Bachelor In Radiology And Imaging Technology
Department Of Radiology
School of Health & Allied Science

Syllabi of [UG Programme for Bachelor in Medical Radiology And Imaging Technology] **under School of Health & Allied Science to be implemented from the Academic Year 2025-26.**

Vision

To be a leading institution in radiology and imaging technology education by producing competent, ethical, and compassionate imaging professionals who contribute to accurate diagnosis and quality patient care through excellence in medical imaging science.

Mission

- To provide comprehensive education and practical training in diagnostic radiology, imaging techniques, and radiographic sciences.
- To develop skilled imaging technologists who can operate advanced imaging equipment such as X-ray, CT, MRI, Ultrasound, and DSA.
- To foster a culture of ethical practice, patient safety, and clinical accuracy in diagnostic imaging.
- To promote continuous learning, research, and adaptation to technological advancements in radiological sciences.
- To collaborate with hospitals and imaging centres to ensure real-world exposure and professional readiness of students.

Preamble

The **Bachelor of Medical Radiology and Imaging Technology (BMRIT)** is a four-year undergraduate programme designed to impart thorough knowledge, technical skills, and professional competencies in the field of medical imaging. The course curriculum aligns with the **National Commission for Allied and Healthcare Professions (NCAHP), 2025** guidelines to prepare skilled radiology technologists who can work effectively in clinical, research, and industrial settings.

This programme provides a strong foundation in human anatomy, physiology, radiation physics, radiographic procedures, and advanced imaging modalities like CT, MRI, and ultrasonography. The students are trained in both theoretical concepts and hands-on practice through simulation-based labs and clinical postings. The course promotes patient safety, radiation protection, ethical medical practice, and the use of emerging technologies.

Through a rigorous and practical curriculum, BMRIT aims to create professionals capable of supporting diagnostic teams, ensuring quality imaging, and contributing to patient care. The course also builds communication, critical thinking, and professional development for working in multi-disciplinary healthcare teams.

Justification

Radiology and medical imaging are vital components of modern diagnosis and treatment planning. With the growing need for skilled imaging technologists across

hospitals, diagnostic centres, and research institutions, the **BMRIT programme** plays a pivotal role in meeting healthcare demands.

The course is designed to ensure graduates are capable of operating imaging equipment safely, performing radiographic examinations independently, maintaining imaging records, and assisting radiologists in diagnosing various pathologies. The integration of **radiobiology, digital imaging, PACS, and interventional radiology** in the curriculum ensures updated and practice-ready learning.

The programme prepares students to work across domains including X-ray, fluoroscopy, CT, MRI, and nuclear medicine. It also introduces basic research skills to promote innovation and continuous professional growth.

Program Educational Objectives (PEOs)

PEO 1: Demonstrate technical proficiency in performing radiographic and imaging procedures including X-ray, CT, MRI, and ultrasound with adherence to patient safety and radiation protection guidelines.

PEO 2: Communicate effectively with patients, healthcare teams, and demonstrate leadership and ethical professionalism in clinical radiology environments.

PEO 3: Uphold ethical, legal, and social responsibilities by ensuring accurate documentation, informed consent, and confidentiality during imaging procedures.

PEO 4: Pursue higher education, research, or professional development in advanced radiological science and related interdisciplinary areas.

PEO 5: Analyze and interpret radiologic findings, troubleshoot equipment, and apply decision-making skills in various diagnostic scenarios.

PEO 6: Utilize PACS, RIS, and other digital systems for documentation, reporting, and effective healthcare data management.

PEO 7: Engage in quality assurance, radiation safety audits, and contribute to improvement in radiological service standards.

Program Outcomes (POs)

PO1: Radiologic Science Knowledge – Apply fundamental and advanced knowledge in imaging physics, human anatomy, physiology, pathology, and radiographic procedures in clinical practice.

PO2: Problem Analysis – Analyze and resolve patient positioning, exposure factor issues, image artifacts, and equipment malfunctions.

PO3: Design/Development of Solutions – Design appropriate imaging protocols for varied clinical conditions ensuring diagnostic accuracy and minimal radiation exposure.

PO4: Conduct Investigations of Complex Problems – Perform and assist in specialized imaging investigations (e.g., CT Angiography, MRI sequences, interventional radiology).

PO5: Modern Tool Usage – Operate, calibrate, and maintain modern radiological equipment and use PACS/RIS systems for digital imaging and reporting.

PO6: Entrepreneurship and Innovation – Demonstrate entrepreneurial skills by planning and managing imaging centres or engaging in innovative practices in teleradiology and digital health.

PO7: Environment and Sustainability – Implement best practices in biomedical waste disposal, radiation protection, and sustainable use of imaging technologies.

PO8: Ethics – Adhere to ethical guidelines including patient rights, informed consent, and medico-legal accountability in diagnostic imaging.

PO9: Individual and Team Work – Function independently and collaboratively in multidisciplinary radiology teams for efficient patient diagnosis.

PO10: Communication – Effectively communicate findings with radiologists, clinicians, and patients using verbal and written methods.

PO11: Quality Control – Conduct quality assurance procedures including image quality evaluation, equipment performance checks, and reporting standards.

PO12: Lifelong Learning – Stay updated with new imaging technologies, radiological advancements, and evolving clinical guidelines through continuous learning.

Program Specific Outcomes (PSOs)

PSO1: Perform diagnostic procedures using radiographic equipment (X-ray, fluoroscopy, CT, MRI, USG) with accuracy, patient safety, and clinical relevance.

PSO2: Integrate knowledge of anatomy, pathology, and radiology to assist in identifying abnormalities and supporting diagnostic decisions.

PSO3: Apply principles of radiation protection, quality control, and digital imaging systems (PACS/RIS) in radiology departments.

PSO4: Demonstrate professionalism, ethical conduct, and compassionate care in all patient interactions and radiological practices.

Duration

- **Four years (8 semesters)**, as per NCAHP 2025 guidelines.
- Includes academic instruction, practical training, and mandatory **clinical internship** in the 4th year.

Course Outline

The BMRIT syllabus covers a broad spectrum of subjects aligned with NCAHP 2025 including:

- **Human Anatomy & Physiology**
- **Radiation Physics & Imaging Equipment**
- **Radiographic Techniques & Procedures**
- **Patient Care & Medical Ethics**
- **Advanced Imaging Modalities (CT, MRI, USG, DSA)**
- **Radiation Protection & Quality Assurance**
- **Digital Imaging, PACS & Image Processing**
- **Interventional Radiology**
- **Research Methodology & Biostatistics**
- **Clinical Internship & Case Studies**

Career Options

Graduates of **BMRIT** can explore career paths in:

- Diagnostic Radiology Centres (Private/Government)
- Hospitals and Medical Institutions
- CT/MRI Technologist Roles
- Nuclear Medicine Labs
- Cath Labs & Interventional Radiology Units
- Research and Teaching Institutions
- Healthcare IT (PACS/RIS/Digital Imaging Analysts)
- Health Safety and Radiation Protection Agencies
- Higher Education: M.Sc. Radiology, MHA, MPH, PGDM
- Competitive Exams and Healthcare Administration

Scheme Of Examination- BRIT

1st semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Human Anatomy	050601001	70	30			100	3
2	Physiology	050601002	70	30			100	3
3	Basics of Radiation Physics	050601003	70	30			100	2
4	Introduction to Healthcare	050601004	70	30			100	1
5	Medical Terminologies and Record Keeping	050601005	70	30			100	1
6	Basic Computers & Information Science	050601006	70	30			100	1
7	Medical Law & Ethics	050601007	70	30			100	1
8	Professionalism & Values	050601008	70	30			100	1
9	Principles of Management	050601009	70	30			100	1
10	English & Communication	050601010	70	30			100	1
11	Basics of Radiation Physics- Practical	050601011			70	30	100	3
12	BRIT Radiology Clinical Education – part I (studentship)	050601012						5
Total Credit								**23 Credit**

2nd semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Basics of Microbiology	050602001	70	30			100	2
2	Basics of Biochemistry	050602002	70	30			100	2
3	Conventional Radiography & Equipment	050602003	70	30			100	4
4	Clinical Radiography Positioning (Part I)	050602004	70	30			100	5
5	Clinical Radiography Positioning (Part I) - Practical	050602005			70	30	100	3
6	Conventional Radiography & Equipment - Practical	050602006			70	30	100	1
7	BRIT Radiology Clinical Education – part II (studentship)	050602007						5
Total Credit								**22 Credit**

