



Master of Vocation (Radiology and Medical Imaging Technology)

M. Voc. (RMIT) Syllabus

Year 1 (Degree)

FIRST SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
MVRMIT101	Anatomy & Physiology	40	60	100
MVRMIT102	Radiographic Procedures	40	60	100
MVRMIT103	Instrumentation of Conventional Radiology equipments.	40	60	100
MVRMIT104	Principles of Radio Graphic Exposure	40	60	100
PRACTICAL				
MVRMIT105	Anatomy & Physiology Lab	60	40	100
MVRMIT106	Radiographic Procedures Lab	60	40	100
MVRMIT107	Instrumentation of Conventional Radiology equipments Lab	60	40	100
MVRMIT108	Clinical Posting	60	40	100
Total		400	400	800

SECOND SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
MVRMIT201	Patients Care In Diagnostic Radiology	40	60	100
MVRMIT202	Radiation Evaluation And Protection In Diagnostic Radiology	40	60	100
MVRMIT203	Interventional Radiology Technique	40	60	100
MVRMIT204	Quality Assurance and Quality Control in Diagnostic Radiology and Imaging	40	60	100
MVRMIT205	Communication & Soft Skills	40	60	100
PRACTICAL				
MVRMIT206	Patients Care In Diagnostic Radiology Lab	60	40	100
MVRMIT207	Radiation Evaluation And Protection In Diagnostic Radiology Lab	60	40	100
MVRMIT208	Interventional Radiology Technique Lab	60	40	100
Total		380	420	800

Master of Vocation (Radiology and Medical Imaging Technology)
M. Voc. (RIT) Syllabus
Year 2 (Degree)
THIRD SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
MVRMIT301	Basic Electronic And Biostatistics	40	60	100
MVRMIT302	Advanced Techniques And Instrumentations Of CT	40	60	100
MVRMIT303	Instrumentations Of Specialized Radiology Equipments	40	60	100
MVRMIT304	Corporate Communication	40	60	100
PRACTICAL				
MVRMIT305	Advanced Techniques And Instrumentations Of CT Lab	60	40	100
MVRMIT306	Instrumentations Of Specialized Radiology Equipments Lab	60	40	100
MVRMIT307	Clinical Posting	60	40	100
Total		340	360	700

FOURTH SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
MVRMIT401	ADVANCED Techniques and Instrumentation Of Ultrasound	40	60	100
MVRMIT402	Advanced Techniques and Instrumentation Of MRI	40	60	100
MVRMIT403	Nuclear Medicine Imagine Techniques	40	60	100
MVRMIT404	Research Methodology	40	60	100
PRACTICAL				
MVRMIT405	ADVANCED Techniques and Instrumentation Of Ultrasound Lab	60	40	100
MVRMIT406	Advanced Techniques and Instrumentation Of MRI Lab	60	40	100
MVRMIT407	Dissertation (Thesis + viva)	60	40	100
Total		340	360	700

M. Voc. RMIT -I Semester

PAPER:- 1 HUMAN ANATOMY & PHYSIOLOGY

Paramedical Course - Masters Anatomy

Syllabus:

UNIT-1

Introduction: Overview of the structure organization of the human body; anatomical terminology of positions & locations, planes.

Cell: Cell morphology and diversity; introduction to ultra structure and function of cell organelles.

Skeletal Muscles: Major skeletal muscles of the head, neck, thorax, abdomen and upper and lower limbs.

General Osteology: General morphology of bones; structural classification of bones, development and growth of skeletal tissue and bones.

General Astrology: Structural and functional classification of joints; general morphology of a synovial joint and associated structures; movements made available by synovial joints.

Detailed Osteology and Astrology Practical: Naming and identification of osteological features of individual human bones; Bones of Upper limbs – Clavicle, Scapula, Humerus, Radius, Ulna; Lower limbs – Femur, Hip bones, Sacrum, Tibia, Fibula, Ribs, Sternum Vertebral Column. Naming, identification and application of classification to the major joints of the human body; examples of variability in the human skeleton.

UNIT-2

Cardiovascular System: Macroscopic features, function and location of the adult and the location of major arteries and veins; macroscopic features of blood vessels including arteries, veins and capillaries; morphological features of the cellular components of blood.

Lymphatic System: Macroscopic features, major function and location of the lymphatic vascular structures, lymph nodes, tonsils and other mucosa-associated lymphatic tissue, spleen and thymus; microscopic anatomy of lymph nodes.

Nervous System: Macroscopic features and major functions of the brain brief structure, location & function of cerebrum, cerebellum & brain stem and spinal cord; morphological features and major function of the contents of the peripheral nervous system and autonomic nervous system.

Respiratory System: Macroscopic features and major functions of the nasal cavity, paranasal sinuses,

pharynx, larynx, trachea, bronchi, lungs and thoracic wall including the thoracoabdominal diaphragm.

Digestive System: Macroscopic features and major functions of the mouth, salivary glands, pharynx, oesophagus, stomach, small and large intestines, liver pancreas, biliary system and peritoneal cavity.

UNIT-3

Urinary System: Macroscopic features, major functions and location of the kidneys, ureters, urinary bladder and the urethra.

Endocrine System: Macroscopic features, location and basic function of the hypothalamus, thyroid gland, parathyroid glands, suprarenal glands, pineal gland and organs with a minor endocrine function.

Male Reproductive System: Macroscopic features, Major functions and location of the scrotum, testes, epididymis, ductus deferens, inguinal canal, seminal vesicles, prostate gland, bulbourethral gland and penis.

Female Reproductive System: Macroscopic features, major functions and location of the ovaries, uterine tubes, uterus, vagina and external genitalia.

