

**MNPE-09425068494**

**In Collaboration with**

**Karnataka State Open  
University**

**Manasagangotri, Mysore-6**

**Syllabus**

**Diploma in X-Ray &  
Radiography Technician**

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# Diploma in X-Ray & Radiography Technician

**ELIGIBILITY** - 10th Class pass under 10+2 system.

**COURSE PERIOD:** 1 YEAR

**TOTAL MARKS:** 1000

**TOTAL SEMESTER :** 2

## SEMESTER I

SUBJECT TITLE	SUBJECT CODE	MARKS		
		Theory	Practical	Total
ANATOMY	DXR-101	50	50	100
X-RAY EQUIPMENT FOR RADIOGRAPHERS	DXR-102	50	50	100
PHYSIOLOGY	DXR-103	50	50	100
RADIO GRAPHIC AND DARK ROOM TECHNIQUES	DXR-104	50	50	100
PRACTICAL	DXR-105		100	100

## SEMESTER II

SUBJECT TITLE	SUBJECT CODE	MARKS		
		Theory	Practical	Total
RADIOGRPAHY FOR SPECIAL INVESTIGATION	DXR-201	50	50	100
BASICS OF IMAGEOLOGY	DXR-202	50	50	100
IMAGEOLOGY	DXR-203	50	50	100
BASIC OF PATHOLOGY	DXR-204	50	50	100
PRACTICAL	DXR-205		100	100

## **Program Structure (Face to Face)**

<b>1<sup>ST</sup> SEMESTER</b>		
<b>CODE</b>	<b>COURSE TITLE</b>	<b>CREDITS</b>
DXR101	ANATOMY	4
DXR 102	X-RAY EQUIPMENT FOR RADIOGRAPHERS	4
DXR 103	PHYSIOLOGY	4
DXR 104	RADIOGRAPHY & DARK ROOM TECHNIQUES	4
DXR 105	PRACTICAL	2
<b>TOTAL CREDIT</b>		<b>18</b>

<b>2ND SEMESTER</b>		
<b>CODE</b>	<b>COURSE TITLE</b>	<b>CREDITS</b>
DXR201	RADIOGRAPHY FOR SPECIAL INVESTIGATION	4
DXR 202	BASICS OF IMAGEOLOGY	4
DXR 203	IMAGEOLOGY	4
DXR 204	BASICS OF PATHOLOGY	4
DXR 205	PRACTICAL	2
<b>TOTAL CREDIT</b>		<b>18</b>

# DETAILED SYLLABUS

## SEMESTER I

### DXR 101: ANATOMY

Total Credit :4

#### Block 1

Unit 1

- Introduction of Bones of the Human Body

Unit 2

- Upper Limb: clavicle, scapula, humerus, radius, ulna, carpus, metacarpus & phalanges

Unit 3

- Lower Limb: hipbone, femur, tibia, fibula, tarsus, metatarsus & phalanges

Unit 4

- Skull: name the bone of skull and sutures between them.

#### Block 2

Unit 1

- Thorax: ribs and their articulations

Unit 2

- Vertebral Column: cervical, thoracic, lumbar, sacral and coccygeal vertebrae

Unit 3

- Surface Markings of the Body:
- Nine regions of the abdomen
  - Four quadrants of the Hip

Unit 4

Introduction of different Vital Organs:

#### Block 3

Unit 1

- Respiratory Organs:
- Nasopharynx
  - Oropharynx
  - Larynx
  - Trachea

Unit 2

- Bronchi
- Lungs (and their lobular segments)
- Thoracic cavity
- Pleura and Pleural cavity

Unit 3

Circulatory Organs

- Anatomical position of the heart
- Pericardium of the heart
- Chambers of the heart

Unit 4

- Great vessels of the heart
- Valves of the heart

**Block 4**

Unit 1

Digestive Organs

- Tongue
- Teeth
- Oral cavity

Unit 2

- Pharynx
- Esophagus
- Stomach

Unit 3

- Small intestine
- Stomach
- Small intestine

Unit 4

- Large intestine and its colons

**DXR 102:X-RAY EQUIPMENT FOR RADIOGRAPHERS**

**Total Credit : 4**

**Block 1**

Unit 1

Introduction  
Electrical system,  
Main Supply,

Unit 2

Components and controls in X-ray circuits Generation of electrical energy,  
distribution and uses of electrical energy High tension transformer

Unit 3

The rectification of high tension,  
The control of kilo voltage,

Unit 4

Filament circuit and tube current

**Block 2**

Unit 1

Exposure switches and exposure timers switching and timing system exposure switching & its Radiographic application

Unit 2

X-Ray Tubes,  
Portable X-Ray equipment general Features of X-ray,  
Fixed and rotating Anodes,

Unit 3

Characteristics of X-Ray Tubes of Mammography  
Faults in X-Ray Tube.