3rd semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Pathology	050603001	70	30			100	2
2	Clinical Radiography Positioning (Part- II)	050603002	70	30			100	3
3	Radiography and Image Processing Techniques	050603003	70	30			100	2
4	Contrast and Special Radiological Procedures	050603004	70	30			100	3
5	Clinical Radiography Positioning (Part- II)- Practical	050603005			70	30	100	3
6	Radiography and Image Processing Techniques- Practical	050603006			70	30	100	1
7	Contrast and Special Radiological Procedures- Practical	050603007			70	30	100	3
8	BRIT Radiology Clinical Education – part III (studentship)	050603008						4
Total Credit								**21 Credit**

4th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Cross Sectional Anatomy	050604001	70	30			100	2
2	Modern Radiological Imaging Equipment and Physics	050604002	70	30			100	3
3	Interventional Radiology Techniques	050604003	70	30			100	3
4	Patient Care in radiology	050604004	70	30			100	2
5	Cross Sectional Anatomy- Practical	050604005			70	30	100	3
6	Modern Radiological Imaging Equipment and Physics-Practical	050604006			70	30	100	1
7	Interventional Radiology Techniques- Practical	050604007			70	30	100	2
8	Patient Care in radiology- Practical	050604008			70	30	100	2
9	BRIT Radiology Clinical Education – part IV (studentship)	050604009						4
Total Credit								**22 Credit**

5th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Basics Techniques in CT Technology	050605001	70	30			100	5
2	Radiation Safety in Diagnostic Radiology	050605002	70	30			100	3
3	Quality Assurance in Diagnostic Radiology and Regulatory Requirements	050605003	70	30			100	2
5	Basics Techniques in CT Technology- Practical	050605004			70	30	100	4
6	Radiation Safety in Diagnostic Radiology- Practical	050605005			70	30	100	2
7	Quality Assurance in Diagnostic Radiology and Regulatory Requirements - Practical	050605006			70	30	100	1
8	BRIT Radiology Clinical Education – part V (studentship)	050605007						4
Total Credit								**21 Credit**

6th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Basics Techniques in MRI Technology	050606001	70	30			100	4
2	Introduction to Nuclear Medicine Techniques	050606002	70	30			100	2
3	Ultrasound Techniques	050606003	70	30			100	3
4	Biostatistics and Research Methodology	050606004	70	30			100	2
5	Basics Techniques in MRI Technology- Practical	050606005			70	30	100	4
6	Introduction to Nuclear Medicine Techniques- practical	050606006			70	30	100	1
7	Ultrasound Techniques- Practical	050606007						NC
8	BRIT Radiology Clinical Education – part VI (studentship)	050606008						5
Total Credit								**21 Credit**

7th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	RIT Internship	040607001			150	50	200	25
Total Credit								**25 Credit**

8th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	RIT Internship	040608001			150	50	200	25
Total Credit								**25 Credit**

Annexure - I

Programme Structure - BRIT

1st semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					Hours
			lecture	tutorial	practical		No. of credit	
1	Human Anatomy	050601001	3	0	0		3	3
2	Physiology	050601002	3	0	0		3	3
3	Basics of Radiation Physics	050601003	2	0	0		2	2
4	Introduction to Healthcare	050601004	1	0	0		1	1
5	Medical Terminologies and Record Keeping	050601005	1	0	0		1	1
6	Basic Computers & Information Science	050601006	1	0	0		1	1
7	Medical Law & Ethics	050601007	1	0	0		1	1
8	Professionalism & Values	050601008	1	0	0		1	1
9	Principles of Management	050601009	1	0	0		1	1
10	English & Communication	050601010	1	0	0		1	1
11	Basics of Radiation Physics- Practical	050601011	0	0	3		3	6
12	BRIT Radiology Clinical Education – part I (studentship)	050601012	0	0	5		5	10
Total Credit								**23 Credit**

2nd semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					Hours
			lecture	tutorial	practical		No. of credit	
1	Basics of Microbiology	050602001	2	0	0		2	2
2	Basics of Biochemistry	050602002	2	0	0		2	2
3	Conventional Radiography & Equipment	050602003	4	0	0		4	4
4	Clinical Radiography Positioning (Part I)	050602004	5	0	0		5	5
5	Clinical Radiography Positioning (Part I) - Practical	050602005	0	0	3		3	6
6	Conventional Radiography & Equipment - Practical	050602006	0	0	1		1	2

7	BRIT Radiology Clinical Education – part II (studentship)	050602007	0	0	5		5	10
Total Credit								**22 Credit**

3rd semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					Hours
			lecture	tutorial	practical		No. of credit	
1	Pathology	050603001	2	0	0		2	2
2	Clinical Radiography Positioning (Part- II)	050603002	3	0	0		3	3
3	Radiography and Image Processing Techniques	050603003	2	0	0		2	2
4	Contrast and Special Radiological Procedures	050603004	3	0	0		3	3
5	Clinical Radiography Positioning (Part- II)- Practical	050603005	0	0	3		3	6
6	Radiography and Image Processing Techniques- Practical	050603006	0	0	1		1	2
7	Contrast and Special Radiological Procedures- Practical	050603007	0	0	3		3	6
8	BRIT Radiology Clinical Education – part III (studentship)	050603008	0	0	4		4	8
Total Credit								**21 Credit**

4th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					Hours
			lecture	tutorial	practical		No. of credit	
1	Cross Sectional Anatomy	050604001	2	0	0		2	2
2	Modern Radiological Imaging Equipment and Physics	050604002	3	0	0		3	3
3	Interventional Radiology Techniques	050604003	3	0	0		3	3
4	Patient Care in radiology	050604004	2	0	0		2	2
5	Cross Sectional Anatomy-Practical	050604005	0	0	3		3	6
6	Modern Radiological Imaging Equipment and Physics-Practical	050604006	0	0	1		1	2
7	Interventional Radiology Techniques- Practical	050604007	0	0	2		2	4
8	Patient Care in radiology-Practical	050604008	0	0	2		2	4
9	BRIT Radiology Clinical Education – part IV (studentship)	050604009	0	0	4		4	8
Total Credit								**22 Credit**

5th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					Hours
			lecture	tutorial	practical		No. of credit	
1	Basics Techniques in CT Technology	050605001	5	0	0		5	5
2	Radiation Safety in Diagnostic Radiology	050605002	3	0	0		3	3
3	Quality Assurance in Diagnostic Radiology and Regulatory Requirements	050605003	2	0	0		2	2
5	Basics Techniques in CT Technology- Practical	050605004	0	0	4		4	8
6	Radiation Safety in Diagnostic Radiology- Practical	050605005	0	0	2		2	4
7	Quality Assurance in Diagnostic Radiology and Regulatory Requirements - Practical	050605006	0	0	1		1	2
8	BRIT Radiology Clinical Education – part V (studentship)	050605007	0	0	4		4	8
Total Credit								**21 Credit**

6th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					Hours
			lecture	tutorial	practical		No. of credit	
1	Basics Techniques in MRI Technology	050606001	4	0	0		4	4
2	Introduction to Nuclear Medicine Techniques	050606002	2	0	0		2	2
3	Ultrasound Techniques	050606003	3	0	0		3	3
4	Biostatistics and Research Methodology	050606004	2	0	0		2	2
5	Basics Techniques in MRI Technology- Practical	050606005	0	0	4		4	8
6	Introduction to Nuclear Medicine Techniques- practical	050606006	0	0	1		1	2

7	Ultrasound Techniques-Practical	050606007	0	0	NC		NC	NC
8	BRIT Radiology Clinical Education – part VI (studentship)	050606008	0	0	5		5	10
Total Credit								**21 Credit**

7th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					Hours
			lecture	tutorial	practical		No. of credit	
1	RIT Internship	050607001			1200		25	1200
							Total Credit - 25	

8th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					Hours
			lecture	tutorial	practical		No. of credit	
1	RIT Internship	050608001			1200		25	1200
							Total Credit - 25	

BRIT
Semester I

1st semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Human Anatomy	050601001	70	30			100	3
2	Physiology	050601002	70	30			100	3
3	Basics of Radiation Physics	050601003	70	30			100	2
4	Introduction to Healthcare	050601004	70	30			100	1
5	Medical Terminologies and Record Keeping	050601005	70	30			100	1
6	Basic Computers & Information Science	050601006	70	30			100	1
7	Medical Law & Ethics	050601007	70	30			100	1
8	Professionalism & Values	050601008	70	30			100	1
9	Principles of Management	050601009	70	30			100	1
10	English & Communication	050601010	70	30			100	1
11	Basics of Radiation Physics-Practical	050601011			70	30	100	3
12	BRIT Radiology Clinical Education – part I (studentship)	050601012						5
Total Credit								**23 Credit**

Semester: I

Course Name: Human Anatomy		**Course Code: 050601001**					
Batch: 2025-26 onwards	**Programme :**BRIT	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 03**
			3	-	-	3	**Total Hrs.: 54**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic biology knowledge this includes familiarity with cell biology, the basic structure and function of cells and their organelles, and an elementary knowledge of human physiology and anatomy such as body systems, tissues, and organs.					
Course Objectives	To provide students with comprehensive knowledge of human anatomy with relevance to radiologic techniques and patient positioning. Students will learn organ systems, structural relationships, and radiographic anatomy essential for MRIT practice.						
Course Outcomes	CO1: Describe the general anatomy of the human body. CO2: Explain the normal disposition and clinical relevance of organ structures. CO3: Describe microscopic tissue structure. CO4: Identify topographic landmarks on the body surface. CO5: Locate and identify human organs and structures. CO6: Recognize tissues under a microscope. CO7: Interpret normal radiographic appearances.						