Special Senses: Macroscopic features and major functions of the contents of the orbital cavity, the eyeball, lacrimal apparatus, and external, middle and internal ear.

UNIT-4

Upper Limb: Relevant osteology; detailed plain radiographic anatomy of skeletally mature individuals.

Head and Neck: Relevant osteology of the skull and cervical vertebrae; surface anatomy, lymphatics major blood vessels and nerves of the head and neck; regional anatomy of the brain and its meninges.

UNIT-5

Histology: macroscopic and microscopic studies of epithelial tissue, general connective tissue, cartilaginous tissue, bone tissue, muscle tissue, nervous tissue and the integument; major functional advantages of each tissue type.

Anatomy Practical:

- Demonstration of bones identification and side determination upper limb-clavicle, scapula, humerus, radius, ulna, lower limb-femur, Hip bone, Tibia, Fibula, Vertebral Column, Ribs, Sternum, Sacrum
- Demonstration of heart.
- Demonstration of different parts of respiratory system and normal X-rays- lungs.
- Demonstration of the part of digestive system and normal X-rays- stomach, small intestine, large intestine, liver.
- Embalming of human cadavers for teaching purposes & social/ funeral embalming.
- Surface anatomy on cadaver.
- Demonstration of major vessels of the body-Aorta, subclavian, carotid, brachial, radial, ulnar, femoral, renal.
- Demonstration of bones & joints of the limb in normal X-ray.
- Demonstration of major muscles of the body-limbs, head & neck.
- Demonstration of other organs—spleen, testis, uterus.
- Histology-General epithelium, connective tissue, gland, bone, cartilage lymphoid tissue Systemic-Lung, Esophagus, Stomach, Small Intestine, Pancreas, Liver, Kidney, Pituitary Gland, Thyroid, Testis, Ovary.

PARAMEDICAL SYLLABUS – PHYSIOLOGY (M.Sc.)

General Physiology: Cell: Structure and function of a cell, Transport across the cell membrane, Passive Transport: Diffusion (Simple and Facilitated), Osmosis (Osmotic pressure, Tonicity), Active transport: Primary (Na^+K^+ ATPase), Secondary, Carrier type (Uniporters, Symporters, Antiporters), Vesicular (Endocytosis and Exocytosis), Tissues: Definition and classification (Epithelial, Connective, Muscular, Nervous), Body water and body fluids: Distribution of total body water, Ionic composition of body fluids, Concept of pH and H^+ concentration. The Membrane Potentials: Resting membrane potentials (Genesis & function), Action Potential

Blood: Composition and functions of blood, Hemoglobin (Normal values and time), Blood Cells: RBCs, WBCs, Platelets (Development, structure and functions), Coagulation of blood and bleeding disorders, Haemophilia, Purpura, Blood groups (ABO, Rh) Uses, Lymphoid tissues (types) and immunity, Immune system (Natural and Acquired), Applied: Anaemia (Types), Jaundice, Hemophilia

Gastrointestinal Tract: Organization of structure of GIT, Functions of digestive system, Innervation of GIT (Enteric Nervous System). Mouth (Oral Cavity): Boundaries, Tongue, Teeth, Composition and functions of saliva, Mastication (chewing), Swallowing (Deglutition) Stages. Stomach: Structure, Functions of stomach and innervation, Composition and functions of gastric juice, Regulation of secretion of gastric juice, Gastric motility and emptying. Pancreas: Structure, Nerve supply, , Composition, functions and regulation of secretion of pancreatic juice. Liver: Structure, Functions and Liver function tests Bile: Composition, functions and control of secretion. Gall Bladder: Functions of gall bladder. Small Intestine: Intestine juice, Digestion and movements. Large Intestine: Structure, movements, absorption and secretion, dietary fibers. Digestion and absorption in GIT: Digestion and absorption of carbohydrates, lipids and proteins. Food and nutrition: constituents of a normal diet, Balanced diet, Applied aspect (Deficiency diseases, Kwashiorkar, Marasmus)

Respiratory System: Structure and functions of respiratory system, Air Passages: Nose and nasal cavity, pharynx, larynx, tracheobronchial tree, lungs, respiratory membrane, pleura, Properties of gases: Partial Pressure, composition of dry air, Functions of respiratory system: Lung defense mechanism and pulmonary circulation. Mechanics of respiration: Mechanism of breathing (Inspiration and Expiration), Alveolar Surface Tension (Actions of surfactant), Alveolar Ventilation: Dead space (Anatomical and Physiological), Diffusion capacity of lungs (Clinical Significance), Lung volumes and capacities (Static: Tidal Volume, Residual Volume, Vital Capacity, Total Lung capacity; Dynamic: FEV_1 , FEV_2 , FEV_3 , Minute/Pulmonary Ventilation, Maximum Voluntary Ventilation). Transport of gases: Oxygen transport [Carriage of oxygen in blood; Dissolved form & combined with hemoglobin, Carriage of oxygen in the body; In tissues (At rest and during exercise), In lungs]. Carbon-di-oxide transport [Carriage of Carbon-di-oxide in blood; In dissolved form, carbamino form (In plasma and RBCs), as bicarbonate, Carriage of Carbon-dioxide in lungs], Oxygen hemoglobin dissociation curve (Shift to right & Shift to left). Regulation of respiration: Nervous Regulation of respiration [Automatic control via Medullary and Pontine Respiratory centers, Voluntary control of respiration], Genesis of respiration (Inspiration and Expiration), Factors affecting respiration [Chemical and non-chemical stimuli], Chemical Regulation of respiration [Peripheral chemoreceptors (Carotid bodies and Aortic bodies) and Central (Medullary) chemoreceptors]. Physio clinical aspects: Dyspnea, Apnea, Hypoxia

