

SUMANDEEP VIDYAPEETH

(Declared as Deemed to be University under Section 3 of the UGC Act 1956)

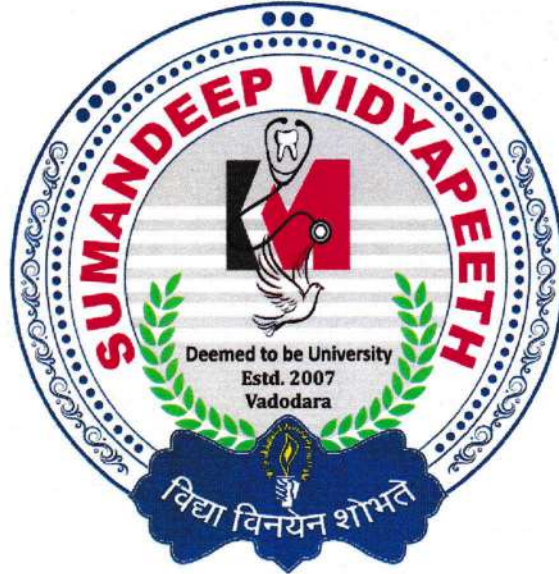
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Category – I deemed to be university under UGC Act - 2018

At & Post Piparia, Tal: Waghodia 391760 (Gujarat) India.

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CURRICULUM

Diploma in X-RAY TECHNOLOGY

Attested CTC

Charan 15/2/2021

Vice-Chancellor

Sumandeep Vidyapeeth

An Institution Deemed to be University

VIII. Piparia, Taluka: Waghodia.

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AMENDED UP TO DECEMBER -2020

INTRODUCTION:

Learning Objectives:

1. At the completion of this course, the student should be –
1. Able to work in the hospital medical imaging department, at the patient's bedside, in the operating room or Emergency or in private imaging clinics/ centers.
2. S/he to assist the use of X-ray, CT scan, angiography, fluoroscopy, ultra sound and MRI to produce images of organs and body parts.
3. Demonstrate sufficient understanding of basic science related to the technology and be able to integrate such knowledge in his/her work.
4. Act upon his/her job description ethically keeping in mind the requirements of the community at large.
5. Demonstrate empathy and humane approach towards communities and exhibit interpersonal behavior in accordance with the societal norms and expectations.
6. To integrate the academic environment with the clinical setting.
7. Manage information to enable effective, timely, accurate, and cost-effective reporting of related information.
8. Have knowledge of Research design/practice sufficient to evaluate published studies as an informed consumer.

Learning goals and objectives for paramedical healthcare professionals

1. Provide the profession and community with trained qualified technologist
2. Provide education a comprehensive program that promotes problem solving, critical thinking and communication skills in the clinical environment
3. Students will demonstrate quality patient care skills including professionalism and ethical behaviors as specified in the code of ethics
4. Graduate students with specific skills necessary to be competent entry level

Program outcomes

1. Should be able to undertake Mammography, CT scan and MRI procedures independently.
2. Assist in specialized radiological procedures.
3. Able to do the image processing.
4. Should be able to handle all radiological and imaging equipment independently.
5. Should ensure radiation protection and quality assurance.
6. Undertake care and maintenance of all radiological and imaging equipment.
7. Able to evaluate images for technical quality.
8. Able to identify and manage emergency situations.
9. Able to receive and document verbal, written and electronic orders in the patient's medical record.
10. Should have computer skills.
11. Should be able to provide empathetic professional patient care.
12. Able to demonstrate professional growth, sense of professionalism and desire to learn.
13. Able to demonstrate the core values of caring, integrity and discovery.
14. To exhibit keen interest, initiative & drive in the overall development of the Department and 'Leadership Qualities' for others to follow.
15. He / She is expected to be confident and to perform all the duties diligently with utmost sincerity and honesty.

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16. Any other duty/task/work assigned by any higher authority like Director, Dean, Medical Superintendent, Head of the Department from time to time; either in "Public Interest" or in the interest of upkeep / development of the Department / Institutions

Ethics and accountability:

Students will understand core concepts of clinical ethics and law so that they may apply these to their practice as healthcare service providers. Program objectives should enable the students to:

- Describe and apply the basic concepts of clinical ethics to actual cases and situations
- Recognize the need to make health care resources available to patients fairly, equitably and without bias, discrimination or undue influence
- Demonstrate an understanding and application of basic legal concepts to the practice
- Employ professional accountability for the initiation, maintenance and termination of patient-provider relationships
- Demonstrate respect for each patient's individual rights of autonomy, privacy, and confidentiality

Commitment to professional excellence

The student will execute professionalism to reflect in his/her thought and action a range of attributes and characteristics that include technical competence, appearance, image, confidence level, empathy, compassion, understanding, patience, manners, verbal and non-verbal communication, an anti-discriminatory and non-judgmental attitude, and appropriate physical contact to ensure safe, effective and expected delivery of healthcare.

Eligibility for admission:

1. Candidate should have passed 10 + 2 with science (PCB).

Duration of the course:

Duration of the course is 3 year including internship.

Attendance:

A candidate has to secure minimum 80% attendance in overall with at least-

1. 75% attendance in theoretical
2. 80% in Skills training (practical) for qualifying to appear for the final examination.

No relaxation, whatsoever, will be permissible to this rule under any ground including indisposition etc.

Medium of instruction:

English shall be the medium of instruction for all the subjects of study and for examination of the course.