COURSE SYLLABUS

Unit	Contents	Hours
I	**Introduction: Human Body as a Whole** Definition of anatomy and its subdivisions, Terms of location, positions and planes, Cell and its organelles, Epithelium – definition, classification, describe with examples, functions, Glands – classification, describe serous and mucous glands with examples, Basic tissues – classification with examples	**09**
II	**Locomotion and Support** Cartilage – types, examples and histology Bone – classification, examples and histology. Parts of long bone, names of all bones, vertebral column and intervertebral disc. Fontanel's of fetal skull. Joints – classification of joints with examples, typical synovial joint (in detail). Muscular system – classification of muscular tissue and histology Important muscles of the body- Sternocleidomastoid, Trapezius, Muscles of tongue, Deltoid, Biceps brachii, Intercostal muscles, Thoracic diaphragm, Rectus abdominis, External oblique, Internal oblique, Transversus abdominis, Pelvic diaphragm, Gluteus maximus, Gluteus medius, Gluteus Minimus, Quadriceps femoris, Soleus.	**09**
III	**Cardiovascular System** Heart – size, location, chambers, exterior and interior, Blood supply of heart, Pericardium, Systemic and pulmonary circulation, Branches of aorta - common carotid artery, subclavian artery, Axillary artery, brachial artery, radial artery, superficial palmar arch, femoral artery, popliteal artery, dorsalis pedis artery., Peripheral pulse, Inferior venacava, portal vein, portosystemic anastomosis, Great saphenous vein, median cubital vein, Dural venous sinuses, Lymphatic system – cisterna chyli and thoracic duct, Lymphatic tissues and its histology, Regional lymph nodes – cervical, axillary and inguinal lymph nodes.**Respiratory System** Parts of RS – nose, nasal cavity, paranasal air sinuses, larynx, trachea, lungs, pleura, bronchopulmonary segments, Histology of trachea and lungs.	**09**

IV	**Gastro-Intestinal System Theory**Parts of GIT- oral cavity (lip, cheek, tongue, salivary glands, palate, dentition) pharynx (Waldeyer's ring) esophagus, stomach, small and large intestine and appendix, Liver, gall bladder, pancreas and spleen, Histology of esophagus, stomach, small and large intestine, liver, gall bladder and pancreas.**Peritoneum** Description of reflection, folds and pouches in brief.	**09**
V	**Urinary System** Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder. **Reproductive System** Parts of male reproductive system- testis, vas deferens, epididymis, prostate, Parts of female reproductive system- uterus, fallopian tubes, ovary, mammary gland, Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube and ovary. **Endocrine Glands** Names of all endocrine glands, describe in detail on pituitary gland, thyroid gland and parathyroid gland, suprarenal gland, Histology of pituitary, thyroid, parathyroid, suprarenal gland.	**09**
VI	**Nervous System** Neuron, Classification of nervous system, Cerebrum, cerebellum, brain stem, spinal cord & spinal nerve, Meninges, ventricles and cerebrospinal fluid, Blood supply of the brain, Cranial nerves (in brief), Nerve plexus (Brachial & lumbar) **Sensory Organs** Skin and its appendages, Eye – parts of eye ball and lacrimal apparatus, Extra- ocular muscles, Histology of cornea and retina, Ear – parts of ear- external, middle and inner ear and contents Embryology Spermatogenesis and oogenesis, Ovulation, fertilization, Placenta	**09**
	Total	**48**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Human Anatomy, Vol.1,2 &3, 5th edition, 2010,	B.D. Chaurasia	CBS publishers & distributors Pvt. Ltd.
2	Physiology & Anatomy with Practical Considerations	Ester. M. Grishcimer	J.P.Lippincott. Philadelphia
3	Manipal Manual of Anatomy, 2nd edition, 2012	Sampath Madhyastha	CBS publishers & distributors Pvt. Ltd
4	Text Book of General Anatomy, 2nd edition, 2013	Shobha Rawlani and Shivlal Rawlani	Jaypee brothers
5	Langman's Medical Embryology, 11th edition, 2009	T.W Sadler	Wolters Kluwer

Semester: I

Course Name: Physiology		Course Code: 050601002					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 3**
			3	0	0	3	**Total Hrs.: 54**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of biology and organ systems from school education.					

Course Objectives	To provide students with an understanding of the functioning of various body systems and their role in maintaining homeostasis, enabling students to relate physiological knowledge with clinical applications and patient care in radiological settings.
Course Outcomes	CO1: Describe the normal functioning of various organs and systems. CO2: Explain the interdependence of physiological systems for homeostasis. CO3: Evaluate contributions of organ systems to the internal environment. CO4: Identify physiological abnormalities and their impact. CO5: Apply knowledge in interpreting physiological basis of disease. CO6: Correlate physiological principles to allied healthcare practices.

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**General physiology** Introduction to Physiology, Concept of Homeostasis, cell – Morphology – Functions of organelles and Cell membrane, Transport mechanisms, Body fluid compartments. **Muscle nerve physiology** Neurons: Morphology, Action Potential, Neuroglia: Types & functions, Muscles: Types, structure of sarcomere. Neuromuscular junction, sliding filament mechanism of contraction. **Blood** Composition, properties, functions. Plasma proteins: Concentrations and functions, RBC: Morphology, functions, count, physiological variations and life span Erythropoiesis – stages, essential factors, regulation of Erythropoiesis, Hemoglobin: Functions, concentration, physiological variations. Fate of Hemoglobin – Jaundice, types, Color index, MCH, MCV, MCHC, PCV – normal values, WBC: Morphology, functions of all types including T & B lymphocytes, total and differential counts, physiological variations, Platelets: Morphology, count, functions, thrombocytopenia & bleeding time, Blood groups: Basis of blood grouping. Landsteiner's laws, ABO system, determination of blood groups, blood transfusion, complications of incompatible blood transfusion, Rh group, erythroblastosis foetalis, prevention and treatment, Blood bank. Haemostasis: Mechanisms. Clotting mechanism: factors, intrinsic and extrinsic pathways. Disorders of clotting – hemophilia, vitamin K deficiency. Anticoagulants – mechanism of action and their uses, Anemia: Classification – Morphological and Etiological, Blood volume: normal values.	**10**
II	**Cardiovascular system** Organization of cardiovascular system, greater and lesser circulation, Physiological anatomy of the heart, nerve supply, Junctional tissues of heart (pacemaker), Cardiac cycle: Mechanical events, Heart sounds, causes, characteristics and significance, Normal ECG, clinical significance of ECG, Heart rate – Physiological variations, Cardiac output: Definitions, normal values, physiological variations, Arterial blood pressure: Definitions, normal values, physiological variations, factors maintaining blood pressure. Role of baroreceptors in regulation of blood pressure.	**10**
III	**Respiratory system** Respiratory and Non-respiratory function of respiratory system. Physiological anatomy of respiratory system Functions of respiratory **tract. Respiratory membrane.** Respiratory muscles. Surfactant: functions, respiratory distress syndrome. Definitions of terms used in respiratory physiology: Eupnea, Hyperpnoea, Tachypnea, Apnea, Dyspnea.	**8**