Cardiovascular System: General Cardiac chambers (Valves in the heart, Heart sounds, P

acemaker tissue of the heart), Properties of Cardiac Muscle, Cardiac Cycle, Electrocardiogram (ECG), Circulation: Functions, Pressure changes in vascular system, Organization and functions of vascular system, Distribution of major vessels in the body, Lymphatic system, Regulation of cardiovascular system:, Local (Basic Myogenic tone), Systemic: Chemical, Neural (Autonomic and medullary; Baroreceptors and Chemoreceptors) Heart Rate: Definition, Factors affecting HR and it's control, Cardiac Output: Definition, Distribution and control, Arterial Blood Pressure: Definition, factors affecting and regulation

Excretory System: Anatomy and Physiology of Urinary System, Kidney: Structure, Organization and functions of Glomerulus, Glomerular membrane, Blood supply Functions of kidney: Formation of urine, Regulation of water balance, Regulation of electrolyte balance, Regulation of acid-base balance, Endocrine functions of kidney, Urinary Passages: Ureters, Urinary Bladder (Structure and function, Higher control of micturation)

Endocrine System: Definitions, Control (Neural and endocrine), Characteristics of hormones, Pituitary Gland: Physiological anatomy (Anterior, intermediate and posterior lobe), Anterior Pituitary – Six Hormones (GH, PRL, TSH, ACTH, LH, FSH, Growth Hormone (GH): Control and actions, Applied (Gigantism, Acromegaly, Dwarfism), Prolactin (PRL): Control and actions of PRL, Posterior Pituitary, ADH (Anti diuretic hormone): Control of ADH secretion, Actions of ADH, Applied, Oxytocin: Actions and Control of oxytocin secretion, Intermediate lobe of Pituitary , MSH (Melanocyte stimulating hormone), Thyroid Gland: Physiological anatomy, Types of hormones (T3 and T4), Regulation of thyroid secretion, Actions of thyroid hormone: Calorigenic , On carbohydrate metabolism, On lipid metabolism, On growth and development, Effect on nervous system, Applied (Goiter, Hypothyroidism, Hyperthyroidism), Parathyroid, Calcitonin and Vitamin-D: Role of calcium in metabolic processes, Distribution, Absorption and fate of calcium in the body, Hormones regulating calcium metabolism (Vitamin-D, PTH, Calcitonin), Applied (Rickets, Osteomalacia & Adult Rickets, Hyperparathyroidism), Adrenal Cortex: Physiological Anatomy of adrenal gland, Regulation of glucocorticoid secretion, Actions of glucocorticoids, Cushing's Syndrome, Mineral corticoids (Aldosterone, Actions of aldosterone, Regulation of aldosterone secretion, Addison's Disease), Sex Hormones, Adrenal Medulla: Physiological Anatomy, Actions of catecholamine's, Actions (CVS, carbohydrate metabolism, lipid metabolism, BMR, CNS, Eyes, Urinary bladder, skin), Pancreas: Physiological Anatomy, Glucagon, Insulin (Actions), Applied (Diabetes Mellitus; Causes, Signs and symptoms), Thymus and Pineal Gland: Thymus: Functions, immunological role of thymus, Pineal gland: General features, Functions, control

Reproductive System: Physiology of reproduction: Sex determination and sex differentiation, Puberty: Control of onset and stages, reproductive hormones; Gonadotropin (FSH & LH), Male Reproductive System: Testis: Structure and functions, Spermatogenesis, Structure of the sperm, Seminal tract and related glands, supporting structure, seminal fluid (semen), Endocrine functions of testis (Testosterone, Control of testicular activity) Female Reproductive System, Female reproductive tract: Uterus and related structures, ovaries, ovarian hormones (Estrogen, Progesterone and Relax in) , Female Sexual Cycle: Changes in the ovaries and uterus (Menstrual cycle), Vagina and gonadotropin secretion Contraceptive measures

Central Nervous System: Organization and functions of nervous system Brain: Cerebral Hemisphere (Cerebrum), Basal Ganglia, Thalamus, Hypothalamus Brain stem: Midbrain, Pons, Medulla, Reticular formation, Cerebellum Spinal Cord: Structure and functions, Ascending (Sensory) tracts, Motor (Descending) tracts Cerebrospinal Fluid

Peripheral Nervous system, Somatic Nervous System: Spinal nerves, Reflexes, Mono and Polysynaptic reflexes, Cranial nerves, Autonomic Nervous system (ANS): Sympathetic and Parasympathetic

Special Senses: The Smell: Olfactory receptors, Olfactory pathway, Physiology of olfaction, The

Taste: Taste Receptors (Taste buds), Taste Pathway, Physiology of taste The Ear: Physiological Anatomy (External ear, Middle Ear, Inner ear, Cochlea), Physical Properties of sound, Mechanism of hearing, The Eye: Physiological Anatomy (Sclera, Choroid, Retina, Crystalline lens, photoreceptors), Visual Pathway, Image forming mechanism of eye, Visual Acuity, Visual reflexes, Accommodation, Defects of image forming mechanisms, Lacrimal Apparatus (Lacrimal gland, Lacrimal canaliculi, nasolacrimal duct, tears or Lacrimal fluid)

Skin and Temperature: Structure and function of skin, Temperature Regulation

Practical

Haemoglobinometry

- White Blood Cell count
- Red Blood Cell count
- Determination of Blood Groups
- Leishman's staining and Differential WBC count
- Determination of packed cell Volume
- Erythrocyte sedimentation rate [ESR]
- Calculation of Blood indices
- Determination of Clotting Time, Bleeding Time

PAPER: 2 - Course/ Paper: Radiological Procedure

Course Code: RMIT 102

Objectives:

1. To know management and positioning of patients while performing radiological procedures.
2. Knowledge of indications, contraindications, contrast media, radiation dose, exposure timing and radiation safety measures for different radiological procedures.
3. To understand the patient preparations needed before any radiological examination.
4. Knowledge of post procedural care.