Assessment: Assessments should be completed by the academic staff, based on the compilation of the student's theoretical & clinical performance throughout the training programme. To achieve this, all assessment forms and feedback should be included and evaluated. Student must attain at least 50% marks in each Theory, Internal assessment and Practical independently / separately for each unit of a subject.

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COURSE OF INSTRUCTION

Course Name	Course code	Theory (In hrs.) (Class and lab)	Practical (In hrs.) (Clinical)
First Year - Total Hours 640			
Anatomy	DXRT101	60	40
Physiology	DXRT102	60	40
Pathology	DXRT103	60	40
Radiation physics	DXRT104	60	-
Radiographic positioning	DXRT105	160	120
Total		400	240
Second Year - Total Hours 420			
Radiological Special Procedures	DXRT201	120	100
Radiographic positioning and Patient care	DXRT202	80	100
Total		200	220
Third Year-200Hours			
Darkroom technique & new imaging modalities	DXRT301	160	40

SCHEME OF EXAMINATION

Course	Course Code	Assessment			
		Hours	Internal	External	Total
First Year					
Anatomy	DXRT101	3	20	80	100
Physiology	DXRT102	3	20	80	100
Pathology	DXRT103	3	20	80	100
Radiation physics	DXRT104	3	20	80	100
Radiographic positioning	DXRT105	3	20	80	100
Total			120	480	600
Second Year					
Radiological Special Procedures	DXRT201	3	20	80	100
Radiographic positioning and Patient care	DXRT202	3	20	80	100
Total			40	160	200
Third Year					
Darkroom technique & new imaging modalities	DXRT301		20	80	100

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FIRST YEAR DIPLOMA X-RAY TECHNOLOGY

DRIT101-ANATOMY

60 HOURS

THEORY

UNIT – I (ORGANISATION)

- Terms, terminology, planes
- Tissues of the body (General) Epithelial tissue
- Glands, mucous membrane

UNIT – II (SKELETAL SYSTEM)

- Cartilage
- Bones
- Ossification, blood supply
- Joints
- Synovial joint

UNIT – III (MUSCULAR TISSUE)

- Muscle classification – I
- Muscle – II,
- UNIT – IV (Nervous system)
- Neuron, Neuroglia
- Spinal cord & Spinal nerves
- Parts of brain & major functions
- Cranial nerves
- Autonomic nervous system

UNIT – V (SENSORY ORGANS)

- Nose & Olfaction
- Tongue

UNIT – VI (CIRCULATION & LYMPHATIC)

- Systemic, Pulmonary, Portal
- Heart, chambers, valves
- Coronary circulation, venous drainage, applied
- Major branches of aorta, major veins, pulse
- Femoral and Auxiliary artery
- Diaphragm
- Lymphoid tissue classification, structure I
- Lymphoid tissue classification, structure II
- Lymphatic drainage, lymphatic trunks

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PRACTICAL:**40 HOURS**

1.	Human skeleton
2.	Organ systems
3.	Organs – 1
4.	Organs – 2
5.	Organs – 3
6.	Organs – 4
7.	Organs – 5
8.	Types of Cartilages
9.	Bones -1
10.	Bones -2
11.	Bones -3
12.	Histology of compact bones
13.	Muscles of body as functional groups
14.	Histology of types of muscles

DRIT102-PHYSIOLOGY**60 HOURS****UNIT-1 GENERAL PHYSIOLOGY**

- Introduction to cell physiology,
- Transport across cell membrane
- Homeostasis, Body Fluid compartment & measurement

UNIT-2 BLOOD

- Introduction - composition and function of blood
- Plasma proteins
- Red blood cells.
- Hemoglobin
- WBC
- Platelets
- Homeostasis
- Blood Group

UNIT-3 NERVE – MUSCLE PHYSIOLOGY

- Resting membrane potential & Action potential
- Types of muscle & Mechanism of Muscle Contraction
- Neuromuscular Junction
- Neuron and neuroglia
- Properties of nerve fibre
- Secretion & Composition & function of CSF

UNIT-4 GIT

- Movement of GIT
- Deglutition & Mechanism of Vomiting
- Digestive Juices in upper digestive tract
- Digestive juices in lower digestive tract

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UNIT-5 EXCRETORY SYSTEM

- Kidneys-structure, function
- Glomerular filtration rate
- Counter current mechanism of concentration of urine,
- micturition, Diuretics
- Artificial kidney, renal function tests
- Skin
- Regulation of body Temperature

UNIT-6 RESPIRATORY SYSTEM

- Mechanism of Breathing
- Hypoxia
- O₂ and CO₂ transport
- Pulmonary volume & Capacities

UNIT -7 CARDIO VASCULAR SYSTEM

- Introduction to CVS & general principles of circulation
- Properties of Cardiac muscle
- Cardiac cycle, heart sounds, Pulse
- Cardiac output, Heart rate ,BP ,ECG
- Coronary circulation, Cutaneous circulation-Triple response ,Shock
- Effects of exercise on CVS and Respiratory system

UNIT-8 LYMPHATIC SYSTEM

UNIT- 9 ENDOCRINE SYSTEMS

- Hormones of pituitary, Thyroid
- Parathyroid Gland
- Hormones of Adrenal Gland & Pancreas