	Mechanics of breathing – intrapulmonary and Intrapleural pressure changes during a respiratory cycle. Spirometry – Lung volumes and capacities. Vital capacity. Oxygen transport: Role of hemoglobin, factors affecting, oxygen carrying capacity. Carbon dioxide transport: forms, chloride shift (Hamburgers phenomenon). Respiratory centers. Role of chemo receptors in regulation of respiration. Pulmonary ventilation and alveolar ventilation. Partial pressure of gases, Calculation of partial pressure of gasses in mixture. Arterial and venous blood gas concentrations and contents. Hypoxia: Types and effects Cyanosis,Asphyxia, Periodic Breathing, Acclimatization. Hyperbaric O2 therapy, Artificial respiration and Ventilators.	
IV	**Excretory system** Functions of kidneys. Nephrons – Juxta glomerular apparatus – functions, Steps in Urine formation – Ultrafiltration, Tubular Reabsorption, Tubular Secretion, GFR. Definition, normal values, factors affecting GFR, measurement of GFR, Renal threshold for glucose, tubular load for glucose, Role of aldosterone and ADH in urine formation, Micturition, Innervation of bladder. Diuresis, Renal functions tests – Based on analysis of urine and analysis of blood, Skin: Functions of skin. Sweat glands.	**4**
V	**Digestive system** **Introduction, structure of alimentary canal, Saliva: Composition, functions, Stomach: Functions. Gastric Juice: composition, functions, Pancreatic Juice: Composition and functions, Liver: Functions, Bile: composition, functions, Gall bladder: functions, Succusentericus: Composition, functions. Functions of large intestine, Movements of small intestines, Deglutition.**	**4**
VI	**Endocrine system** **Major endocrine glands- Hormone: Definition, Anterior pituitary: hormones and their functions, disorders – Giganitism, acromegaly, dwarfism, Posterior pituitary: Hormones – diabetes insipidus, Thyroid: Hormones, normal values, functions, role of TSH. Disorders: simple goitre, myxoedema,**	**8**
VII	**Special senses** Vision: Physiological anatomy of eye ball, rods & cones, Refractive errors: Myopia, hypermetropia, presbyopia & astigmatism, Audition: Functions of outer, middle & inner ear, cochlea, Deafness – types, Taste: Taste buds, primary taste sensation, Smell: Receptors, modalities of smell **Reproductive system** Male reproductive system: functions of testes, puberty, spermatogenesis functions of testosterone, semen, Female reproductive system: Ovarian hormones functions – Menstrual cycle, Hormonal basis of changes in menstrual cycle, Family Planning.	**10**
Total		**54**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Foundation of Anatomy and Physiology	Ross Wilson	Churchill Livingstone.
2	Physiology & Anatomy with Practical Considerations	Ester. M. Grishcimer	J.P. Lippincott. Philadelphia
3	Text Book of Physiology	A. P. Krishna	Suman Publication
4	Text Book of Physiology	A.K. Jain	Avichal Publishing Company;

Semester: I

Course Name: Basics of Radiation Physics		**Course Code: 050601003**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 2**
			2	0	0	2	**Total Hrs.: 36 Theory**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: School-level physics and basic science concepts.					
Course Objectives	To develop a foundational understanding of radiation physics including basic concepts, electronics, X-ray production, and interactions of radiation with matter, facilitating competent practice in radiographic techniques and safety.						
Course Outcomes	CO1: Explain basic physics concepts related to imaging. CO2: Differentiate types of radiations and energy forms. CO3: Describe the construction and function of radiological equipment. CO4: Understand quality control measures. CO5: Distinguish between X-ray and other imaging systems. CO6: Explain the principles behind X-ray production. CO7: Illustrate circuit systems used in radiology.						

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Basic concepts: Units and measurements-**Force, work, power and energy- Temperature and heat-SI units of above parameters. Atomic structure-atom model-Nucleus-electronic configuration-periodic table-Isotopes-Ionization- excitation-Binding energy-electron volt-Electromagnetic radiation-Quantum nature of radiation-mass energy equivalence-Fluorescence-electromagnetic spectrum.	5
II	**Electricity and magnetism:** Electric charges, Coulomb's law-Unit of charge- Electric potential, unit of potential-Electric induction, capacitance and Capacitors, series and parallel connection-electric current, unit, resistance, ohm's law, electric power, Joule's law. Varying currents-Growth and decay of current in LR circuit time constant, charge and discharge of a Capacitor through a resistance and inductance. Oscillations in an LC circuit. Alternating currents: Peak and RMS values and current and voltage, circuit containing LR, CR and LCR-Power factor, series and parallel LCR circuits, DC circuit, Ohm's law, resistivity, series and parallel combination, EMF, Kirchhoff's law, heating effect of current. Electromagnetic waves: Introduction, Maxwell's equation, electromagnetic waves, energy density and intensity, momentum, electromagnetic spectrum and radiation in Atmosphere.	6

III	**Electronics Semiconductors;** Conduction in crystals, Energy bands. Intrinsic and Extrinsic semiconductors n-type and p-type semiconductors, majority and minority carriers. Semiconductor diodes: p-n junction-properties forward and reverse bias, characteristics of p-n junction Rectifiers-Half-wave and full wave, ripple factor, Efficiency of HW and FW rectifiers. Filter circuits; Zener diode, regulated power supply. Transistors-Symbols, Transistor connections and characteristics, Transistor as an amplifier, load line analysis, operating point, types of amplifiers-voltage and power amplifiers. Feedback-negative feedback in amplifiers.	5
IV	**Discovery of x-rays-X-ray production and properties:** Bremsstrahlung radiations-Characteristics X-Rays, factors affecting X-ray emission spectra, X-ray quality and quantity, HVL measurements, heel effect, soft and hard X-Rays, added and inherent filtration, reflection and transmission targets.	5
V	**Heat** Definition of heat, temperature, Heat capacity, specific heat capacity, Heat transfer-conduction, convection, radiation, thermal conductivity, equation for thermal conductivity (k), the value of k of various material of interest in radiology, thermal expansion, Newton's law of cooling, Heat radiation, perfect black body, Stefan law, application in Diagnostic Radiology (Heat dissipation in both stationary and rotating X-ray tubes).	4
VI	**Interaction of ionizing radiation with matter-**Types of interactions of X-and gamma radiation, Photoelectric & Compton, Pair production, annihilation radiation. Interaction of X and gamma rays: Transmission through matter, law of exponential attenuation, half value layer, and linear attenuation coefficient-coherent scattering- photonuclear disintegration-Particle interactions. Interactions of X rays and Gamma rays in the body; fat-soft tissue-bone-contrast media-total attenuation coefficient-relative clinical importance.	5
VII	**Exponential attenuation (linear/mass attenuation coefficients)**, Half Value Thickness (HVT), Tenth Value Thickness (TVT), dependence on energy and atomic number. Radiation intensity and exposure, photon flux and energy flux density. LET, range of energy relationship for alpha, beta particles with X-Rays. Physical quantity, its unit and measurement: Fundamental and derived quantity, SI unit, various physical/radiation quantity used in Diagnostic Radiology and its unit (for example, KVp, mA, mAS, Heat unit.	6
Total		**36**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Basic radiological physics	K. Thayalan	Jaypee Brothers Medical Publishers (P) Limited, 2003
2	Christensen's physics of diagnostic radiology	Curry and Dowdey	Wolters Kluwer
3	X-Ray Equipment for Student	D.N. And M.O. Chesney	Blackwell Science Ltd

4	A Textbook Of Radiation Physics For Radiologic Technology	Surendra Maharjan, Suraj Sah	Samiksha Publications
5	A Concise Guide on Basic Radiographic Physics Darkroom Procedures, Radiographic Positioning & Techniques	Lalit Agarwal	JBD Publications

Course Name: Basics of Radiation Physics- Practical		**Course Code: 050601011**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 06**
			0	0	6	3	**Total Hrs.: 108**
Total Evaluation Marks: 100 Practical		**Examination Duration: 3 HRS**					
		Pre-requisite of course: School-level physics and basic science concepts.					
Course Objectives	To develop a foundational understanding of radiation physics including basic concepts, electronics, X-ray production, and interactions of radiation with matter, facilitating competent practice in radiographic techniques and safety.						
Course Outcomes	CO1: Explain basic physics concepts related to imaging. CO2: Differentiate types of radiations and energy forms. CO3: Describe the construction and function of radiological equipment. CO4: Understand quality control measures. CO5: Distinguish between X-ray and other imaging systems. CO6: Explain the principles behind X-ray production. CO7: Illustrate circuit systems used in radiology.						

Sr. No	PRACTICALS SYLLABUS	**Hours**
1.	Basic concepts	108
2.	Electricity and magnetism, Electromagnetic waves	
3.	Electronics	
4.	Discovery of x-rays-X-ray production and properties	
5.	Heat	
6.	Interaction of ionizing radiation with matter-	
7.	Exponential attenuation, Physical quantity, its unit and measurement	
Total		108

Semester: I

Course Name: Introduction to Healthcare		**Course Code: 050601004**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 1**
			1	0	0	1	**Total Hrs.: 18**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: this introductory-level course assumes no prior healthcare training and is designed to build a foundational understanding of health delivery systems					
Course Objectives	Provide foundational insight into India's healthcare delivery structure and its various levels.Introduce core public health policies, key national health programs, AYUSH integration, and epidemiological terminology.						
Course Outcomes	CO1: Identify the healthcare system's levels (primary, secondary, tertiary). CO2: Understand the scope of national health programs and health policy. CO3: Recognize the role and basics of AYUSH systems in healthcare. CO4: Recall key demographic and epidemiological concepts relevant to public health. CO5: Apply introductory public health principles in community health settings.						