Skills:

1. Knowledge of image quality in radiological images.
2. Students will be able to position the patients for radiological procedures.
3. Management of patients in radiology department for various procedures.
4. Ability to handle emergency situations in radiology department.
5. Precautions and care required in interventional suits.

UNIT 1:

Contrast Media:- Applications, types, safety aspects, mode and volume of administration, administration techniques

Digestive system:-

Anatomy and physiology
Associated pathology and radiographic appearance
Barium swallow
Barium meal
Barium meal follow through
Enteroclysis
Barium enema

Geneto Urinary System: -

Anatomy and physiology
Associated pathology and radiographic appearance
Intravenous urogram (IVU)
Micturating cystourethrogram (MCU)
Ascending urethrogram (ASU)
Hysterosalpingography (HSG)
Fallopian tube recanalisation (FTR)
Retrograde urethrogram (RGU)

UNIT 2

Cardio-respiratory system:

Anatomy and physiology
Associated pathology and radiographic appearance
Bronchography
Percutaneous lung biopsy

Mammography:

Anatomy and physiology
Indications, Contra Indications and special views
ICRP guidelines, BIRADS

UNIT 3:

Skull:

Related anatomy of facial and cranial bones
Associated pathology and radiographic appearance
Indications, Contra Indications and special views

Vertebral Column:

Related anatomy
Associated pathology and radiographic appearance
Indications, Contra Indications and special views

Upper limb:

Related anatomy
Associated pathology and radiographic appearance
Indications, Contra Indications and special views

Lower limb:

Related anatomy
Associated pathology and radiographic appearance
Indications, Contra Indications and special views

UNIT 4:**Pelvis:**

Related anatomy of pelvic bones and hip joint
Associated pathology and radiographic appearance
Indications, Contra Indications and special views

Hepatobiliary System:

Related anatomy
Associated pathology and radiographic appearance
ERCP/PTBD, T-Tube cholangiography, PTC

UNIT 5:**Dental Radiography:**

Related anatomy
Associated pathology and radiographic appearance
OPG
Cephalometry

Additional Procedures:

Related anatomy
Associated pathology and radiographic appearance
Arthrography, Sialography, dacrocystography, sinography, fistulography

Practicals:

Contrast Media Digestive system
Geneto Urinary System Cardio-respiratory system Mammography

Skull
Vertebral Column Upper limb
Lower limb Pelvis
Hepatobiliary System
Dental Radiography
Other Procedures

PAPER: 2 - Instrumentation of Conventional X Ray Equipments

Course Code: RMIT 102

Objectives:

1. To understand the general physics related to Medical imaging technology.
2. Construction and working of Equipments used in x- ray.
3. Application of Equipments in Medical Imaging Technology.

Skills:

- 1) Knowledge of basic physics associated with radiology.
- 2) Students will be able to understand the construction and equipment description of X-ray, fluoroscopy and mammography.
- 3) Maintenance and care of x-ray Equipments used in radiology departments.
- 4) Quality control of radiology Equipments.

Unit 1:

Generation of electrical energy
Distribution of electrical energy
Uses of electricity in hospitals
Safety rules for technologist

UNIT 2:

X ray circuit components
High tension transformers
Main voltage compensation
High tension switches

Stabilizers and UPS

UNIT 3:

Fuses
Switches
Earthing
High tension cables constructions and design
Rectifications

Types of rectifiers
Transformers and its types
Tube rating
Types of generators

UNIT 4:

Switches
Circuit breakers
Exposure switching and its application
Magnetic relay
Thermal relay switches
Interlock in tube circuit and over load inter interlocks

UNIT 5:

Exposure Timers
Timing systems
Electronic timer
Ionization timer
Photo timer
Synchronous timer and impulse timer

PRACTICALS:

Uses of electricity in health care centres
Safety rules for technologist X ray circuit components
High tension transformers

Main voltage compensation
High tension switches
Stabilizers and UPS Fuses
Switches Earthing
Exposure Timers
Timing systems
Electronic timer

PAPER: 3 - Principle Of Radiographic Exposure

Course Code: RMIT 103

Objectives:

1. To know basic physics of radiography

2. Construction and working of film, intensifying screen, cassette, dark room, computed radiography, direct radiography, automatic processor.
3. To understand radiographic film Processing chemistry.
4. To study the factors affecting image quality in radiographic image and their application.

Skills:

- 1) Students will be able to manage the workflow in x-ray imaging.
- 2) Knowledge of improving image quality in radiographic images.
- 3) Appropriate knowledge for the use of radiation factors.
- 4) Students will be able to process the radiographic film in different systems, eg: dark-room, CR, DR and automatic processor.
- 5) Ability for the care and maintenance of radiographic films, cassettes, intensifying screens, darkroom accessories and X-ray equipment.