UNIT 10REPRODUCTIVE SYSTEM

- Introduction to reproductive system, Puberty
- Male reproductive system,
- Female reproductive system,
- Physiological changes during pregnancy, pregnancy tests, parturition & lactation
- Male & Female contraceptive methods
- Special senses
- Vision
- Audition
- Olfaction
- Gustation

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PRACTICAL:**40 HOURS**

- Introduction and Laboratory guidelines
 - Demonstration of estimation of Hemoglobin
 - Practical of estimation of Hemoglobin
 - Practical of BT & CT
 - Practical of Blood Grouping
-
- ESR & PCV
 - Blood Pressure
 - Pulse
 - Revision
 - Heart rate & heart sound
 - Breathing rate & breathing sound
 - Identification of blood cells by peripheral smear. RBC, WBC, Platelets.
 - Revisions

DRIT103-PATHOLOGY**60 HOURS****UNIT I-CELL INJURY AND ADAPTATION:**

- Necrosis:
- Definition.
- Types of necrosis.
- Short notes: Coagulative necrosis.
- Liquefactive necrosis
- Caseous necrosis
- Fat necrosis
- Gangrene

UNIT II- INFLAMMATION AND REPAIR:**Inflammation: Definition**

- Types of inflammation
- Vascular changes, Hemodynamic changes
- Changes in vascular permeability
- Cellular events: Margination, Adhesion, Emigration, Chemotaxis, Phagocytosis.
- Shortnotes: Phagocytosis, Chemotaxis and Granulomas

Healing and repair:

- Process of healing by primary intention.
- Process of healing by secondary intention.
- Shortnotes: factors influencing wound healing.

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UNIT III-FLUID AND HEMODYNAMIC DERANGEMENTS:

Edema:

- Definition
- Types of edema
- Pathogenesis of renal and cardiac edema
- Lymph edema

Shock:

- Definition
- Types of shock
- Pathogenesis of septic and hypovolemic shock

Thrombosis:

- Definition
- Factors influencing thrombosis
- Fate of thrombosis

UNIT IV-NEOPLASIA

- Introduction: nomenclature, metaplasia, dysplasia, anaplasia, hyperplasia, hypertrophy
- Definition
- Differences between benign and malignant tumors
- Spread of tumors
- Shortnotes: Gross features and clinical features of:
 - Squamous papilloma
 - Squamous cell carcinoma
 - Lipoma
 - Fibrosarcoma.

UNIT V-INFECTIOUS DISEASES:

- Tuberculosis: Etiology and clinical features.
- Geon complex
- Secondary tuberculosis
- Leprosy: Etiology, classification and morphology of Lepromatous and Tuberculoid
- leprosy
- Etiology, mode of infection, clinical features and gross pathology of HIV infection

UNIT VI-DISEASES OF RED CELLS AND BLEEDING DISORDERS

- Anaemia: definition and classification
- Clinical features of:
 - Iron deficiency anaemia
 - Vit B 12 deficiency anaemia
 - Sickle cell anemia
- Coagulation disorders: classification, capillary fragility and platelet disorders.
- Haemophilia(SN) thrombocytopenia including ITP(SN)

UNIT VII-DISEASES OF WHITECELL AND LYMPH NODES

- Leukaemia: definition, classification and clinical features
- Lymphoma: definition, types and clinical features

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UNIT VIII-NUTRITIONAL DISEASES

- Vit A, B, C, D deficiency including a brief account of rickets

PRACTICAL:

40 HOURS

- Receiving of Specimen in the laboratory
- Grossing Techniques
- Mounting Techniques – various Mutants
- Maintenance of records and filing of the slides
- Tissue processing for routine paraffin sections
- Section Cutting
- Staining of tissues - H& E Staining
- Collection, Transport, Preservation, and Processing of various clinical Specimens
- Urine Examination – Collection and Preservation of urine. Physical, Chemical, Microscopic Examination
- Urine Examination –Chemical and Microscopic Examination
- Collection of Blood samples
- Various Anticoagulants used in Haematology

DRIT105-RADIATION PHYSICS

60 HOURS

UNIT I-REVIEW OF IDEAS ON ATOMIC AND NUCLEAR PHYSICS

- Alpha decay, beta decay gamma emission
- Internal conversion and nuclear isomerism
- Nuclides and its classification
- Radio activity
- Half life

UNIT II-ELECTROMAGNETIC RADIATION

- Electromagnetic spectrum
- Common properties of electromagnetic radiation
- Relationship between energy, frequency, wavelength and velocity eg, x- ray and gamma rays

UNIT III-REVIEW OF X-RAYS

- Properties of x-rays
- Production of x-rays
- Interaction of x-rays with the target
- Spectra of x-rays
- Quality and intensity of x-rays
- The factors influencing quality and intensity

UNIT IV-INTERACTIONS OF X-RAYS, GAMMA RAYS AND BETA RAYS WITH MATTER

- Transmission through matter
- Law of exponential attenuation
- Half value layer
- Linear attenuation coefficient
- Interaction of radiation with matter
- Classical scattering

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- Compton scatter
- Photo electric absorption
- Pair production
- Practical aspects of radiation absorption and transmission through body tissue

UNIT V-METHODS OF MEASUREMENT OF X AND GAMMA RAY

- Principles of radiation detection and measurement
- Ionization chamber
- G M counter
- Scintillation detector
- Photo film method
- Pocket dosimeter
- TLD
- Solid state detectors
- Chemical dosimeters
- Exposure meters and rate meters
- Measurement of half value layer
- Unit of quantity of radiation exposure, Definition and application of roentgen and relationship with RAD, unit of Dose equivalent(REM)

UNIT VI-Radiation protection

- Introduction
- Maximum permissible Dose, the code of practice
- Protective materials for X and γ radiation
- Radiation monitoring
- Evaluation of workload, occupancy & use factors in diagnostic x-ray departments
- Department planning,
- Protection regulation fluoroscopy & radiography.