COURSE SYLLABUS

S.no.	Topic and contents	Hours
1.	Introduction to Health: Definition of Health, Determinants of Health, Health indicators of India, Health team concept National Health Policy National Health Programs (Brief objectives and scope) Family welfare programs in India Introduction to Nursing: Nursing and Nursing principles, Interpersonal relationships, Bandaging basic turns, Bandaging extremities, Triangular bandages and their applications Nursing position, bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's position, comfort measures, Aids, rest and sleep Lifting and transporting patients, Transferring patients to wheel chair, transferring from bed to stretcher Bedside Management: Proper usage of bed pan, Observation of stools, urine, sputum. Understand the use and care of catheters. Enema procedures Method of giving nourishment: Feeding, tube feeding, drips, transfusion Monitoring and recording of vitals Simple aseptic techniques, sterilization and disinfection Observation of surgical dressings Concepts of First Aid	**18**
	SUGGESTED LEARNING RESOURCES	

S.No.	Title of Book	Author	Publication

		1	Principles and Practiceof Nursing Management and Administration	Jogindra Vati	Jaypee Brothers Ltd	
		2	Textbook of Preventive and Social Medicine	K Park	Banarsidas Bhanot Publishers	
		3	Introduction to Healthcare	Dakota Mitchell and Lee Haroun	Delmar	
		4	Introduction to Healthcare and Careers	Roxann Delaet	Joanes and Bartlett Learning	

Semester: I

Course Name: Medical Terminologies and Record Keeping		**Course Code: 050601005**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 1**
			1	0	0	1	**Total Hrs.: 18**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: this is a foundational course aimed at introducing common medical terminology, including roots, prefixes, suffixes, and abbreviations, and is suitable for students without prior healthcare instruction.					
Course Objectives	• *Introduce students to the building blocks of medical terms (roots, prefixes, suffixes).* • *Enable proper pronunciation, spelling, and analysis of medical terminology.* • *Familiarize students with terminology across key human body systems.* • *Emphasize correct usage of abbreviations and acronyms in clinical communication.*						
Course Outcomes	CO1: Identify and define fundamental medical word components. CO2: Apply correct pronunciation and spelling of medical terms. CO3: Analyze and construct terms using appropriate prefixes, roots, and suffixes. CO4: Demonstrate understanding of terminology used by body systems. CO5: Interpret common abbreviations in clinical documentation. CO6: Utilize medical terminology accurately in communication with healthcare teams.						

COURSE SYLLABUS

Topic and contents	Hours
Topics include: **origin, word building, abbreviations and symbols, terminology related to the human anatomy, reading medical orders and reports, and terminology specific to the student's field of study. Spelling is critical and will be counted when grading tests. Topics to be covered under the subject are as follows:** 1. Derivation of medical terms. 2. Define word roots, prefixes, and suffixes. 3. Conventions for combined morphemes and the formation of plurals. 4. Basic medical terms. 5. Form medical terms utilizing roots, suffixes, prefixes, and combining roots. 6. Interpret basic medical abbreviations/symbols. 7. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system. 8. Interpret medical orders/reports. 9. Data entry and management on electronic health record system.	**18**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication

1	Medical Terminology, Documentation, and Coding	Anne P. Stich	Routledge Publisher
2	Medical Terminology for Health Professions	Ann Ehrlich, Carol L. Schroeder	Cengage Learning
3	Medical Terminology	M. Mastenbjörk M.D. S. Meloni M.D. Medical Creation David Andersson	Medical Creations
4	Medical Records: Organization and Management	GD Mogli (Author)	Jaypee Brothers Medical Publishers

Semester: I

Course Name: Basic Computers & Information Science		**Course Code: 050601006**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 1**
			1	0	0	1	**Total Hrs.: 18**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: introductory-level course designed for students					
Course Objectives	• Provide foundational understanding of computer hardware, software, and basic digital literacy. • Develop practical skills in operating systems, office productivity tools, and basic internet usage. • Introduce information science concepts relevant to data handling and radiological settings.						
Course Outcomes	CO1: Identify components of a computer system and their functions. CO2: Operate basic software applications (e.g., word processors, spreadsheets). CO3: Understand file management and digital document handling. CO4: Apply concepts of information storage, retrieval, and internet usage in healthcare. CO5: Demonstrate proficiency in practical computer tasks relevant to medical imaging documentation.						

COURSE SYLLABUS

Topic and contents	**Hours**
Topics to be covered under the subject are as follows: 1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages. 2. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems). 3. Processor and memory: The Central Processing Unit (CPU), main memory. 4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices. 5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). 6. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. 7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. 8. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. 9. Introduction of Operating System: introduction, operating system concepts, types of operating	**18**

system.

10. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
11. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Application of Computers in clinical settings. Practical on

fundamentals of computers -

1. Learning to use MS office: MS word, MS PowerPoint, MS Excel.
2. To install different software.

Data entry efficiency

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Basic of Computer and Information Technology	Ashok Arora	Vikas
2	Computer and Information Science	Roger Lee (editor)	Springer
3	Computer and Information Sciences	Tadeusz Czachórski , Erol Gelenbe, Krzysztof Grochla, Ricardo Lent (Editor	Springer
4	Information science and computer basics: An introduction	Mitchell, Ruth K	Clive Bingley

Semester: I

Course Name: Medical Law & Ethics		**Course Code: 050601007**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 1**
			1	0	0	1	**Total Hrs.: 18**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: introductory-level subject designed to build awareness of legal and ethical dimensions in healthcare and radiological practice.					
Course Objectives		❖ Impart foundational understanding of the intersection between law and medicine. ❖ Teach core ethical principles governing healthcare providers, including consent and confidentiality. ❖ Highlight medico-legal responsibilities and consequences of professional negligence. ❖ Analyze major statutes and case law affecting medical practice.					
Course Outcomes		CO1: Explain key ethical responsibilities of healthcare professionals. CO2: Apply ethical principles—autonomy, beneficence, non-maleficence, justice—to clinical scenarios. CO3: Describe and differentiate between consent, confidentiality, and duty of care. CO4: Identify acts of professional negligence and their legal liabilities. CO5: Analyze medico-legal cases including negligence and malpractices. CO6: Recall relevant medical laws (e.g., Indian Medical Council Act, Transplantation of Human Organs Act, MTP Act).					

COURSE SYLLABUS

Topic and contents	Hours
The important and relevant topics that need to focus on are as follows: 1. **Medical ethics - Definition - Goal - Scope** 2. **Introduction to Code of conduct** 3. **Basic principles of medical ethics – Confidentiality** 4. **Malpractice and negligence - Rational and irrational drug therapy** 5. **Autonomy and informed consent - Right of patients** 6. **Care of the terminally ill- Euthanasia** 7. **Organ transplantation** 8. **Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.** 9. **Professional Indemnity insurance policy** 10. **Development of standardized protocol to avoid near miss or sentinel events** 11. **Obtaining an informed consent.** 12. **Medical ethics - Definition - Goal - Scope** 13. **Introduction to Code of conduct** 14. **Basic principles of medical ethics – Confidentiality** 15. **Malpractice and negligence - Rational and irrational drug therapy**	**18**

16. Autonomy and informed consent - Right of patients
17. Care of the terminally ill- Euthanasia
18. Organ transplantation
19. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
20. Professional Indemnity insurance policy
21. Development of standardized protocol to avoid near miss or sentinel events

Obtaining an informed consent.

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Medical Law and Ethics	Bonnie F. Fremgen	Pearson
2	Medical Law and Ethics	Jonathan Herring	OUP UK
3	Medical Law and Ethics	Purosottam Behera	Mittal Publications
4	Reflections on Medical Law and Ethics in India	Bismi Gopalakrishnan, Mercy Khaute, B. Sandeepa Bhat	Eastern Law House

Semester: I

Course Name: Professionalism & Values		Course Code: 050601008					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 1**
			1	0	0	1	**Total Hrs.: 18**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: introductory-level course focused on developing core professional attributes and ethical awareness for radiologic practice.					

Course Objectives	• Introduce the concept of professionalism and its distinction from vocation • Cultivate key professional values: integrity, objectivity, competence, confidentiality, respect, compassion, accountability • Explore personal moral values, professional conduct, codes of conduct, ethical behavior, and accountability • Address issues of teamwork, cultural sensitivity, and professionalism lapses in healthcare
Course Outcomes	CO1: Define professionalism and distinguish it from a regular occupation. CO2: Demonstrate integrity, accountability, respect, and empathy in clinical scenarios. CO3: Apply principles of confidentiality, professional competence, and due care. CO4: Adhere to professional codes of conduct and ethical guidelines. CO5: Work effectively in multidisciplinary teams with cultural competence. CO6: Identify, reflect on, and address professional conduct lapses.

