

SCHEME OF STUDIES AND EXAMINATION  
DIPLOM IN X-RAY TECHNICIAN

I St YEAR

SL NO	SUBJECT	THEORY		PRACTICAL		TOTAL	
		Hours	Marks	Hours	Marks	Hours	Marks
	PART-A						
	1. Communication Skill in English	245	75	65	25	245	75
	2. General foundation course (computer applications)	150	50	95	25	245	75
	PART-B						
	1. Anatomy, Physiology and related pathology	80	100	120	100	200	200
	2. General Physics	80	100	120	100	200	200
	3. Radiation Physics	80	100	120	100	200	200
	PART-C						
	1. On the job training (project work)				50		50
	TOTAL	635	425	445	375	1090	800

II nd YEAR

SL NO	SUBJECT	THEORY		PRACTICAL		TOTAL	
		Hours	Marks	Hours	Marks	Hours	Marks
	PART-A						
	1. Communication Skill in English	245	75	65	25	245	75
	2. General foundation course (computer applications)	150	50	95	25	245	75
	PART-B						
	1. Dark room techniques	80	100	120	100	200	200
	2. Radiology	80	100	120	100	200	200
	3. Radiography( special investigation and radiotherapy)	80	100	120	100	200	200
	PART-C						
	1. On the job training (project work)				50		50
	TOTAL	635	425	445	375	1090	800

# **Syllabus of Diploma in X- ray Technician**

## **Theory**

Anatomy: General Introduction to Human Anatomy:

- Definition of Anatomy
- Definition of topographic term/terms used to describe the body.
- Cells and Tissues of Body

Anatomical Description of:

- Skin
- Osteology (Bone structure, individual bones)
- Joint structure joints of upper and limbs, ligaments, Fascia and Bursae.
- Musculo skeletal (upper and lower extremities).
- Cardiovascular system
- Lymphatic system (Structure, Function, Lymphatic glands)
- Respiratory system (Respiratory passages and organs)
- Digestive system (Elementary canal structure)
- Urogenital system (male and Female Organs Kidney structure )
- Endocrine system (name, Location and Functional)
- Sensing organs (Eye, Nose and Ear)
- Central Nervous system

Physiology (Function and Mechanism of):

- Digestion
- Respiratory
- Circulation
- Excretion
- Nervous System
- Role of Endocrine glands
- Physiology of thermoregulation
- Physiology of Blood
- Reproduction (genitor- urinary system)
- Vision, Hearing and Speech.

Biochemistry:

- Definition of Biochemistry
- Elementary ideas/ overview of the following:

General metabolism of;

- Carbohydrates
- Lipids
- Proteins

Different types of Enzymes and their Functions.

Microbiology:

- Microscope and Microscopy
- Introduction- Micro organism- Classification
- Epidemiology
- Sample collection, transportation and preservation, to maintain aseptic condition

Pathology:

Introduction to pathology- Definition.

Etiology and Classification of:

- Inflammatory
- Neoplastic
- Metabolic
- Congenital

PARET-I

PRACTCAL

1. Anatomy:

Demonstration of Surface Markings of Organs:

Heart, Lungs, Liver, Spleen, Stomach, Important bony landmarks, Arteries, Veins, Nerves, Joints

Arteries:

Carotid, Brachial, Radial, Anterior Tibal

Veins:

Juglar, Cubital Lateral poplital and Sciatic

Bony Preminences:

Clavicle, Anterior Iliac Crest , Posterior Iliac Crest, Supra sternal Notch, Sternum , Ribs, Vertebral Column, Anterior and Superior Iliac spine Pubic symphysis, Medial and Lateral Malleolae, Patella, Tibial tubercle

Joints and Their Movements:

- Ball & Socket joints- shoulder and hip joints, (Elbow and Knee joints).
- Microbiological Study of Microscope: Simple Compound
- Their different parts and functions
- Visit to microbiology Lab for culture media and culture of stool, urine, blood and demonstration.

Joints and Their Movements:

- Cell (Examination of mucous scraping).
- Skin, connective tissues, bone, cartilage, nervous tissues.

Muscle:

- Skeletal, cardiac, (striated, non- striated and cardiac muscles)

Identification of Long Bones, Hip Bones, Vertebra, Ribs, scapula, Mandible, clavicle, skull.