UNIT VII-MAIN POWER SUPPLY

- Generators and transformers
- AC and DC power supply with examples
- Single phase and poly phase power supply
- Switches, fuses, circuit breakers, earthing etc
- Main voltage drop: causes and remedy
- Cables: low and high tensions

UNIT VIII-RECTIFICATION

- Vacuum diode- variation of anode current with anode voltage and filament temperature
- Gas filled diode and triode
- Principles of rectification
- Wave form of half wave and full wave current/voltage wave form
- Rectifiers: valves, metal rectifiers, semiconductor rectifiers and relative merits and demerits
- Silicon, germanium diodes

UNIT IX: X-RAY CIRCUITS

- Principle of transformers, design efficiency of transformer, source of power loss
- H.T generators for x-ray machines

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- High frequency circuits
- Self-rectifier half wave rectifier, bridge rectifier and three phase rectifier circuits
- Capacitance filter control and stabilizing equipment
- Main voltage compensators and main resistance compensators
- Compensation for frequency variation
- Control of tube voltage, including kv compensator
- High tension selector switch
- Filament circuit
- Control of tube current, space charge compensation

UNIT X: X-RAY TUBE

- Gas filled x-ray tube: construction, working and limitations; thermionic emission
- Stationary anode x-ray tube : construction, working, methods of cooling anode; rating chart and cooling chart
- Rotating anode x-ray tube: construction, working rating chart, speed of anode rotation, angle of anode inclination
- Dual focus with particular consideration in choice of focus
- Anode heel effect
- Grid controlled x-ray tube
- Effect of variation of anode voltage and filament temperature
- Continuous and characteristic spectrum of x-rays
- Inherent filter and added filter; their effect on quality of the spectrum

UNIT XI MODERN X-RAY TUBES

- Types in detail

UNIT XII-FILTERS

- Definition of filtration
- Types of filtration
- Effect of filtration on patient as well as exposure factor
- Types of filters

UNIT XIII:X-RAY BEAM RESTRICTORS

- Definition
- Functions of restrictors
- Patient protection

UNIT XIV-GRIDS

- Definition and types
- Evaluation of grid performance
- Grid cut-off
- Air gap technique

UNIT XV: FLUOROSCOPY

- Image intensifier
- Direct fluoroscopy
- Principles of image intensification
- Image quality : unsharpness, noise, resolution, distortion
- Spectral emission ; gas spot

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- Multifield image intensifiers
- Lens system and image distribution
- Viewing and recording of fluoroscopic image

UNIT XVI: FACTORS EFFECTING IMAGE QUALITY

- Radiographic image.
- Geometry of the radiographic image

DRIT106-RADIOGRAPHIC POSITIONING

160 HOURS

UNIT 1-SKULL AND CRANIAL BONES AND FACIAL BONES

- Related radiological anatomy
- **Basic & special projections**
- Cranium
- Base of skull
- Sella turcica
- Mastoids
- Optic foramina and Orbits
- Nasal bone
- TM joint
- Facial bone
- Zygomatic arches
- Mandible
- Para nasal sinuses

UNIT2-NECK

- Related radiological anatomy
- Positioning- AP, LAT

UNIT3-CHEST

- Related radiological anatomy
- **Basic & special projections**
- AP,LAT
- AP supine & semierect
- Lateral decubitus
- AP lordotic
- Anterior oblique
- Posterior oblique
- Upper airway: AP, LAT

UNIT4-ABDOMEN

- Related radiological anatomy
- **Basic & special projection**

Special:

- AP supine (KUB)

Special:

- PA prone
- Lateral decubitus

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- Erect AP
- Dorsal decubitus
- Lateral
- Acute abdomen: three-way series

UNIT5-KUB

- Related radiological anatomy
- Positioning- AP

UNIT6-PELVIC GIRDLE AND PROXIMAL FEMUR

- Related radiological anatomy
- Basic & special projections
- Pelvic girdle
- AP pelvis
- Frog lateral(modified cleaves method)
- AP axial for pelvic outlet(tailor method)
- AP axial for pelvic inlet(modified linenfold method)
- Posterior oblique- acetabulum(judge method)

UNIT6-HIP AND PROXIMAL FEMUR

- AP unilateral hip
- Axiolateral, inferosuperior (danielius – miller method)
- Unilateral frog leg(modified cleaves method)
- Modified axiolateral(clements- nakayama method)
- Sacroiliac joints: AP, posterior obliques

UNIT7-SHOULDER GIRDLE

- Related radiological anatomy
- Basic and special projections
- Shoulder non trauma routine:**
- AP(external rotation)
- AP(internal rotation)
- Inferosuperior axial(Lawrence method)
- Inferosuperior shoulder projection(west point method)
- Posterior oblique – glenoid cavity(grashey method)
- Intertubercular groov(kisk method)

Shoulder (trauma routine):

- AP neutral rotation
- Transthoracic lateral (Lawrence method)

Scapula Y view

- Tangential projection- supraspinatus outlet(neer method)
- Apical oblique projections (garth method)