Unit 4

Image Intensifier/Fluoro Scopic equipment,  
Standard Fluoro scopic table,  
Table for Myalography,  
X-Ray image intensifier Tube,  
Radiation protection  
Radiation Hazards,

**Block -3**

Unit 1

Dental Radiographic equipment specialized dental X-Ray equipment

Unit 2

Ionization Chamber,  
GM and Scintillation counter,  
Measuring radiation dose,  
Absorption Co-efficient,  
Grid,  
Cones and filters.

Unit 3

Inverse square law, scattered Radiation Radio Activity,  
Curie,

Half life,  
Decay Factor,

Unit 4

Doses,  
Film Bodge,  
Pocket Ionization chamber,  
Maximum permissible dose.

**Block 4**

Unit 1

Care and Maintenance of X-ray Tube

Unit 2

X-Ray intensifying Screens

Unit 3

Study of KV and MAS

Unit 4

Uses of grid, potter Bucky

**DXR 103: PHYSIOLOGY**

**Total Credit : 4**

**Block 1**

Unit 1

**Introduction Physiology**  
Odema and Swelling

Unit 2

Cell structure  
Cell division  
Function of Cell  
Reproduction

Unit 3

Brief description of Physiology  
Terms used in Physiology  
System of the body

Unit 4

The body fluids  
Tissue fluids exchange

## **Block 2**

### Unit 1

- Introduction of Tissue
- Function of Tissues
- Types of Tissue
- Introduction of Cartilages

### Unit 2

The important physico-chemical laws applied to physiology

- Diffusion
- Osmosis
- Bonding

### Unit3

- Filtration
- Dialysis
- Surface Tension
- Adsorption
- Colloid

### Unit 4

Brief Description

- Ear
- Nose
- Eyes

## **Block 3**

### Unit1

#### **Cardiovascular System**

- A) Anatomy and Physiology of Heart,
- B) Define and function of Veins and arteries in the circulatory system
- C) Circulation-systematic and pulmonary (In brief).
- D) Brief review of chamber of Heart- the cardiac cycle

### Unit 2

#### **Digestive System**

- A) Physiology and Anatomy of mouth, pharynx, stomach, small intestine, large intestine, Absorption of food and its excretion.
- B) Role of Bile in Digestion and Excretion
- C) Brief description of Liver and function



Unit 3

**Respiratory System**

- A) Brief description of Larynx, Trachea and Lungs.
- B) Respiratory movement and rate of Respiration

Unit 4

**Urinary System**

- A) Structure and functions of Kidney, Uretures, Bladder, Urethra and Nephron.
- B) Composition of normal urine.
- C) Related Diseases- Cystitis, Nephritis, Pyelonephritis
- D) Disorder of micturition, renal failure, uraemia

**Block 4**

Unit 1

**Endocrine Organs**

- A) Pituitary gland
- B) Thyroid gland
- C) Parathyroid gland
- D) Introduction and function of Pancreas
- E) Brief description and function of adrenal gland and Thymus gland

Unit 2

**Reproductive System**

- A) Introduction
- B) Puberty
- C) The menopause
- D) Pelvic cavity
- E) The female organs of generation
- F) The genito- urinary Tract in the male

Unit 3

**Central nervous system**

- A) Brain, Spinal code and Meninges with its functions

Unit 4

**Blood and their components**

- A) Define blood
- B) Composition of blood
- C) Summary of the function of blood
- D) Hemopoiesis

## **DXR-104 : RADIO GRAPHIC AND DARK ROOM TECHNIQUES**

**Total Credit : 4**

### **Block 1**

#### Unit 1

Photography and Film Material

- a) Image produced by Radiation
- b) Latent Image formation
- c) Structure of X-Ray Film

#### Unit 2

- d) Sensitivity and contrast of film
- e) Types of Films including Laser Film
- f) Storage of Exposed films and unexposed films

#### Unit 3

Screens and Cassettes

- a) Construction of intensifying screen
- b) Choice of Fluorescent material
- c) Care of intensifying screens

#### Unit 4

- d) Types of Screen
- e) Care of a cassette
- f) Mounting of intensifying screen in the cassette