COURSE SYLLABUS

Topic and contents	Hours
1. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality 2. Personal values- ethical or moral values 3. Attitude and behavior- professional behavior, treating people equally 4. Code of conduct, professional accountability and responsibility, misconduct 5. Differences between professions and importance of team efforts 6. Cultural issues in the healthcare environment	18

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Textbook of Medical Ethics	Erich H Loewy	Springer

	2	Professionalism, Professional Values and Ethics in Nursing	Suresh K Sharma, Asha P Shetty	Jaypee Brothers Medical Publishers	
	3	Essentials of Professionalism, Professional Values & Ethics for BSc Nursing Students	Varinder Kaur	CBS Publishers and Distributors Pvt. Ltd	
	4	Textbook of Professional Ethics and Human Values	R S Naagarazan	New age International Publishers	

Semester: I

Course Name: Principles of Management		**Course Code: 050601009**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 1**
			1	0	0	1	**Total Hrs.: 18**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: introductory-level course to provide foundational knowledge in management principles.					

Course Objectives	• Understand core functions of management: Planning, Organizing, Leading (Directing), Controlling • Develop knowledge of managerial roles, decision-making, communication, and teamwork. • Cultivate skills in applying management techniques in healthcare/radiology settings.
Course Outcomes	CO1: Define management and its evolution, including Fayol's principles. CO2: Apply the four functions of management—planning, organizing, leading, controlling. CO3: Demonstrate understanding of managerial roles, communication, and leadership styles. CO4: Use decision-making tools and team dynamics in problem-solving. CO5: Implement control mechanisms and performance measurement in organizational settings. CO6: Analyze case studies and real-world scenarios to apply management concepts ethically and effectively.

COURSE SYLLABUS

Topic and contents	**Hours**
1. Introduction to management 2. Strategic Management 3. Foundations of Planning 4. Planning Tools and Techniques 5. Decision Making, conflict and stress management 6. Managing Change and Innovation 7. Understanding Groups and Teams 8. Leadership 9. Time Management 10. Cost and efficiency	**18**

SUGGESTED LEARNING RESOURCES

S. No.	**Title of Book**	**Author**	**Publication**
1	Essentials of Professionalism, Professional Values & Ethics for BSc Nursing Students	Varinder Kaur	CBS Publishers and Distributors Pvt. Ltd

2	Professionalism Professional Values and Ethics in Nursing	Suresh K Sharma	Jaypee Brothers
3	Professionalism, Professional Values & Ethics	Shama Lohumi and Rakesh Lohumi	CBS publishers and Distributers PVT Ltd

Semester: I

Course Name: English & Communication Skills		**Course Code: 050601010**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: I**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 1**
			1	0	0	1	**Total Hrs.: 18**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: foundational course for improving English proficiency and communication abilities in academic and healthcare contexts.					
Course Objectives	• Develop essential skills in grammar, effective writing, reading, speaking, and listening. • Enhance communication competence specific to healthcare interactions, including patient engagement and professional correspondence. • Build confidence in formal speaking situations such as presentations, interviews, and group discussions.						
Course Outcomes	CO1: Demonstrate correct usage in grammar — tenses, active/passive voice, speech changes. CO2: Write formal texts: letters, emails, essays, reports, memos, and notes. CO3: Understand and summarize written content; employ comprehension and summary strategies. CO4: Communicate fluently in spoken English with correct pronunciation and diction. CO5: Utilize effective listening techniques in academic and clinical settings. CO6: Apply communication principles to interact empathetically with patients and healthcare teams.						

COURSE SYLLABUS

Topic and contents	Hours
Language-Basic Content: Review of grammar, Remedial study of grammar, building vocabulary Introduction Parts of speech Exercise on use of grammar Tense, Number, Gender Assessment methods: Objective type, Fill in the blanks. Content: Read and comprehend prescribed course books Reading, Summarizing, Comprehension Assessment methods: Fill in the blanks and one-mark questions **Content: Various Forms of Composition Letter writing** Note taking Precise writings Diary writing Reports on health problem etc. Official correspondence: Outgoing correspondence, replying incoming correspondence, writing circulars, notices, charge memos, note taking, writing summaries, observation reports. Teaching learning activities: Exercise on writing: Letter writing, resume/CV Essay writing. **Assessment methods: Applications, short reports to be written.** **Content: English-** Spoken mode, Debates, Telephonic conversion, formal & informal conversation: Agreeing emphasizing, interrupting, politely, opinions, interviews, visual presentation. Teaching learning activities: Participating in seminar, Telephonic conversion, conversation in different situations, practice in public speaking	

Assessment methods: Assessment of the skills based on the checklist. Content: Listening to comprehension media, audio, video, speeches, definition of listening, types of listening, purposes of listening, obstacles for listening, contexts of listening, to be a good listener, listening to a lecture etc. **Teaching learning activities**: Listening to audio, video tapes and identify the key points. Assessment methods: Practical test of listening and filling out the blanks, essay type.	

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Communicative English for General Nursing Students	Tom Koorkkakala	K.J. Publications
3	How to write and speak Better, Reader's	John Ellison Kahn	Reader's Digest Association
4	Communication and Soft Skill Development	Ashwini Deshpande	Career Publications

BRIT
Semester II

2nd semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Basics of Microbiology	050602001	70	30			100	2
2	Basics of Biochemistry	050602002	70	30			100	2
3	Conventional Radiography & Equipment	050602003	70	30			100	4
4	Clinical Radiography Positioning (Part I)	050602004	70	30			100	5
5	Clinical Radiography Positioning (Part I) - Practical	050602005			70	30	100	3
6	Conventional Radiography & Equipment - Practical	050602006			70	30	100	1
7	BRIT Radiology Clinical Education – part II (studentship)	050602007						5
Total Credit								**22 Credit**

Semester: II

Course Name: Basics of Microbiology		**Course Code: 050602001**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: II**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 2**
			2	0	0	2	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: this is a foundational subject that introduces essential microbiological concepts, lab skills, and infection control—no prior microbiology background assumed.					
Course Objectives	• Provide an overview of microbial diversity—bacteria, fungi, viruses, and parasites—and their historical discovery. • Teach basic microscopy, staining methods, and culture techniques. • Explain microbial growth, metabolism, and genetics. • Introduce sterilization/disinfection methods, infection control, and aseptic practices.						
Course Outcomes	**CO001:** Describe the structure, classification, morphology and growth of bacteria **CO002:** Describe the methods sterilization and disinfection and its applications **CO003:** Explain the concepts of immunity, hypersensitivity and immunization **CO004:** Describe Nosocomial infections and methods for prevention of Hospital acquired infections **CO005:** Describe the management of biomedical waste **CO006:** List the common fungi and viruses and explain their importance						

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Morphology of Bacteria:** (Structure, size, shape, arrangement cell wall, flagella, spore, capsule, fimbria) **Physiology of Bacteria:** (Bacterial growth curve, Temp, O2, Co2, micro and macro nutrient growth requirements) Culture Media Culture Methods Antimicrobial sensitivity tests **Sterilization and Disinfections:** Definition, Dry heat Sterilization, Moist heat Sterilization, Chemical disinfectants, Gaseous disinfection, Test for disinfection / Sterilization control	**9**
II	**Infection: Classification, Sources of infection, Modes of transmission** Nosocomial infection including biomedical waste management: Definition, Classification, Significance, Prevention and control Biomedical waste management	**8**
III	**Immunology**: Immunity, Antigen, Antibody, Hypersensitivity	**5**
IV	**General Properties of fungi. (General characters, classification, Morphology, Reproduction)** General Properties of Viruses. (General character, classification based on Genome, Capsid, Envelope & replication and cultivation of virus).	**7**

V	**Applied Microbiology:** Pyrexia of unknown origin, Meningitis, Zoonotic infections, Hepatitis, HIV infection and AIDS, Food poisoning, Diarrhea, Urinary tract infections, Pulmonary Tuberculosis	**7**
Total	**36**	

SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Text book of Microbiology	Ananthnarayana&Panikar	University Press
2	Text book of Microbiology	Baveja	Arya Publications
3	Text book of Microbiology	Sathish Gupte	JPB
4	Textbook of Microbiology	Dr Arora	CBS Publishers & Distributors Pvt. Ltd