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Clavicle

- AP and AP axial

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Acromioclavicular joints:

- AP bilateral with and without weight

Sternoclavicular joints

Scapula

- AP
- Lateral erect
- Lateral recumbent

UNIT8-HUMOURS

- Related radiological anatomy
- AP
- LAT
- Horizontal beam LAT
- Proximal humerus views

UNIT9-ELBOW

- Related radiological anatomy
- AP- fully extended, partially flexed
- AP oblique- external and internal rotation
- Lateral
- Acute flexion(jones method)
- Trauma axial lateral(coyle method)
- Radial head lateral

UNIT10- FOREARM

- Related radiological anatomy
- AP
- LAT

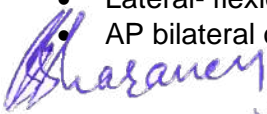
UNIT11-WRIST

- Related radiological anatomy
- PA, AP
- PA oblique
- Lateral
- Radial deviation
- Carpal canal- inferiosuperior (gaynor-hart method)
- Carpel bridge

UNIT12- HAND

- Related radiological anatomy
- PA
- PA oblique
- Lateral
- Lateral- flexion and extension
- AP bilateral oblique(nirgaard method)

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UNIT13- FINGERS

- Related radiological anatomy
- PA
- Oblique
- LAT

UNIT14-THUMB

- Related radiological anatomy
- AP
- PA oblique
- Lateral
- AP (Roberts method)
- Skiers thumb (folio method)

UNIT15-FEMUR

- Related radiological anatomy
- Mid and distal femur
- AP
- Lateral
- Mid and proximal femur
- AP
- Lateral

UNIT16-KNEE

- Related radiological anatomy
- Knee
- AP
- Oblique- medial and lateral rotations
- Lateral
- AP(weight bearing)
- Knee- intercondylar fossa
- PA axial(camp coventry and holmblad method)
- AP axial

UNIT17-LEG

- Related radiological anatomy
- AP
- LAT

Ankle

- Related radiological anatomy
- AP
- AP mortise (15° oblique)
- Lateral
- AP stress

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Foot

- Related radiological anatomy
- AP
- Oblique
- Lateral
- AP and lateral weight bearing

Calcaneus

- Related radiological anatomy
- Plantodorsal(axial)
- Lateral

UNIT18-CERVICAL SPINE

- Related radiological anatomy
- Basic views
- AP open mouth (C1 and C2)
- AP axial
- Oblique
- Lateral
- Erect
- Trauma lateral(horizontal beam)
- Cervicothoracic junction (swimmers view)

Special views

- Lateral- hyperflexion and hyperextension
- AP (fuchs method) or PA (judd method)
- AP wagging jaw (ottonello method)
- AP axial (pillars)

UNIT19-THORACIC SPINE

- Related radiographic anatomy and projections
- AP
- Lateral
- Oblique

UNIT20-LUMBAR SPINE, SACRUM AND COCCYX

- Related radiographic anatomy
- AP
- Oblique
- Lateral
- Lateral (L5 – S1)
- AP axial (L5 – S1)

Scoliosis series

- AP or PA
- Erect lateral
- AP(ferguson method)
- AP – R and L bending

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Spinal fusion series

- AP or PA – R and L bending
- Lateral – hyperextension and hyperflexion

UNIT21-SACRUM AND COCCYX

- AP axial sacrum
- AP axial coccyx
- Lateral sacrum
- Lateral coccyx

UNIT22-PAEDIATRIC RADIOGRAPHY

- Positioning, care and radiation protection while handling babies

Each student shall undergo training in Skill Simulation Laboratory for learning certain basic clinical skills like IV/IM injection, setting IV-line, Cardio-pulmonary resuscitation (CPR), and Life support skills in the beginning of second year, for duration of continuous four days. (Board of Studies letter No.:FPMS/SV/BOS-MIN/0006/2016-17, dated 19/04/2017, and vide notification of Board of Management resolution Ref.:No. SVDU/R/2017-18/5056, dated 09/01/2018).

SECOND YEAR DIPLOMA X-RAY TECHNOLOGY

DRIT201-RADIOLOGICAL SPECIAL PROCEDURES

120 HOURS

UNIT1-INTRODUCTION TO THE SUBJECT

- All radiographic procedures including:
- IVU
- MCU
- Retrograde pyelourethrogram
- Myelogram
- Ba studies
- HSG/ FTR
- Sialography
- T- tube cholangiography
- Percutaneous transhepatic cholangiography
- Direct portal venography
- Bronchography
- Angiography
- Phlebography
- Dacrocystography

UNIT2 -CONTRAST MEDIA

- Definition
- Classification
- Chemistry
- Physiology
- Toxicity
- Treatment- emergency drugs
- C M used in USG

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UNIT3-I V U

- Anatomy of urinary system
- Indication & contra indication
- Risk factors
- Contrast media
- Patient preparation
- Procedure and filming techniques
- Nephrotomogram
- Modification of urogram
- Complication and aftercare

UNIT4-M C U

- Anatomy of lower urinary tract
- Indication & contra indication
- Procedure & filming
- Complications
- Other techniques

UNIT5-MYELOGRAM

- Anatomy of spinal cord
- Definition, indication & contraindication
- Preparations, requirements & contrast media
- Lumbar, cisternal & lateral cervical puncture
- C T myelogram
- M R myelogram