### **Block 2**

#### Unit 1

Film Processing and Developing

- a) Constituents of processing solution and repleisher factor` affecting the developer
- b) Components of developer, Fixer and replenisher
- c) Film rinsing, washing and drying
- d) Film processing equipment
  - i) Manual
  - ii) Automatic

#### Unit 2

Dark Room Design

- a) Outline structure of dark room and materials used
- b) Miscellaneous
  - i) Trimming
  - ii) Identification of films
  - iii) Records Filing
  - iv) Records Distribution

#### Unit 3

Health effect of Low Level X-Ray Radiation Dose

Mobile Radiographic equipments

Biological effect and Significance of Radiation Dose

Unit 4

Care and maintenance of X-Ray Machine and Dark Room Components  
Safety and precaution when working on X-Ray machine

**Block 3**

**Radiography**

Unit 1

Upper limb

- i) Fingers
- ii) Hand, Carpal Tunnel
- iii) Wrist Joint
- iv) Fore arm
- v) Elbow Joint
- vi) Head of Radius and Ulna
- vii) Humerus
- viii) Shoulder Joint
- ix) Acromio-clavicular joint
- x) Scapula
- xi) Sterno claviclar joint

Unit 2

Lower Limb

- i) Toes
- ii) Foot
- iii) Calcaneum
- iv) Intercondylar Notch
- v) Ankle Joint
- vi) Tibia and Fibula
- vii) Patella
- viii) Knee Joint
- ix) Femur

Unit 3

Hips and Pelvis

- i) Theatre procedure for Hip Pinning and Reduction
- ii) Pelvis
- iii) Sacro Iliac Joint
- iv) Pelvic Bone
- v) Acetabulum

Unit 4

Vertebral Column

- i) Atlanto - Axial Joint
- ii) Odolontoid Peg
- iii) Cervical Spine
- iv) Thoracic Spine
- v) Lumbar spine

- vi) Lumbo Sacral spine
- vii) Sacrum
- viii) Coccyx
- ix) Scoliosis
- x) Kyphosis

## **Block 4**

### Unit 1

Bones of the Thorax

### Unit 2

Skull  
Land Marks,  
Planes Cranium,  
Facial Bones,  
Maxilla, Mandible,  
Zygomatic Bone,

### Unit 3

Temporo - Mandibular Joint,  
Mastoids,  
Petrous bones,  
Optic Foramen,  
Sella Turcica,  
Paranasal Sinuses

### Unit 4

Abdomen  
a) Acute Abdomen  
b) Pregnancy  
c) Pelvic Metry

## **DXR 105: PRACTICAL**

**Total Credit : 2**

### **Block 1**

#### Unit 1

Labeled Diagrams of different organs and bones Vivo

#### Unit 2

X-Ray tubes and general features and Mobile equipment  
Image Intensifier  
Care and Maintenance of X-Ray equipment

### Unit 3

To study affects of KV and MAS  
To Survey X-Ray control for Radiation  
X-Ray intensifying Screens

### Unit 4

Demonstrate the uses of grid, potter bucky and Radio graphic contrast  
Demonstrate effects of improper centering of X-Ray tube  
Radiation field coincidence.

## **Block 2**

### Unit 1

Surface marketing of Human Body  
Identification of bones and parts on X-Ray Film  
Identification of various parts and structures in human body on charts and models.

### Unit 2

Visit to pathology museum for identification of common pathological lesion's  
Visit to anatomy museum for identification of various parts of Human Body

### Unit 3

How the dark room lights (safe light) be tested for safety.  
How intensifying screens be tested for uniform contrast

### Unit 4

Identification of parts of the X-Ray machine  
Identification of dark room components  
Identification of films

## SEMESTER II

### **DXR 201 : RADIOGRAPHY FOR SPECIAL INVESTIGATION**

**Total Credit : 4**

#### **Block 1**

##### Unit 1

General pathology in radiation therapy:

Pathology:

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

Neoplasia:

##### Unit 2

Bengin & malignant including its mode of growth and metastasis.