UNIT 1:

X ray production
Interaction of radiation with matter
Useful range
Clinical application
The Photographic Process
Basic review of photographic emulsion
Photographic latent image
Film materials
Speed and contrast of photographic material
Intensifying screens and cassettes
Film processing

UNIT 2:

Sensitometry
Photographic density
Opacity
Transmission
Production of characteristic curve
Features of characteristic curve
Variation in the characteristic curve with development
Comparison of emulsion by their characteristic curve
Application of characteristic curve
Information from the characteristic curve

UNIT 3:

Radiographic image
Radiographic density
Acceptable range
Factors influences density
Radiographic contrast
Components
Factors influence contrast
Management of radiographic image quality

UNIT 4:

Resolution
Line spread function & modulation transfer function
Unsharpness in the radiographic image and various factors contributing towards unsharpness
Types of unsharpness
Radiographic mottle
Geometry of the radiographic image
Magnification / distortion – types and factor

UNIT 5:

Instrumentation of processing equipment
Automatic film processor (AFP)
Layout and planning of dark room
Viewing accessories: viewing boxes
Magnifiers and viewing conditions

PRACTICALS:

X ray production
Interaction of radiation with matter Film materials
Speed and contrast of photographic material Intensifying screens and cassettes
Film processing

Radiographic image Radiographic density Acceptable range
Factors influences density
Layout and planning of dark room
Viewing accessories: viewing boxes Magnifiers and viewing conditions

PAPER: 4 – Clinical Posting

Course Code: RMITP 104

Practicals of all the learnt theories.

SunRise University

M. Voc. RMIT -II Semester

PAPER: 1 - Patients Care in Diagnostic Radiology

Course Code: RMIT 201

Objectives:

1. To know the basic needs and care for the patients inside the radiology departments.
2. Preparation of patients for various radiological examinations.
3. Knowledge of the transferring patients before and after the radiological examination and restraining of patients at the time of examination.

Skills:

- 1) Students will be able to transfer the patients without causing any complications and can restrain the uncooperative patients during radiological examinations.
- 2) Obtaining vital signs, handling equipments used for various procedures.
- 3) Management and Care of patient during emergency situations.
- 4) Using sterilised techniques to reduce the chances of infection in work practices.

UNIT 1:

Introduction to the patient care
Responsibility of the health care facility
Responsibilities of the Imaging technologist
General patient care
Patient transfer technique
Restraint technique
Aspects of patient comfort
Specific patient conditions
Security of the patient property
Obtaining vital signs
Laying up a sterile trolley
IV injection administration

UNIT 2:

Nursing procedure in radiology
General abdominal preparation
Clothing of the patient
Giving an enema
Handling the emergencies in radiology
First aid in the x ray departments

UNIT 3:

Patient care during investigation
GI tract, biliary tract, respiratory tract, gynecology, cardiovascular, lymphatic system, C N S. etc.

UNIT 4:

Infection control
Isolation technique
Infection source
Transmission modes
Procedures
Psychological considerations
Sterilization & sterile technique

UNIT 5:

Patient education
Communication
Patient communication problems
Explanation of examinations
Radiation safety/ protection
Interacting with terminally ill patient
Informed consent

PRACTICALS:

Introduction to the patient care
Responsibility of the health care facility
Responsibilities of the Imaging technologist Aspects of patient comfort
Specific patient conditions
Security of the patient property Obtaining vital signs
Laying up a sterile trolley IV injection administration Giving an enema
Handling the emergencies in radiology First aid in the x ray departments
Nursing procedure in radiology General abdominal preparation Infection control
Isolation technique Patient education Communication
Patient communication problems Explanation of examinations
Radiation safety/ protection

PAPER: 2 - Radiation evaluation and Protection in Diagnostic Radiology **Course Code: RMIT 202**

Objectives:

1. Knowledge of radiation protection principles and their application in radiology department.
2. Knowledge of departmental layouts for protection of patients, occupational workers and general public.

Skills:

- 1) Protecting the patients, occupational workers and general public from secondary radiation.
- 2) Regulation of radiation practices according to internationally accepted methods.
- 3) Obtaining, handling equipments used for various procedures.

UNIT 1:

- Introduction to Radiation Protection
- Need for Protection
- Aim of Radiation Protection
- Basic radiation units and qualities
 - Exposure
 - Absorbed
 - Absorbed dose equivalent
 - Quality factor
 - Tissue weighting factor

UNIT 2:

- Limits of Radiation exposure
- Concept of ALARA (or ALARP)
- ICRP regulation
- Maximum permissible dose
- Exposure in pregnancy, children
- Protection in Diagnostic Radiology
- Protection for primary radiation
- Work load
- Use factor
- Occupancy Factor
- Protection in scatter Radiation and leakage radiation
- X-Ray room design
- Structural shielding
- Protective devices
- Radiation signages

UNIT 3:

- Technical protective considerations during Radiography
- Evaluation of hazards
- Effective communication
- Immobilization
- Beam limiting devices
- Filtration
- Exposure factors
- Protection in
 - Fluoroscopy
 - mammography
 - mobile radiography
 - CT scan
 - Angiography room

UNIT 4:

- Radiation measuring instruments
- Area monitoring
- Personals dosimeters
- Film badge
- Thermo luminescent dosimeter
- Pocket dosimeter

UNIT 5:

Biological aspects of Radiological protection
Biological effects of radiation
Direct and indirect actions of radiation
concept of detriment-Documentation and stochastic effect of radiation-somatic and general effects
Dose relationship
Effects of antenatal exposure

PRACTICALS:

Introduction to Radiation Protection Need for Protection
Aim of Radiation Protection
Exposure in pregnancy, children
Protection in Diagnostic Radiology Protection for primary radiation
Protective devices
Radiation signages Protection in
Fluoroscopy
Mammography
mobile radiography
CT scan
Angiography room
Personals dosimeters
Film badge
Thermo luminescent dosimeter
Pocket dosimeter
Radiation measuring instruments Area monitoring
Biological aspects of Radiological protection Biological effects of radiation
Direct and indirect actions of radiation

PAPER: 3 - Interventional Radiology Techniques Course Code: RMIT 203

Objectives:

1. To know management and positioning of patients while performing interventional radiological procedures.
2. Knowledge of indications, contraindications, contrast media, radiation dose, exposure timing and radiation safety measures for different interventional radiological procedures.
3. To understand the patient preparations needed before any interventional radiological examination.
4. Knowledge of post procedural care.