UNIT6-CONTRAST MEDIA IN GIT

- Introduction
- Properties of an ideal barium preparation
- Advantages of barium sulphate preparation
- Manufacture
- Characteristics influencing coating
- Adverse effects
- Other contrast media used
- Contrast media used for CT in GIT
- Contrast media for MRI in GIT

UNIT7-BARIUM SWALLOW

- Anatomy of upper GI tract
- Indications & contraindications
- Contrast
- Procedure and techniques
- Specific conditions
- Complications

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UNIT8-BARIUM MEAL

- Anatomy of stomach

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- Indications & contraindications
- Preparation
- Contrast media
- Standard views
- Conventional single contrast study
- Double contrast barium study
- Biphasic study of upper GIT
- Hypotonic duodenography
- After care & complications

UNIT9-BMFT

- Anatomy of GI tract
- Indications & contraindication
- Contrast medium
- Patient preparation
- Small bowel follows through
- Dedicated small bowel follow through
- Peroral pneumocolon
- Retrograde small bowel examination
- Advantages, disadvantages & complications

UNIT10-ENTEROCLYSIS

- Anatomy of small bowel
- Indication contraindication
- Equipment, contrast medium
- Preparation
- Techniques
- Single contrast study
- Double contrast study
- Air D C enteroclysis
- Comparison
- Advantages, disadvantages & after care

UNIT11-BARIUM ENEMA

- Anatomy of large bowel
- Definition, indication, contraindication
- Contrast
- Preparation and positioning
- DCBE, SCBE
- Special barium enema studies
- Aftercare & complications

UNIT12-HSG

- Anatomy of female reproductive system
- Definition, indication and contraindication
- Equipments, procedures & techniques
- After care & complications
- Sonosaplingiography

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UNIT13-FTR

- Definition, indication and contraindication
- Instrumentation
- Timing of the study, patient preparation
- Technique and filming
- Other methods
- Post procedure follow up and complications

UNIT14-SIALOGRAPHY

- Anatomy of salivary glands
- Definition, indication & contraindication
- Equipments
- Preparation of the patient
- Procedure & filming

UNIT15-CATHETERS

- Classification
- Catheters used for different studies
- Sterilization of catheters
- Balloon angioplasty catheters

UNIT16-ANGIOGRAPHY (CEREBRAL, VISCERAL, PERIPHERAL)

- Anatomy of blood vessels
- Definition indication & contraindication
- Patient preparation and precautions
- Local anaesthesia
- Direct needle puncture
- Catheter angiography
- Percutaneous transluminal angioplasty

UNIT17-DACROCYSTOGRAPHY

- Anatomy of nasolacrimal duct
- Definition, indication & contraindication
- Materials & technique
- Complications
- Other techniques

UNIT18-PATIENT CARE & PROFESSIONAL ETHICS

- Development of communication skills with patient- general comfort and reassurance to the patient-patient education and explaining about the study-drugs used in the preparation of the patient. Handling of an unconscious patient-shifting of patients -hazards of lifting and manoeuvring patients -rules for correct lifting- transfer from chair/wheel chair or trolley to couch and vice-versa -safety of patient and worker while lifting & shifting of patients-handling of geriatric, paediatric and trauma patients -handling female patients-pregnant women. Communicable diseases - hygiene in the department-cross infection and infection handling of infectious patients in the department -application of asepsis. Ethics of medical practice- Radiography professionalism-essential qualities of the radiographer-improving professional and personal qualities. Radiographer as a part of Hospital /Organization-responsibilities. Medico-legal considerations - radiographers clinical and ethical responsibilities- misconduct and malpractice.

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UNIT 1-SKULL AND CRANIAL BONES AND FACIAL BONES

- Related radiological anatomy
- **Basic & special projections**
- Cranium
- Base of skull
- Sella turcica
- Mastoids
- Optic foramina and Orbits
- Nasal bone
- TM joint
- Facial bone
- Zygomatic arches
- Mandible
- Para nasal sinuses

UNIT2-NECK

- Related radiological anatomy
- Positioning- AP, LAT

UNIT3-CHEST

- Related radiological anatomy
- **Basic & special projections**
- AP,LAT
- AP supine & semierect
- Lateral decubitus
- AP lordotic
- Anterior oblique
- Posterior oblique
- Upper airway: AP, LAT

UNIT4-ABDOMEN

- Related radiological anatomy
- Basic & special projection
- Basic:**
- AP supine (KUB)
- Special:**
- PA prone
- Lateral decubitus
- Erect AP
- Dorsal decubitus
- Lateral

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Acute abdomen: three-way series

UNIT5-KUB

- Related radiological anatomy
- Positioning- AP

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UNIT6-PELVIC GIRDLE AND PROXIMAL FEMUR

- Related radiological anatomy
- Basic & special projections
- Pelvic girdle
- AP pelvis
- Frog lateral(modified cleaves method)
- AP axial for pelvic outlet(tailor method)
- AP axial for pelvic inlet(modified linenfold method)
- Posterior oblique- acetabulum(judge method)

UNIT6-HIP AND PROXIMAL FEMUR

- AP unilateral hip
- Axiolateral, inferosuperior (danelius – miller method)
- Unilateral frog leg(modified cleaves method)
- Modified axiolateral(clements- nakayama method)
- Sacroiliac joints: AP, posterior obliques