- Demonstration of the interior of thorax with organs in (In model ) such as lungs, trachea, heart, aorta and venacava, oesophagus, diaphragm.
- Demonstration of interior of abdomen with organs in situ such stomach, liver, spleen, pancreas, gall bladder, intestine, colon and kidneys and ureter (In model).
- Demonstration of pelvic organs such as bladder, rectum

In Female:

Ovaries, Fallopian tubes, Uterus and Vagina

In Males:

Testes, Vas deferens, Seminal vesicles, prostate, Urethra, Penis Demonstration of brain, spinal cord and spinal nerve Demonstration of sensory organs –eye, ear, surface marking of important organs like heart liver spleen, stomach (Demonstration of organ should be done in models supplemented by visits to

Museums of medical college .However it must be supplemented by dissecting frog/rabbit/rate/gimping).

2. Physiology:

- Study of Microsoft (Already covered in Anatomy).
- Preparation of blood smear,leishman's staining identification of R.B.C., Different types of W.B.C. and differential count of W.B.C.
- Pulse recording, temperature recording, respiratory and maintenance of T.P.B. chart.
- Effective of exercise of T.P.R. ( This may be done amongst the class students themselves).
- Demonstration of blood – pressure instrument ( Mercurial type) and recording of blood pressure.

3. Pathology;

- Visit to pathological Museum

4. Biochemistry:

- Familiarity with Laboratory glassware's.

Basic Techniques:

- Methods of Measuring Liquids
- Methods of weighing
- Cleaning of Glassware
- Separation of solids from Liquids.

PART-II

GENERAL PHYSICS (THEORY)

1. Elementary idea of thermo ionic emission, Electron- idea of mass and nature of charge, coulomb' law, Electric field unit of potential.
2. Ohm;s lwe, unit of resistance, potential and combination of resistance in series and parallel.

Fuse, units of electric power, earthing of electrical equipment.

Magnetic fields, lines of force, field pattern due to a straight current carrying conductor, coil carrying current, electromagnet, construction and working of Galvanometer, voltmeter and ammeter. (moving coil type and moving magnet type). Basic physics for magnetic resonance imaging including natural and super conducting magnetic. Basic physics for ultrasound, elementary knowledge for generating of ultrasound waves, their nature and inter actions with body tissues.

### General Physics:

- Heat and method of transference of heat condensers, inductance and impedance
- A.C and D.C currents- effective current. RMS value, peak value.
- Electromagnetic induction –Laws, fields, influence.
- Transformers- principles, construction, losses of step down and High transformers.
- Diode valves and its use in rectifier's solid state rectifiers. Its verifying circuits used in X- ray tube, X-ray certificate, interlocking certificates.

Structure of Atom, Nucleus and orbital Electrons.

### PRACTICAL

- Verification of ohm's law.
- Verify the rules of series and parallels combination of resistances.
- Study of the potential drop across different resistance.
- Determine the field along the axis of a coil carrying current.
- Study the characteristic curve of a diode value.
- Study the impedance of a coiled in A.C and D.C.
- To find the transformation ratio of a transformer.

To construct a rectifying circuit with the help of:

- Diode value
- Transistors
- To study the nature of sound waves (sonometer)

### PAPER-III

#### THEORY (RADIATION PHYSICS)

- Various used for measuring radiation – Roentgen rad and rem.
- Ionization chambers, G. M. counter and scintillation counter, interaction of X-ray with matter.
- Quality and quantity of X-rays, HVT, linear adsorption coefficient, Grid, cones and filters.
- Inverse square law, scattered radiations and appliances used to reduce it.

Radio activity:

Half life, Decay factor, Details about radium, cobalt and cesium, Doses- dose and dose rate, exposure dose, exit dose, surface dose isotope charts and their uses, Radiation Hazards- ways of protection for public patient, film badge, pocket ionization chamber, maximum permissible dose, personal monitoring tag, TLD.

#### PRACTICAL (RADIATION PHYSICS)

- Verification of inverse square law.
- Calibration of a X- Ray machine.
- To study the affect of Kv and mass.
- Find out the HVT of a given beam.
- To check the lead apron for any crack.
- Find out whether the glass in the screen is lead glass or ordinary glass.
- To find out the depth dose at a certain depth of a X- ray beam.
- To survey the X-ray control for radiation.
- Demonstration that the intensifying edict of X- ray intensifying screen is dues to light produced by flour – screen and not due to the X-ray.
- Demonstrate the use of Grid/ potter – bucky diaphragm and radiographic contrast.
- Demonstrate effect of improper of X- ray tube.
- Verification of optical and radiation field coincidence.
- Effect of direct X- ray exposure to the personnel monitoring device like TLD or film badge.

## PAPER-IV

### PART-A :

Introduction to Radiology and Radiological Services and Anatomy  
Physiology and Related Pathology.