Semester: II

Course Name: Basics of Biochemistry		**Course Code: 050602002**					
Batch: 2025-26 onwards	**Programme: BRIT**	**Semester: II**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			2	0	0	2	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: introductory biochemistry covering fundamentals, designed for students with no prior exposure.					
Course Objectives	• Provide essential knowledge of biochemical principles underpinning physiology and pathology. • Familiarize students with key biomolecules (carbohydrates, proteins, lipids, nucleic acids, vitamins, minerals). • Introduce clinical aspects: sample handling, nutrition, and laboratory safety. • Teach basic laboratory techniques: colorimetry, biochemical assays, and quality assurance in sample processing.						
Course Outcomes	**CO1:** Understand the responsibility of health care personals and hazards faced in the clinical laboratory **CO2:** Explain the different types, use, care and maintenance of laboratory apparatus and instruments. **CO3:** Understand the fundamental chemistry and knowledge of different solutions **CO4:** Understand what acids, bases, salts and indicators are and also know about acid base balance **CO5:** Describe the sample collection procedure to analyse various biochemical parameters **CO6:** Describe assimilation of nutrients and consequences of malnutrition **CO7:** Understand the different functional tests like LFT (Liver function test), RFT (Renal function test) **CO8:** Understand the overview of tumor markers, cardiac markers, blood sugar and GTT, lipid profile and diagnostic enzymology **CO9:** Describe the applications of radioisotopes						

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Nutrition** Calorific value Nitrogen Balance Respiratory quotient BMR Nutritional importance of carbohydrate, lipids, proteins, vitamins and minerals Emphasis on parenteral nutrition	**9**
II	**Acid–Base Balance** Henderson Hassel Bach equation Buffers of the body fluids Ph regulation Disturbance in acid base balance Anion gap Basic principles & estimation of blood gases and ph. Water & Electrolyte balance Over view of water and electrolyte balance Basic principles in estimation of Electrolyte Normal values and interpretation	**9**
	Clinical chemistry	

III	Brief over view of normal values and interpretation of results Renal function tests Liver function tests Tumor markers Cardiac markers Diagnostic Enzymology Lipid profile Blood sugar and GTT Normal &Abnormal urine analysis	9
IV	**Radioisotopes:** Definition, Application &Hazards Normal and abnormal urine analysis Clinical charts on LFT, RFT, and diagnostic enzymology	9
Total		**36**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Text Book of biochemistry for dental students	Vasudevan, Sreekumari, Kannan Vaidyanathan	Jaypee Brothers
2	Biochemistry for Physiotherapy and allied health sciences students.	Nandini M, Beena V Shetty, Vinitha Ramanath Rai	Jaypee Brothers Medical Publisher (India)
3	Clinical chemistry	Varley	CBS Publishers & Distributors
4	Textbook of biochemistry for paramedical students	P Ramamoorthy	Jaypee Brothers Medical Publishers

Semester: II

Course Name: Conventional Radiography & Equipment		**Course Code: 050602003**					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: II**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 4**
			4	0	0	4	**Total Hrs.: 72**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: oundational course in basic radiographic equipment and techniques.					
Course Objectives		• Introduce students to the fundamental components and operation of conventional X-ray systems, including tube, circuits, generators, meters, and timers • Enable comparison between conventional and digital radiography systems. • Equip students with the skills to perform routine equipment checks and maintenance procedures.					
Course Outcomes		**CO001:** Describe the structure and working of x-ray tube, production of x-rays **CO002:** Describe the types of x-ray tube and heat dissipation methods **CO003:**Explain the x-ray generator circuits **CO004:** Describe the different circuit types **CO005:** Describe the meters and exposure timers **CO006:** List the control of scattered radiation **CO007:** Describes about the fluoroscopy **CO008:** Explains about the care and maintenance of x-ray equipment's					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**X-ray tube:** historical aspects, construction of X-ray tubes, requirements for X- ray production(Electron source, target and anode material), tube voltage, current, space charge, early X-ray tubes(Coolidge tubes, tube envelop and housing) cathode assembly, X-ray production efficiency, advances in X-ray tubes, anode angulation and rotating tubes-line focus principle-space charge effect, tube cooling-Modern X-ray tubes-stationary anode, rotating anode, grid controlled X- ray tubes, heel effect, off focus radiation, tube insert and housing-Tube rating- Quality and intensity of x-rays-factors influencing them. **Production of x-rays:** X-ray tube, gas filled x-ray tube, construction working and limitations; stationary anode x - ray tube; construction, working, methods of cooling the anode, rating chart and cooling chart;	**10**
II	**Rotating anode x - ray tube:** construction, working rating chart, speed of anode rotation, angle of anode inclination, dual focus and practical consideration in choice of focus, anode heel effect, grid controlled x - ray tube; effect of variation of anode voltage and filament temperature; continuous and characteristics spectrum of x - rays, inherent filter and added filter, their effect on quality of the spectrum. **Grid controlled and high speed tubes,** focal spot size, speed of anode rotation, target angle, inherent filtration, radiation leakage and scattered radiation).Interlocking and X-ray tube overload protection. **Heat dissipation methods,** tube rating, heat units, operating conditions and maintenance and Q.A	**10**

	procedures.	
III	**Filament current and voltage**, X-ray circuits (primary circuit, auto transformer), types of exposure switch and timers, principle of automatic exposure control (AEC) and practical operation, filament circuit, high voltage circuits, half wave, full wave rectification, three phase circuits. Types of generators, 3 phase, 6 and 12 pulse circuits-high frequency generators-falling load generators, Capacitors discharge and grid control systems. **X-ray generator circuits:** Vacuum tube diodes-semi-conductor diodes- transistor-Rectification-half and full wave-self rectification-X-ray generator; filament circuit-kilo Voltage circuit-single phase generator-three phase generator- constant potential generator-Fuses, switches and interlocks-Exposure switching and timers-HT cables-earthing.	**10**
IV	**High tension circuits:** H.T. generator for x-ray machines, three phase rectifier circuits, three phase six rectifier circuit, three phase 12 rectifier circuit, high and medium frequency circuits; capacitance filter control and stabilizing equipment; mains voltage compensator, mains resistance compensator, compensation for frequency variation, control of tube voltage, kV compensator; high tension selector switch, filament circuit, control of tube current, space charge compensation. **Interlocking circuits: Relays:** description and working, use of relays in diagnostic machines for over load protection, circuit diagram; simplified circuit and block diagrams illustrating sequence of events from mains supply to controlled emission of x-rays.	**10**
V	**Meters and exposure timers:** Moving coil galvanometer: construction and working/conversion to millimeter, ammeter and voltmeter, meters commonly used in diagnostic x-ray machines, pre reading kV meter and millimeter, digital panel meters. Clockwork timers, synchronous motor timer, electronic timers, photo metric timers (fluorescent and photoelectric effect as applied in timers), ion chamber-based timers, integrated timer.	**10**
VI	**Control of scattered radiation: Beam limiting devices:** cones, diaphragms, light beam collimator, beam centering device, methods to verify beam centering and field alignment; Filters- inherent filters, added filters, heavy metal filters, grids; design and control of scattered radiation, grid ratio, grid cut-off, parallel grid, focused grid, crossed grid, grided cassettes, stationary and moving grid potter bucky diaphragms, various types of grid movements; single stroke movement, oscillatory movement and reciprocatory movement.	**8**
VII	**Fluoroscopy:** Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, construction of fluoroscopic screen and related accessories, tilting table, dark adaptation. Image intensifier - Construction and working, advantages over fluoroscopic device, principles and methods of visualising intensified image, basic principles of closed circuit television camera and picture tube. Vidicon camera, CCD. Automatic brightness control, automatic exposure control, chamber selection during fluoroscopy. Serial radiography: Manual cassette changer, rapid automatic film changer, basic principles of cine fluoroscopy and angiography use of grid controlled x-ray tube.	**8**
VIII	**Care and Maintenance of X-ray equipment;** General care; functional tests; testing the performance of exposure timers, assessing the MA settings, testing the available KV, measurement of focal spot of an x-ray tube, testing the light beam diaphragm, practical precautions pertaining to Brakes and locks, H.T. cables, meters and controls, tube stands and tracks as well as accessory equipment.	**6**
Total		**72**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Radiographic Imaging (Cbs)I.C.R.P.	D.N. Chesney & M.O Chesney	CBS Publishers Distributors

	2	An Introduction Of Physics to Diagnostic Radiography	Christensen, Curry & Dowdey	Lea & Febiger	
	3	Radiological Science for technologists	Stewart C Bushong	Mosby	
	4	Equipment for Diagnostic Radiography	E. Forster	Springer Dordrecht	
	5	The Physics Of Radiology And Imaging	K Thayalan	Jaypee	

Semester: II

Course Name: Clinical Radiography Positioning (Part I)		**Course Code: 050602004**					
Batch: 2025-26 onwards	**Programme : II**	**Semester: II**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 5**
			5	0	0	8	**Total Hrs.: 90**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Foundational knowledge from Anatomy, Physiology, and Radiographic Equipment.					