Causes of Disease:

##### Unit 3

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

Bloods diseases:

Leukaemias, Anaemias

##### Unit 4

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

#### **Block 2**

##### Unit 1

Radiotherapy techniques for:

Skin disease , Disease in system: respiratory, alimentary, urinary reproductive (including  
Brest, nedorcine, nervous)

##### Unit 2

Special procedural and related contrast media, Contrast Media,  
Emergencies in radiology department

##### Unit 3

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

Billiary tract:

##### Unit 4

Oral cheloecystograph- trnas hepatic percutaneous cholanigraphy, pre-operative  
cholangiography,

### **Block 3**

#### Unit 1

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

Gastrointestinal tract:

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

#### Unit 2

Female genital tract:

- Hystro salpingography and pelvimetry

#### Unit 3

Angiography:

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

#### Unit 4

CNS:

- Ventriculography, Myelography, Pheumoencephalography & Shuntography

### **Block 4**

#### Unit 1

Tomography:

- Principal, Equipment and types of movement in tomography

#### Unit 2

Venography:

- Splenoprotovenography & Superior venography, Lymphangiography

#### Unit 3

Mammography

Radioculography, Dacrocystography, Sialography, Sinography, Nasopharyngography,

Laryngography

Bronchography, Arthrography, Discography,

#### Unit 4

Introduction to Ultrasonography, Computerised tomography, scanning and magnetic  
resonance Imaging Radiography-Special investigation & Radiography

General Pathology in relation to radiology. Define pathology, cell growth, cell  
damage,

## **DXR 202: BASICS OF IMAGEOLOGY**

**Total Credit : 4**

### **Block 1**

#### Unit 1

##### **Conventional**

Ultra Sonography  
Doppler Ultra Sound

#### Unit 2

Color Doppler flow imaging,  
Principles of ultra sound,  
Types of transducers basics of Doppler ultra sound system

#### Unit 3

##### **CT scan**

Conventional CT,  
Spiral CT  
Basic principles

#### Unit 4

Equipment description,  
CT Art facts,  
Indications,  
Contra Indications,  
Contrast Media used

### **Block 2**

#### Unit 1

##### **MRI**

Basic Principles,  
Equipment description.  
MR Angiography,

#### Unit 2

MR Artifacts,  
Indications  
Contra indications,  
Contrast media used.

#### Unit 3

##### **Nuclear Medicine and PET Scan**

Definition,  
Description of Equipment



Unit 4

Characteristics of Radio Nuclide,  
Commonly used Radio Nuclide.  
Safety Precaution

**Block 3**

Unit 1

**Mammography**

Introduction of Mammography  
Preparation of Patients  
Techniques use in Mammography

Unit 2

Safety precautions for a Patient or Technician/ Specialist during mammography  
Clinical Application

Unit 3

**Interventional Radiology**

Introduction of Interventional Radiology  
Safety precautions for a Patient or Technician/ Specialist during Interventional  
Radiology

Unit 4

Select patients for invasive procedures  
Complications of interventional radiology  
The risks of ionizing radiation for the patient and IR staff

**Block 4**

Unit 1

**Clinical application of SPECT**

Brain  
Heart  
Liver and Spleen

Unit 2

Gallium and Tumor Imaging  
Kidneys  
Adrenals  
GIT  
CNS

Unit 3

Personal Studies  
Finding in Diseases  
Valvular Heart Disease

Unit 4

Thallium Myocardial perfusion imaging  
Thallium Stress testing  
Imaging myocardial cell damage  
Pulmonary imaging

**DXR 203: IMAGEOLOGY**

**Total Credit : 4**

**Block 1**

Unit 1

**CT Scan**

Conventional CT  
Spiral CT  
Preparation of Patient

Unit 2

**CT Scan**

Contrast Media  
Indications and Contra Indications

Unit 3

**MRI**

Preparation of the patient  
Contrast Media  
Indications and Contra Indications  
Clinical application  
Procedures  
MR Angiography

Unit 4

**Nuclear Medicine**

Preparation of Patient  
Indication and contra indications  
Clinical application and procedure,  
Brain Scan  
Bone Scans  
MNGA  
RNV Study.  
Thyroid Perfusion Scan  
DTPA  
Renogram  
Bullido Scan

## **Block 2**

### Unit 1

#### **Ultra Sound**

Conventional Doppler, and Colour Doppler.  
Preparation, Indication  
Clinical Application

### Unit 2

#### **Interventional Radiology**

Preparation of Patient  
Indications and contra indications  
Techniques of various procedures and various systems in the body.

### Unit 3

#### **Mammography system**

Background, diagnosis and screening.  
Imaging requirements  
Equipment - tube, compression, grids, AEC

### Unit 4

#### **Mammography System**

Image receptor requirements.  
Radiation dose, Image quality  
Interventional - accessories  
Biopsy equipment attachments.

