews
- Attending the Interview
- Interview Process
- Employers Expectations
- General Etiquette

- Dressing Sense
- Postures & Gestures

UNIT VI

Group Discussion & Presentation:

- Definition
- Process
- Guidelines
- Helpful Expressions
- Evaluation

(Note: Every student shall be given 15 minutes. of presentation time & 45 minutes of discussion on his/ her presentation.)

The student will be evaluated on the basis of :

- his / her presentation style
- Feedback of Faculty & Students
- General Etiquette
- Proficiency in Letter Drafting / Interview Preparation

The paper is internal and at least 3 tests will be taken. Best 2 of 3 shall account for final grades (70% Test & 30% Presentation)

SEMESTER I

DRIT-106: Practical

Anatomy and Physiology & Related Pathology : 20 marks

General and Radiation Physics : 20 marks

Dark Room Techniques : 20 marks

Introductory Biology : 15 marks

Internal Assessment: 25 Marks

SEMESTER-II

DRIT-201: General Radiology

Theory

Upper Limb:

- Finger individual and as a whole hands- carpal tunnel- wrists fore-elbow- head of radius- humerus
- shoulder joint- acromioclavicular- scapulothoracic joint.

Lower Limb:

- Toes-foot- calcaneum- ankle joint- leg knees- patella- femur- inter condylar notch.

Hip & Pelvis:

- Hip-neck of femur- the procedure for hip pinning of reduction- pelvis sacroiliac joints- pubic bones- acetabulum- sp.p. nailing and plating.

Vertebral column:

- Curves- postures- relative levels- atlanto occipital region- odontoid process, cervical spine- cervicothoracic spine- thoracic- lumbar spine- lumbosacral spine- sacrum coccyx, scoliosis- kyphosis – Flexion and extension – Lordosis abduction and adduction etc.

Bones and the Throat:

- Sternum- Ribs, clavicles.

Skull:

- Land marks, planes- cranium- facial bones, maxilla Mandible- Zygomatic – T.M. Joints, mastoid petrous bones- Optic foramen- sella turcica – P.N.S. styloid process, jugular foramen. Internal auditory canal, base of skull, C.V. junction- Orbits.

Chest:

- Chest in teleoroography- Chest spine & portable, Erect and decubitus view & apicogram, oedema camera or miniature chest radiography

Abdomen:

- Preparation, indication and contra- indication acute abdomen – pregnancy abdomen for multiplicity maturity and foetal abnormality, abdomen supine and erect decubitus study.

Soft tissue radiography:

- Neck & Breast etc.

Dental radiography:

- Dental X-ray of maxillary and mandibular teeth, occlusal- view of maxilla, mandible and nasal bones, panoramic, cephalometry. Infantogram and invertogram

Practical

Taking X-ray of all the parts of the human body as the theory syllabus

DRIT-202: Special Investigation Radiology

Theory

General pathology in radiation therapy:

Pathology:

- Definition, cell growth – cell deformities – cell damage- defence mechanism cell repair.

Neoplasia:

- Benign & malignant including its mode of growth and metastasis.

Causes of Disease:

- Congenital – traumatic- metabolic and deficiency – infection (micro- organism) immunization.

Bloods diseases:

- Leukaemias, Anaemias

Radiotherapy:

- Radiation treatment- methods – external radiation, use and application of radiation

Radiotherapy techniques for:

- Skin disease , Disease in system: respiratory, alimentary, urinary reproductive (including Breast, endocrine, nervous)

Special procedural and related contrast media, Contrast Media,

Emergencies in radiology department

Urinary tract: I.V.P. Retrograde pyelography- cystourethrography

Biliary tract:

- Oral cholecystography- trans hepatic percutaneous cholangiography, pre-operative cholangiography,

T-tube cholangiography. E.R.C.P.

Gastrointestinal tract:

- Ba.. swallow- Ba.. meal, upper GIT Ba. Meal following through Ba enema. Ba double contrast enema

Female genital tract:

- Hystro salpingography and pelvimetry

Angiography:

- carotid angiography, femoral arteriography, aortography, selective angiography, cardiac catheterization.