Skills:

1. Management of patients in radiology department for various procedures.
2. Knowledge of image quality in interventional radiological images.
3. Precautions and care required in interventional suits.

UNIT 1:

Introduction
Need for interventional procedures

DSA:

- Basic principle
- Types

Equipments:

- Basics of angiographic equipments
- Single and biplane angiographic equipments
- Angiographic table
- Image intensifier
- Flat panel detectors
- Pulseoximetry
- Cardiac resuscitation measure - ECG
- Pressure injector
- Catheters, needles & other tools
- 3D rotational angiography
- Image processing
- Patient monitor

UNIT 2:

Patient care:

- Preparation for procedure
- Post procedure care
- Role of radiographer in interventional procedure
- Crash trolley – Emergency drugs

UNIT 3:

Procedures:

- Diagnostic & therapeutic interventional procedures
- PTC, PTBD, Stenting
- Nephrostomy, ureteric stenting
- Guided biopsies of different organs
- Drainage of collections / abscesses
- Angiograms, angioplasty, embolization
- Venus access
- Radiofrequency ablation
- Image guided nerve blocks

UNIT 4:

- Neuro interventional procedures
- Embolization of extra or intracranial tumors, vascular malformations
- Vetebroplasty – direct puncture
- Laser guided procedure
- Basics of cardiac catheterization
- Safety considerations in angiography room
- Room design
- Protective devices
- Radiation monitoring

UNIT 5:

- Care, maintenance and tests:
 - General care
 - Functional tests
- Quality assurance program:
 - Acceptable limits of variation
 - Corrective action

PRACTICALS:

Basics of angiographic equipments
Single and biplane angiographic equipments
Angiographic table
Image intensifier
Flat panel detectors
Pulseoximetry
Cardiac resuscitation measure - ECG Pressure injector
Catheters, needles & other tools
3D rotational angiography
Preparation for procedure
Post procedure care
Role of technologist in interventional procedure
Diagnostic & therapeutic interventional procedures PTC, PTBD, Stenting
Nephrostomy, ureteric stenting
Guided biopsies of different organs
Drainage of collections / abscesses
Angiograms, angioplasty, embolization Venous access
Radiofrequency ablation
Image guided nerve blocks
Neuro interventional procedures
Embolization of extra or intracranial tumors, vascular malformations
Vertebroplasty – direct puncture

PAPER: 4 – Clinical Posting
Course Code: MVRMITP 204

Practicals of all the learnt theories

M. Voc. RMIT -III Semester

PAPER: 1 – Basic Electronics and Bio- Statistics Course Code: RMIT 301

Course Description: Introduction to Basic Statistical Concepts: Methods of Statistical Analysis; And Interpretation of Data

Behavioural Objectives:

- Understands Statistical Terms.
- Possess Knowledge and Skill in the use of Basic Statistical and Research Methodology.

UNIT 1:

Introduction

Introduction to biostatistics & research methodology, mean, median, mode, standard deviation, types of variables & scales of measurements, measure of central tendency & dispersion, rate, ratio, proportion, incidence & prevalence, correlation and regression.

UNIT 2:

Sampling

Random and non random sampling, different sample techniques – simple random, stratified, systematic, cluster & multistage. Sampling and non sampling errors and methods of minimizing these errors

Sampling distributions. Statistics and parameter. Standard error. Basic probability distributions - Normal, poisson, binomial distributions with their applications in biological sciences.

UNIT 3:

Tests of significance

Basics of testing of hypothesis – Null & Alternative hypothesis, type I and type II errors, level of significance (parametric) & power of the tests, p value. Tests of significance – T test (paired & unpaired), Chi square test & Test of proportion, One way analysis of variance . Repeated measures analysis of variance. Tests of significance (non parametric) – Mann – Whitney U Test, Wilcoxon Test, Kruskal – Wallis Analysis of variance, Friedmann's Analysis of variance

UNIT 4:

Sample size determination

General concept. Sample size for estimating means and proportion, testing of difference in means and proportions of two groups.

Study designs

Descriptive epidemiological methods – case series analysis and prevalence studies .

Analytical epidemiological methods – case control and cohort studies. Clinical trials / intervention studies, odds ratio and relative risk, stratified analysis

UNIT 5:

Reliability and validity of diagnostic tests

Format of scientific documentations

Structure of research protocols, structure of thesis/research report, formats of reporting in scientific journals. Systematic review and meta analysis.

Electricity (AC, DC), Resistors, Capacitors, Circuits, Diodes, Resistance, Transistors, Switches and Circuit breakers.

**PAPER: 2 – Advanced Technique and Instrumentation of Computed
Tomography
Course Code: RMIT 302**

Objectives:

1. To know basic principle and physics of CT scan.
2. Protocols needed for CT examination.
3. Preparation and positioning for CT examination.
4. Post processing of raw CT images.

Skills:

- 1) Students will be able to prepare and position the patients for CT examination.
- 2) Knowledge of improving image quality in CT images.
- 3) Scanning of patient with various CT protocols for better representation of images.
- 4) Post processing for CT scan data eg: volume rendering, surface shaded display, multi planar reconstruction, maximum intensity projection, curved linear projections.
- 5) Management of patient for any post contrast reactions.