## **Block 3**

### Unit 1

#### **Digital Radiography.**

Introduction  
Components of Digital Radiography System  
Digital Fluoroscopic system

### Unit 2

X-Ray Generator and X-Ray Tube  
Important requirements of fluoroscopy unit generator  
Requirements for image intensifier  
Uses of light Diaphragm

### Unit 3

Describe Television image chain in brief  
Describe the major functions of Digital image processor  
Television scan modes

### Unit 4

Describe the ways to classify types of image manipulations  
Types of Image processing

## **Block 4**

### Unit 1

Basic Physics of Radioactivity  
Types of Radiation  
Production of Artificial nuclides

### Unit 2

Definition of Cyclotron  
Design of Cyclotron  
Advantages of Cyclotron Produce Radionuclides

### Unit 3

Half life of Radionuclide  
Kinds of Half lives depending on the method of measuring a radioactive sample overtime  
Types of Radiation Detector

### Unit 4

Measuring device for radiation counter  
Sources of error in counting  
Method of Counting

## **DXR 204 : BASIC OF PATHOLOGY**

**Total Credit : 4**

## **Block 1**

### Unit 1

Introduction to Pathology  
Health and Diseases  
Terminology in Pathology  
Evaluation of Pathology

### Unit 2

Inflammatory reactions  
Tissue response to infection  
Wound healing  
Immunity to infection  
Hyper Sensitivity

### Unit 3

Pyogenic infection  
Tuberculosis, Syphilis, Actinomycetes, Leprosy, Fungal & Viral diseases  
Disorders of growth  
Haemorrhage and shock

#### Unit 4

Disorders of nutrition  
Endocrine disturbances  
Disorders of calcium metabolism  
Thrombosis and embolism  
Oedema

### **Block2**

#### Unit 1

Renal failure  
Hepatic failure  
Pigments  
Calculi  
Healing of fracture

#### Unit 2

The Cell in health and disease  
. Cellular structure and metabolism  
. Definition of Inflammation, Sign of Inflammation & its Types

#### Unit 3

Derangement of Body Fluids and Electrolytes  
• Types of shocks  
• Ischaemia  
• Infection

#### Unit 4

Neoplasia – Etiology and Pathogenesis

### **Block 3**

#### Unit 1

Definition of Hematology  
Formation of Blood  
Erythropoiesis  
Leucopoiesis

#### Unit 2

Thrombopoiesis  
Collection of Blood  
Anticoagulants  
Red cell count – Haemocytometer, Methods and Calculation  
WBC Count – Methods

#### Unit 3

Differential Leucocytes Count (DLC) –  
Morphology of White Cells, Normal Values  
Ranancostry Stains: Staining procedures  
Counting Methods, Principle of staining

Unit 4

Hb estimation - Method  
Colorimetric Method  
Chemical Method  
Gasometric Method  
S. G. Method  
Clinical Importance

**Block 4**

Unit 1

Introduction of Microscope  
Types of Microscope  
Role of Microscope in Pathology  
Function of Microscope  
Care and Maintenance  
Safety Precautions

Unit 2

Components of Immune System  
Secondary Immune deficiency diseases  
Route of Transmission of HIV/AIDS  
Natural History of HIV infection  
Laboratory Diagnostics of AIDS

Unit 3

Difference between Oedema & Swelling  
Define Ischaemia, and Etiology

Unit 4

Definition of Infarction, Etiology & Types of infarcts  
Define Phagocytosis  
The Morphology & function of inflammatory Cells

**DXR-205 : PRACTICAL**

**Total Credit : 2**

**Block 1**

Unit 1

1. Barium swallow
2. Barium meal series
3. Barium follow through
4. Barium Enema

## Unit 2

1. I.V.P.
2. H.S.G.
3. Angiography
4. Myelogram

## Unit 3

1. C.T. Scan
2. MRI
3. Nuclear Medicine and pet scan

## Unit 4

1. Ultra Sound
2. Digital Radiography
3. Computer Radiography
4. Interventional Radiography

## **Block 2**

### Unit 1

1. Draw a picture of Axial Skeleton
2. Draw a picture of Upper Limbs
3. Draw a picture of Lower Limbs
4. Draw a picture of organs
5. Draw a picture of Thorax

### Unit 2

1. Draw different organs
2. Draw different Bones
3. Draw the outline structure of desk room
4. Draw the double coated X-Ray film

### Unit 3

1. Practice, How to prepare developer and fixer
2. Practice, Load and Unload and processing of X-Ray films
3. Practice, Taking X-ray of all parts of Human body.
4. Practice, How to maintain the control panel

### Unit 4

1. Maintenance of Bucky (Grid)
2. Construction of X-Ray Tube
3. Maintenance of intensifying screen
4. How to make X-Ray cassette
5. Collection of Blood
6. Estimation of Hemoglobin, Blood Group, TLC and DLC