UNIT7-SHOULDER GIRDLE

- Related radiological anatomy
- Basic and special projections
- Shoulder non trauma routine:**
- AP(external rotation)
- AP(internal rotation)
- Inferosuperior axial(Lawrence method)
- Inferosuperior shoulder projection(west point method)
- Posterior oblique – glenoid cavity(grashey method)
- Intertubercular groove(kisk method)

Shoulder (trauma routine):

- AP neutral rotation
- Transthoracic lateral (Lawrence method)

Scapula Y view

- Tangential projection- supraspinatus outlet(neer method)
- Apical oblique projections (garth method)

Clavicle

- AP and AP axial

Acromioclavicular joints:

- AP bilateral with and without weight

Sternoclavicular joints

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- AP
- Lateral erect
- Lateral recumbent

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UNIT8-HUMOURS

- Related radiological anatomy
- AP
- LAT
- Horizontal beam LAT
- Proximal humerus views

UNIT9-ELBOW

- Related radiological anatomy
- AP- fully extended, partially flexed
- AP oblique- external and internal rotation
- Lateral
- Acute flexion(jones method)
- Trauma axial lateral(coyle method)
- Radial head lateral

UNIT10- FOREARM

- Related radiological anatomy
- AP
- LAT

UNIT11-WRIST

- Related radiological anatomy
- PA, AP
- PA oblique
- Lateral
- Radial deviation
- Carpal canal- inferiosuperior (gaynor-hart method)
- Carpel bridge

UNIT12- HAND

- Related radiological anatomy
- PA
- PA oblique
- Lateral
- Lateral- flexion and extension
- AP bilateral oblique(nirgaard method)

UNIT13- FINGERS

- Related radiological anatomy
- PA
- Oblique
- LAT

UNIT14-THUMB

- Related radiological anatomy
- AP
- PA oblique
- Lateral
- AP (Roberts method)

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- Skiers thumb (folio method)

UNIT15-FEMUR

- Related radiological anatomy
- Mid and distal femur
- AP
- Lateral
- Mid and proximal femur
- AP
- Lateral

UNIT16-KNEE

- Related radiological anatomy
- Knee
- AP
- Oblique- medial and lateral rotations
- Lateral
- AP(weight bearing)
- Knee- intercondylar fossa
- PA axial(camp coventry and holmblad method)
- AP axial

UNIT17-LEG

- Related radiological anatomy
- AP
- LAT

Ankle

- Related radiological anatomy
- AP
- AP mortise (15° oblique)
- Lateral
- AP stress

Foot

- Related radiological anatomy
- AP
- Oblique
- Lateral
- AP and lateral weight bearing

Calcaneus

- Related radiological anatomy
- Plantodorsal(axial)
- Lateral

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UNIT18-CERVICAL SPINE

- Related radiological anatomy
- Basic views
- AP open mouth (C1 and C2)

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- AP axial
- Oblique
- Lateral
- Erect
- Trauma lateral(horizontal beam)
- Cervicothoracic junction (swimmers view)

Special views

- Lateral- hyperflexion and hyperextension
- AP (fuchs method) or PA (judd method)
- AP wagging jaw (ottonello method)
- AP axial (pillars)

UNIT19-THORACIC SPINE

- Related radiographic anatomy and projections
- AP
- Lateral
- Oblique

UNIT20-LUMBAR SPINE, SACRUM AND COCCYX

- Related radiographic anatomy
- AP
- Oblique
- Lateral
- Lateral (L5 – S1)
- AP axial (L5 – S1)

Scoliosis series

- AP or PA
- Erect lateral
- AP(ferguson method)
- AP – R and L bending

Spinal fusion series

- AP or PA – R and L bending
- Lateral – hyperextension and hyperflexion

UNIT21-SACRUM AND COCCYX

- AP axial sacrum
- AP axial coccyx
- Lateral sacrum
- Lateral coccyx

UNIT22-PAEDIATRIC RADIOGRAPHY

- Positioning, care and radiation protection while handling babies

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THIRD YEAR DIPLOMA X-RAY TECHNICIAN

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UNIT1-COMPUTED RADIOGRAPHY

- Introduction
- Components
- Cassettes and Imaging plates
- Digitizer
- Image formation
- Advantages and disadvantages

UNIT2-DIGITAL RADIOGRAPHY

- Introduction
- Work flow
- System components
- Image formation
- Advantages and disadvantages

UNIT3-PACS

- Introduction
- Work flow
- Components
- Types
- Storage
- Advantages and disadvantages

UNIT4-DSA

- Introduction
- Room layout and design
- Equipment
- Image recording system
- Automatic injection devices
- Contrast media
- Catheters and accessories
- Subtraction techniques

UNIT5: MACRO RADIOGRAPHY

- Definition
- Principle
- Unsharpness
- Scattered radiation
- Cassette support
- Examples of macro radiography

UNIT6: DENTAL RADIOGRAPHY

- Introduction
- Terminology
- Dental formula
- Intra-oral radiography
- Bite wing

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- Periapical radiography
- Occlusal radiography
- Extra oral oblique lateral
- Cephalometry
- Orthopantomography

UNIT8-MAMMOGRAPHY

- Introduction
- Physics involved in it
- Patient preparation
- Different techniques

UNIT9-COMPUTED TOMOGRAPHY

- Introduction to CT
- History
- Advantage of CT
- Comparisons with other imaging modalities
- CT principle
- Basic principle
- CT number
- CT generations
- Slip ring technology
- Electron beam CT
- Multy slice technology
- CT detector