UNIT 1:

Imaging principles in computed tomography
Instrumentation of CT scan
Advances in detector technology
Slip ring technology
Helical CT
Single slice and multi slice scan CT system

UNIT 2:

Image display
Pre and post processing techniques
Image quality in single slice and multi slice helical CT scan
Dose reduction techniques
CT dosimetry

UNIT 3:

Protocol for adult whole body CT
Protocols for paediatric whole body CT
Documentation
CT Artefacts

UNIT 4:

CT angiography
CT fluoroscopy
CT perfusion scanning
Dentascan
Ct colonoscopy
CT bronchoscopy
CT coronary angiography
CT calcium scoring

UNIT 5:

Care maintenance and tests
General care
Functional tests

Quality assurance program
Acceptable limits of variation
Corrective action

PRACTICALS:

Protocol for adult whole body
CT Protocols for paediatric whole body
CT Documentation
CT Artefacts
CT angiography
CT fluoroscopy
CT perfusion scanning
Dentascan
CT colonoscopy
CT bronchoscopy
CT coronary angiography
CT calcium scoring

PAPER: 3 – Instrumentation of Specialized Radiology Equipments

Course Code: RMIT 303

Objectives:

1. To understand the general physics related to Medical imaging technology.
2. Construction and working of Equipments used in x- ray and fluoroscopy.
3. Application of Equipments in Medical Imaging Technology.

Skills:

1. Students will be able to understand the construction and equipment description of X-ray, fluoroscopy and mammography.
2. Knowledge of basic physics associated with radiology.
3. Maintenance and care of x-ray Equipments used in radiology departments.
4. Quality control of radiology Equipments.

UNIT 1:

Portable x ray equipments
Mobile x ray equipments
Capacitor discharge mobile equipment
Cordless mobile equipments
X ray equipments for the operating theatre

UNIT 2:

Fluoroscopy equipments
Construction and working principles of image intensifier
Viewing the intensified image
Recording the intensified image
Digital fluoroscopy
Panel type image intensifier

UNIT 3:

Fluoroscopy/radiographic tables
General features of fluoroscopy / radiographic tables
The serial changer

Remote control table
The spot film devices

UNIT 4:

Computerized Radiography
Digital Radiography
Equipment for cranial and dental radiography
General dental x ray equipment
Pantomography equipment
Equipment for mammography

UNIT 5:

Care, maintenance and tests
General care
Functional tests
Quality assurance programme
Acceptable limits of variation
Corrective action

PRACTICALS:

Portable x ray equipments
Mobile x ray equipments
Capacitor discharge mobile equipment
Cordless mobile equipments
X ray equipments for the operating theatre
Fluoroscopy equipments
Construction and working principles of image intensifier
Viewing the intensified image
Recording the intensified image
Digital fluoroscopy
Computerized Radiography Digital Radiography

PAPER: 4 – Clinical Posting
Course Code: MVRMITP 304

Practicals of all the learnt theories

M. Voc. RMIT –IV Semester

PAPER: 1 –Advanced Techniques & Instrumentation of Ultrasound **Course Code: RMIT 401**

Objectives:

1. To know basic principle and physics of ultrasonography.
2. Preparation of patient for sonographic.
3. Recognizing the artefacts associated with ultrasonography.
4. To learn the measures for improving image quality in ultrasonography.

Skills:

- 1) Students will be able to prepare and position the patients for ultrasonography
- 2) Knowledge of improving image quality in ultrasonography.
- 3) Scanning of patient with various ultrasonography protocols for better representation of images.
- 4) Post processing for ultrasonography data

UNIT 1:

Ultrasound:

Properties of ultrasound
Interaction of ultrasound with matter

Transducers

Types of transducers
Advances in the design of modern ultrasound transducers

UNIT 2:

Image display

Display modes
ultrasound instrumentation controls
Image storage
Scan converter memory
Photographic film
Multi format camera

Laser imager
Colour and video thermal printer
Computer storage
Pre and post processing techniques

UNIT 3:

Doppler imaging

Doppler principles
Continuous wave Doppler and pulsed Doppler
Duplex scanning
Colour flow imaging
Power Doppler
Harmonic imaging
Extended field of view

UNIT 4:

Ultrasound contrast agents
Image characteristics and artefacts
Vascular, interventional, intraoperative and ophthalmic ultrasonography 3D and 4D ultrasound imaging

UNIT 5:

Bio – effects and safety consideration in ultrasound
Ultrasound system performance measurements
Ultrasound equipments quality assurance – conventional & Doppler system testing & documentation
Ultrasound protocols

PRACTICALS:

Ultrasound:

Properties of ultrasound
Interaction of ultrasound with matter

Transducers:

Types of transducers
Advances in the design of modern ultrasound transducers

Laser imager
Colour and video thermal printer
Computer storage
Pre and post processing techniques
Doppler principles
Continuous wave
Doppler and pulsed
Doppler Duplex scanning
Colour flow imaging
Power Doppler
Harmonic imaging
Extended field of view
Vascular, interventional, intraoperative and ophthalmic ultrasonography
3D and 4D ultrasound imaging
Ultrasound protocols

PAPER: 2 - Advanced Techniques & Instrumentation of MRI

Course Code: RMIT 402

Objectives:

1. To know basic principle and physics of MRI scan.
2. Protocols needed for MRI examination.
3. Preparation and positioning for MRI examination.
4. Post processing of raw MRI images.

Skills:

- 1) Students will be able to prepare and position the patients for MRI examination.
- 2) Knowledge of improving image quality in MRI images.
- 3) Scanning of patient with various MRI protocols for better representation of images.
- 4) Post processing for MRI scan.
- 5) Management of patient for any post contrast reactions.