Introduction	
1. Introduction to radiology and Radiological services: Structure of body – cells- tissues.	
Musculo- skeletal system	Skull- vertebral column –shoulder griddle Bones of upper extremities Bones of lower extremities, gornit Muscles
Cardiovascular system	Heart- blood- arteries- veins.
Lymphatic System	Circulation of Lymph, Lymph glands, Thoracic duct.
Digestive System	Mouth – esophagus- stomach – small large intestines- spleen liver pancreas.
Gall- bladder-	
Respiratory System	Nose & larynx- Trachea- lungs.
Nervous System And nerves.	Brain- meanings- ventricles- spinal cord • .
Reproductive System	Female and Male Organs.
Urinary System	Kidneys- uterus- bladder, prost are.
Skin	Structure and its function.
Endocrine System - supra- renal glands.	Pituitary gland- penial gland- thymus gland
Eye	Structure and its function.
Ear	Structure and function. Surface Anatomy



PART-IV

PART-B:

PRACTICAL

- Identification of the various part
- and structures in human body on charts and models
- Identification of bones of skeleton.
- Surface marking of human body.
- Identification of Bones including radiographic Anatomy and soft tissues parts on X-ray films.
- Visit to pathology museum for identification of common lesions.
- Visit to Anatomy museum for identification of the human body.
- Identification of cross sectional anatomy of major organs of the body

DARK ROOM TECHNIQUES (THEORY)  
RADIOGRAPHIC PHOTOGRAPHY AND DARK ROOM TECHNIQUES

Photographic process latent image.	Light image- image produced by radian Light sensitive material
Film Material	The structure of X-ray films- resolving Power.
Frames of film- sensitivity of films. Type of films.	
X-ray film storage screen	X-ray and imaging films
Storage of unexposed films	
Screens	Construction of intensifying screens.
Choice of fluorescent material	
Intensifying factor- Detail- sharpness.	
Speed- screens contact- care of intensifying screens. Type of screens.	
Types of screens, rare earth screen.	
Cassettes	Cassette designs- care of cassette mounting of intensifying screen
In the cassette. Various types of cassettes.	
Film pass box	Types and utilities.
Film processing	Constituents of processing solutions and replensisher.
Factor affecting the developer.	
Types of developer and fixer- factors affecting the use of fixer. Sliver	
Recovery methods.	
Film rinsing, washing and drying	Intermediate rinse- washing and during
Film processing equipment	Manual processing equipment and automatic processing unit.
Dark room Design	outlay and material used.
The Radiographic image	The sharpness- Contrast- Detail- Definition viewing conditions.
Miscellaneous	Trimming, identification of films, legends- records filling-report
distribution. Common radiographic faults due to faulty dark room techniques.	

## PRACTICAL

### Dark Room Techniques

#### Dark Room:

1. How the dark- room light be tested for safety?
2. How intensifying screens be treated for uniform contact?
3. To prepare the developer and fixer for manual / automatic process.
4. load, unload and processing of X- ray film.
5. To check the working of processing tanks.

## PART-V

### Radiography General and Radiographic Anatomy and Techniques

#### THEORY

Upper Limb	Fingers individual and as a whole hands –carpal tunnel- wrists- fore arm-elbow- head of radius- humeru- shoulder joint- Acromic calvicular joint- scapula- sterno Calvicular joint.
Lower Limb	Toes – Foot- Calcaneum- ankle joint- leg – knees – patellatiba –fibula- femur- Condylar notch.
Hips & Pelvis	Hip- Neck femur- pelvis- sacro- iliac joints- pubic bones- acetabulum
Vertebral column	Atlanta- occipital region- odontrod process, cervical spine- cervico thoracic spine- Lumbosacral spine- sacrum- coccyxcoliosis- kyphosis flextion and extension.
Bones of thorax skull	Sternum- ribs. Land marks- planes- cranium- facial bones maxilla- mandible- zygomatic bones T.M. Joints mastoids- piteous bones- optic foramen- sella turcica- P.N.S.
Chest	Chest in teleradiography- chest spine and portable. Digital radiography and its Usefulness, Maro radiography.
Abdomen	Preparation, indication and contra- indication acute abdomen- pregnancy abdomen for Multiplicity, maturity and fetal abnormality, pelvimetry.
Soft tissues Radiography.	Neck and Breast, etc.
Dental Radiography	Occlusal view, dental X-ray, OPG. Cross sectional imaging.

## PRACTICAL

### RADIOGRAPHY- GENERAL

1. Taking X-ray of all the parts of human body as per the theory syllabus.
2. detailed radiographic and cross sectional anatomy.