UNIT10- IMAGE RECONSTRUCTION

- Basic principle
- Image reconstruction from projections
- Reconstruction algorithms

UNIT11- INSTRUMENTATION

- CT scanner
- Imaging system
- CT computer and image processing
- Image display, storage, recording and communications
- CT control console
- Options and accessories for CT systems

UNIT12-DATA ACQUISITION

- Basic scheme for data acquisition
- CT detector technology
- Detector electronics
- Data acquisition and sampling

UNIT13-IMAGE DISPLAY

- Image formation and representation
- Image processing
- Pixel and voxel
- CT number

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- Window level and window width

UNIT14-CT ARTIFACTS

- Classification
- Types
- Causes
- Remedies

UNIT15- IMAGE QUALITY

- Qualities
- Resolution
- Contrast
- Sharpness
- Noise properties in CT

UNIT16-BASIC DIAGNOSTIC ASPECTS

- Role of the CT technologist
- Patient management
- Indication
- Patient preparation
- Patient positioning and scanning protocols

UNIT17-CT CONTRAST MEDIA

- Types
- Use and administration
- Suspected contraindications

UNIT18-CT GUIDED PROCEDURES

- Types
- Protocols
- Both invasive and non invasive

UNIT19-SAFETY CONSIDERATION

- Staff safety
- Patient safety
- Universal precautions
- Knowledge of communicable and non communicable diseases

UNIT20-DOCUMENTATION

- Role of CT Technologist
- Documentation of information about patient care, the procedure and the final outcome

DARK ROOM TECHNIQUES

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UNIT1-INTRODUCTION TO THE SUBJECT

UNIT2-IMAGE CHARACTERISTICS

- Definition

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- Reflected, transmitted and emitted light image
- Noise(fog, quantum noise), SNR, contrast, optimum contrast, sharpness
- Resolution

UNIT3-THE INVISIBLE X-RAY IMAGE

- Latent image
- Subject contrast
- Differential attenuation
- Effects of scatter and its control
- Geometric & motion Unsharpness

UNIT4-RADIOGRAPHY (PHOTOGRAPHIC PRINCIPLE)

- Photographic effect
- Photosensitive chemicals: latent image formation
- Manufacture of emulsion: light and x-ray sensitive emulsion
- Describing photographic performance: density, log relative exposure
- The characteristic curve
Sensitometry

UNIT5-THE RECORDING SYSTEM: FILM MATERIAL

- Film construction
- Film base, subbing layer, emulsion, super coat, backing layers
- Crossover effect; irradiation
- Types of films
- Film storage

UNIT6-THE RECORDING SYSTEM: INTENSIFYING SCREENS

- Luminescence
- Screen unsharpness
- Screen construction
- Phosphors
- Quantum detection & conversion efficiency
- Types of screen
- Intensifying factor : quantum mottle
- Factors affecting speed and unsharpness
- Care of screens

UNIT7-THE RECORDING SYSTEM: FILM CASSETTES

- Cassette construction and ideal features
- Types of cassettes
- Care of cassettes; loading and unloading cassettes
- Special cassettes

UNIT8-THE PROCESSING AREA

- Site and function of the processing area
- Darkroom design and construction
- Darkroom illuminations
- Dark room equipments : manual & automatic processors
- Health and safety

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- COSHH regulations

UNIT9-PHOTOGRAPHIC PROCESSING: PRINCIPLES-1

- Acidity, alkalinity and pH
- Development: (manual)
- Developer solution & activity
- Fixing: fixing solution and activity
- Washing & Drying

UNIT10-PHOTOGRAPHIC PROCESSING: PRINCIPLES- 2 (AUTO PROCESSORS)

- Film transport, cycle time, capacity
- Feed section
- Developer section
- Fixer section
- Washing section
- Drying section
- Replenishment; auto mixers
- Auto processors for special films
- Care & maintenance of the auto processors

UNIT11-SILVER RECOVERY

- Justification for silver recovery
- Amounts of silver in fixer
- Electrolytic recovery; high current systems
- Recovering silver deposit; recycling fixer
- Monitoring efficiency; comparison of methods
- Silver recovery from scrap films

UNIT12-FILM ARTIFACTS

- Definition
- Types
- Causes and remedies

SPECIAL RADIOLOGICAL EQUIPMENT

- Portable and mobile x-ray units
- Dental x-ray machine
- High tension Generators
- X-ray tubes-their types and advancements
- Digital radiography equipment
- Digital subtraction techniques Tomography: Body section radiography, basic principle and equipment, multi section tomography, various types of tomographic movements, Tomosynthesis, Stich radiography, Dual energy x-ray absorptionometry (DEXA) scan.

Allied and Healthcare Professions

Allied healthcare professionals includes individuals involved with the delivery of health or healthcare related services, with qualification and competence in therapeutic, diagnostic, curative, preventive and/or rehabilitative interventions. They work in multidisciplinary health teams in varied healthcare settings including doctors (physicians and specialist), nurses and public health officials

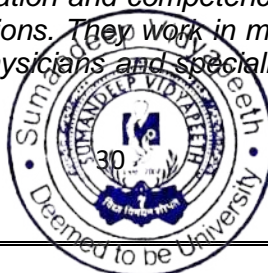
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to promote, protect, treat and/or manage a person('s) physical, mental, social, emotional, environmental health and holistic well-being.

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