UNIT 1:

Basic principles

Spin
Precession
Relaxation time
Pulse cycle
T1 weighted image
T2 weighted image
Proton density image

UNIT 2:

MR instrumentation

Types of gradients
RF transmitter and receiver coils
Gradient coils
Shim coils
RF shielding
Computers

UNIT 3:

Pulse sequence

Spin echo pulse sequences – turbo spin echo pulse sequences
Gradient echo sequence – turbo gradient echo pulse sequence
Inversion recovery sequence - STIR sequence, SPIR sequence, FLAIR sequence
Echo planar imaging & Fast imaging sequences
Advanced pulse sequences

Image formation

2D Fourier transformation method
K space representation
3D Fourier imaging
MIP

UNIT 4:

MR contrast media
MR angiography – TOF & PCA
MR spectroscopy
Protocols in MRI for whole body
MRI artefacts
Safety aspects in MRI

UNIT 5:

- Cardiac MRI
- Musculoskeletal imaging protocols
- Abdominal imaging protocols
- Functional imaging techniques
- BOLD imaging
- Care, maintenance & tests
- General care
- Functional tests
- Quality assurance programme
- Acceptable limits of variation
- Corrective action

PRACTICALS:

- Basic principles
- RF transmitter and receiver coils
- Gradient coils
- Shim coils RF shielding
- Spin echo pulse sequences – turbo spin echo pulse sequences
- Gradient echo sequence – turbo gradient echo pulse sequence
- Inversion recovery sequence - STIR sequence, SPIR sequence, FLAIR sequence
- MR contrast media
- MR angiography – TOF & PCA MR spectroscopy
- Protocols in MRI for whole body
- MRI artefacts
- Safety aspects in MRI Cardiac
- MRI Musculoskeletal imaging protocols
- Abdominal imaging protocols
- Functional imaging techniques
- BOLD imaging

PAPER: 3 - Nuclear Medicine Imaging Techniques

Course Code: RMIT 403

Objectives:

1. To know basic principle and physics of nuclear medicine.
2. Preparation of patient for nuclear medicine examination.
3. Preparation and precautions while handling radiopharmaceuticals.
4. Recognizing the artefacts associated with nuclear medicine.
5. To learn the measures for improving image quality in nuclear medicine.

Skills:

1. Students will be able to prepare and position the patients for nuclear medicine examination.
2. Knowledge of improving image quality in nuclear medicine.
3. Scanning of patient with various nuclear medicine protocols for better representation of images.
4. Post processing for nuclear medicine data
5. Management of patient for any late reactions associated with radiotracers in nuclear medicine.

UNIT 1:

Basic atomic and nuclear physics
Quantities activity
Atomic composition and structure
Nucleus composition
Radioactivity
Exponential decay
Specific activity
Parent/Daughter decay
Modes of Radioactive decay

UNIT 2:

Radiation detectors
Gas filled detectors-Basic principles
Ionization chambers
Proportional counters
Geiger Muller counters
Semiconductor detectors
Scintillation detectors-basic principles

UNIT 3:

Production of radio nuclides
Reactor produced radio nuclide
Reactor principles
Accelerator produced radionuclide
Radionuclide generators
Instrumentation
Basic principles
System components
Detector systems and electronics
Collimators
Image display a recording system
Scanning cameras
Radio pharmacy
Radiopharmaceuticals

General principles of tracer technique
Preparation of different labeled compounds with technetium-99m isotope Cold kits

UNIT 4:

In vivo technique
Static and dynamic studies
Thyroid imaging
Imaging of bone
Respiratory system
Urinary system
G.I system
Cardiovascular system
Iodine 131 uptake studies
Iodine 131 therapy of thyrotoxicosis and thyroid ablation

UNIT 5:

SPECT imaging
PET imaging
Radiation safety in nuclear medicine
Radiation units quantities
MPD
Safe handling of radioactive materials
Storage of radioactive materials
Procedures for handling spill
Disposal of radioactive waste
Radiation monitoring
Survey meters
Personnel dosimeters
Wipe testing
Contamination monitor
Isotope calibrator
Area monitor
Inventory of isotopes

DISSERTATION:

Eligibility to be a guide

Shall be a full time teacher in the college or institution he or she is working.

Viva-voce:-

ETHICS IN M. Voc. RMIT TECHNOLOGY

Introduction: With the advances in science and technology and the increasing needs of the patient, their families and community, there is a concern for the health of the community as a whole. There is a shift to greater accountability to the society. It is therefore absolutely necessary for each and every one involved in the health care delivery to prepare them to deal with these problems. Technicians like the other professionals are confronted with many ethical problems.

Standards of professional conduct for technicians are necessary in the public interest to ensure an efficient laboratory service. Every technician should not only be willingly to play his part in giving such a service, but should also avoid any act or omission which would prejudice the giving of the services or impair confidence, in respect, for technician as a body.

To accomplish this and develop human values, it is desired that all the students undergo ethical sensitization by lectures or discussion on ethical issues.

Introduction to ethics-

What is ethics?

General introduction to Code of RMIT Ethics

How to form a value system in one's personal and professional life? International code of ethics

Ethics of the individual- Technician relation to his job Technician in relation to his trade
Technician in relation to medical profession Technician in relation to his profession.

Professional Ethics-

Code of conduct

Confidentiality

Fair trade practice

Handling of prescription

Mal practice and Negligence Professional vigilance

Research Ethics-

Animal and experimental research/ humanness Human experimentation

Human volunteer research - informed consent Clinical trials

Gathering all scientific factors Gathering all value factors

Identifying areas of value – conflict, setting priorities

Working out criteria towards decision

ICMR/ CPCSEA/ INSA Guidelines for human / animal experimentation