CNS:

- Ventriculography, Myelography, Pneumoencephalography & Shuntography

Tomography:

- Principal, Equipment and types of movement in tomography

Venography:

- Splenoprotovenography & Superior venography, Lymphangiography

Mammography

Radioculography, Dacrocystography, Sialography, Sinography, Nasopharyngography,

Laryngography

Bronchography, Arthrography, Discography,

Introduction to Ultrasonography, Computerised tomography, scanning and magnetic resonance

Imaging

Radiography-Special investigation & Radiography

Practical

Radiography-Special investigation & radiotherapy:

Radiography in various positions for all the special radiological procedures using contrast media, as per

the syllabus

Positioning and treatment of various Cancer patients using

(a) Prescribed filters/Wedges

(b) protecting various organs

Preparation of Radium/ Cobalt applicator/ mould etc.

DRIT-203: Electrocardiography & Techniques

Theory

Introduction:

- Introduction to Electrocardiography; History; psychological basis of E.C.G; conduction Velocity; Electrophysiology Central terminal of Wilson; augmentation, Esophageal leads, Pathway of Activation; Vector Concept

Normal Electrogram:

- Atrial complex ; P-R interval; QRS Complex; S.T Segment; T-Wave; U-Wave; Q-T interval; Electrical Axis; Heart Position; Interpretation of an ECG; How to record and ECG etc.

Abnormal Electrocardiogram:

- Abnormal P-Wave Interventricular Conduction Defects, RBBB, LBBB, Incomplete LBBB, LAHB, LPPHB; Non-specific Interventricular Conduction Defects, Bilateral Bundle, Branch Block, Trifascicular Blocks WPW Syndrome; Lown-Ganong-Levine Syndrome; Mahim by Pass; Hypertrophy; Right Ventricular Hypertrophy (RVH); Pulmonary embolism; Chronic Obstructive

lung Disease (COLD), Biventricular Hypertrophy; Overload Concept; Diastolic Overload (volume overload) etc.

Coronary artery disease:

- Ischaemic Injury, infarction, subtle, atypical, non-specific Patterns: conduction defects and infarction; localisation of infarction: vpm and acute myocardial infarction; atrial infarction; VCG in myocardial infarction; atrial infarction; VCG in myocardial infarction, coronary insufficiency etc.

Exercise test:

- Type of exercise test ; termination exercise; exercise protocols in treadmill testing; escalation of exercise test results; preparation of patient for exercise testing etc.

Drugs and electrolytes:

- Digitalis; potassium; Hypokalemia; calcium; quinidine effect; phenothiazines; Anthracyclines; cerebrovascular accidents; hypothermia; pericarditis ; myocarditis; neuromuscular diseases; heart trauma; malignancy involving heart; electrical alternans; negative U waves; liquid protein diet; anaemia etc;

Disorders of cardiac- rhythm:

- Disturbance of impulse formation; disturbance of impulse conduction; secondary disorders of rhythm; physiology of cardiac rhythm; Automaticity; conductivity; A-V nodes; sinus rhythm; sinus tachycardia; sinus bradycardia; sinus arrhythmia; sino atrial block; partial SA block; complete SA block; causes of Exit block; atrial extrasystoles; Blocked atrial premature beats; cause of Atrial

tachycardia (PAT); Chaotic Atrial Rhythm; Atrial flutter; Atrial fibrillation; Supraventricular tachycardias (SVt); ventricular rhythm; ventricular tachycardia (VT) ventricular fibrillation; pararrhythmias; parasystole; group beating ; AV-Disociation; torsade de points ; sick sinus syndrome etc.

ECG as a clue to clinical diagnosis:

- Pulmonary stenosis tricuspid atresia; atrial septal defect; ventricular septal defect; Ebstein anomaly; corrected transposition of great vessel; mirror image dextrocardia; anomalous origin of left coronary artery; Rheumatic fever: mitral valve prolapse; athlete's heart; cardiac pacing etc.

Practical:

Use of electro-cardiogram machine and recording etc as per the syllabus

DRIT-204: Advanced Diagnostic Techniques

Ultrasound Scanning

Principles

Display of Images, Modes

Doppler Ultrasound

Duplex Ultrasound

Endosonography

Mammography

Equipment

Positioning & Projections

Xero - Radiography

Scintigraphy

Radio nucleids

Equipment

Examination Procedure

Patient Preparation and Position

Magnetic Resonance Imaging

Principles

Equipment

MR Signal

Image Characteristics

Pulse Sequences

Advantage & Precautions

SEMESTER II

DRIT-205: Practical

General Radiology - 20 Marks

Special Investigation Radiology - 20 Marks

Electrocardiography & Techniques - 20 Marks

Advanced Diagnostic Techniques - 15 Marks

Internal Assessment: 25 Marks