Course Objectives	• Define foundational radiographic positioning terminology and projection types • Teach proper alignment of central ray, IR, body part, and exposure factors for optimal imaging in common examinations (upper/lower limbs, shoulder girdle, spine, thorax, skull) • Develop patient preparation, care, and radiation protection techniques in routine and trauma contexts
Course Outcomes	**CO1:** Understand the basic patient positioning during radiographic investigation. **CO2:** Apply special positioning skills for different pathological and physical conditions. **CO3:** Application of equipments while working in radiology departments. **CO4:** Choose proper position during radiography. **CO5:** Explain relative positions of x-ray tube and patient relevant exposure factors during radiography. **CO6:** Explain the use of accessories. **CO7:** Explain the anatomic and physiological basis of the procedure to be undertaken. **CO8:** Explain the radiographic appearances of both normal and common abnormal conditions.

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Principles of Radiography:** Preparation of the Room, Apparatus and Instruments Positions of the Patient: Erect, Sitting, Supine, Prone, Lateral, Oblique, Decubitus Etc. Relative position of X-Ray tube and patient, relevant exposure factors. Use of accessories such as radiographic cones, grid and positioning aids. Anatomic and Physiological basis **of the procedure, Association with theory with practical work. Radiographic appearances, both normal and common abnormal conditions where elementary knowledge of the pathology involved will ensure the application of the appropriate radiographic technique. Modifications in technique for various disabilities and types of subject. Radiation protection, use of gonad shield, practical methods of reducing radiation dose to the patient.**	**12**
II	**Upper limb:** Routine projections for the whole hand, fingers, wrist joint, forearm, elbow joint and humerus. Supplementary projections for Scaphoid, Carpal tunnel, Ball Catchers projections, Head of the Radius, Supracondylar fracture and Olecranon process	14

III	**Lower limb:** Routine projections for the whole foot, toes, calcaneum, ankle joint, leg, knee- joint, patella and femurs. Supplementary projections for Talo-Calcaneal joint, Forced projections for torn ligaments, Flat Feet, Club Feet, Intercondylar projections for loose bodies in the knee, Axial projection for Patella.	12
IV	Shoulder Girdle and Thorax: Routine projections for the shoulder joint, Scapula, Acromio-Clavicular joint, Clavicle, Sternoclavicular joint, Sternum and Ribs. Supplementary projections for the axial projection of Clavicle, Bicipital groove, Coracoid process.	12
V	**Vertebral Column:** Routine projections for Atlanto -Occipital joint, cervical spine, Cervico- thoracic Junction, thoracic Spine, lumbar Spine, Lumbo Sacral Region, Sacrum and Coccyx. Supplementary projections for the intervertebral foramina, posterior arch of Atlas, Flexion and Extension of Cervical Spine, Scoleosis and Kyphosis, Sacro Ileac Joint.	14
VI	**Skull:** Routine projections for cranium and facial bones; Supplementary projections for trauma, Towne's method, Sellaturcica, Optic foramina, Jugular foramina, Temporal bones, Mastoids, Petrous bone, Zygomatic arches, Orbits, Maxillae, Nasal bones, Mandible, Temporomandibular joints. Nasal Sinuses: Techniques for Frontal, Maxillary, Ethmoidal and Sphenoid Sinuses, erect and horizontal projections for fluid levels.	13
VII	**Pelvic girdle and hip region:** **Routine projections for the whole pelvis, Sacro-Ileac joints, hip joint and Neck of Femur.** Supplementary projections for the greater and lesser trochanters of Femur. Frog leg projection, Ischeum, Symphysis Pubis, Ileum, Acetabulum and Congenital Dislocation of Hip, Arthrodesis. **Skeletal survey:** Skeletal survey for metabolic bone disease, metastases, hormonal disorder, renal disorders.	**13**
Total		**90**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Atlas of Radiographic Positioning and Radiological Procedures	Philip W Ballinger, Eugene D. Frank	Mosby
2	Clarks Positioning In Radiography	Ra Swallow, E Naylor	Lippincott Williams and Wilkins

	3	Merrill's Atlas of Radiographic Positioning and Procedures	Bruce W. Long &Jeannean Hall Rollins & Barbara J. Smith	Mosby	
	4	Bontrager's Textbook Of Radiographic Positioning And Related Anatomy	John Lampignano and Leslie E Kendrick	Elsevier Science	
	5	Radiology Of Positioning And Applied Anatomy For Students And Practitioners	Garkal Gs	Jaypee Brothers Medical Publishers	
	6	A Guide on Special Radiographic Investigations & Techniques	Lalit Agarwal	JBD Publications	

Course Name: Clinical Radiography Positioning (Part I)-Practical		**Course Code: 050602005**					
Batch: 2025-26 onwards	**Programme : II**	**Semester: II**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 6**
			0	0	6	3	**Total Hrs.: 108**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Foundational knowledge from Anatomy, Physiology, and Radiographic Equipment.					
Course Objectives		• Define foundational radiographic positioning terminology and projection types • Teach proper alignment of central ray, IR, body part, and exposure factors for optimal imaging in common examinations (upper/lower limbs, shoulder girdle, spine, thorax, skull) • Develop patient preparation, care, and radiation protection techniques in routine and trauma contexts					
Course Outcomes		**CO1:** Understand the basic patient positioning during radiographic investigation. **CO2:** Apply special positioning skills for different pathological and physical conditions. **CO3:** Application of equipments while working in radiology departments. **CO4:** Choose proper position during radiography. **CO5:** Explain relative positions of x-ray tube and patient relevant exposure factors during radiography. **CO6:** Explain the use of accessories. **CO7:** Explain the anatomic and physiological basis of the procedure to be undertaken. **CO8:** Explain the radiographic appearances of both normal and common abnormal conditions.					

Sr. No	**Practicles**	**Hours**
1.	**Principles of Radiography**	15
2.	**Upper limb**	17
3.	**Lower limb**	17
4.	**Shoulder Girdle and Thorax**	14
5.	**Vertebral Column**	15
6.	**Skull**	15
7.	**Pelvic girdle and hip region, Skeletal survey**	15
	Total	**108**

Course Name: Conventional Radiography & Equipment - Practical		Course Code: 050602006					
Batch: 2025-26 onwards	**Programme : BRIT**	**Semester: II**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 2**
			0	0	2	1	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: oundational course in basic radiographic equipment and techniques.					
Course Objectives	• Introduce students to the fundamental components and operation of conventional X-ray systems, including tube, circuits, generators, meters, and timers • Enable comparison between conventional and digital radiography systems. • Equip students with the skills to perform routine equipment checks and maintenance procedures.						
Course Outcomes	**CO001:** Describe the structure and working of x-ray tube, production of x-rays **CO002:** Describe the types of x-ray tube and heat dissipation methods **CO003:**Explain the x-ray generator circuits **CO004:** Describe the different circuit types **CO005:** Describe the meters and exposure timers **CO006:** List the control of scattered radiation **CO007:** Describes about the fluoroscopy **CO008:** Explains about the care and maintenance of x-ray equipment's						

Sr. No	Practicles	Hours
1.	**X-ray tube; Production of x-rays**	5
2.	**Rotating anode x - ray tube; Grid controlled and high speed tubes; Heat dissipation methods**	4
3.	**Filament current and voltage; X-ray generator circuits**	5
4.	**High tension circuits; Interlocking circuits; Relays**	5
5.	**Meters and exposure timers**	5
6.	**Control of scattered radiation: Beam limiting devices**	4
7.	**Fluoroscopy**	4
8.	**Care and Maintenance of X-ray equipment**	4
	Total	36

BRIT
Semester III

3rd semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Pathology	050603001	70	30			100	2
2	Clinical Radiography Positioning (Part- II)	050603002	70	30			100	3
3	Radiography and Image Processing Techniques	050603003	70	30			100	2
4	Contrast and Special Radiological Procedures	050603004	70	30			100	3
5	Clinical Radiography Positioning (Part- II)- Practical	050603005			70	30	100	3
6	Radiography and Image Processing Techniques- Practical	050603006			70	30	100	1
7	Contrast and Special Radiological Procedures- Practical	050603007			70	30	100	3
8	BRIT Radiology Clinical Education – part III (studentship)	050603008						4
Total Credit								**21 Credit**

Semester: III

Course Name: Pathology		**Course Code:** 050603001					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: III**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			2	-	-	2	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and physiology is required. Familiarity with medical terminology is also recommended.					
Course Objectives		To understand the causes, mechanisms, and effects of diseases at the cellular and systemic levels. To develop diagnostic skills through the interpretation of pathological specimens and laboratory data.					
Course Outcomes		• **CO1:** Define the term "Disease" or concepts of Diseases. • **CO2:** Define, classify diseases and the medical terms used. • **CO3:** Describe the cause and mechanism of a few common diseases they come across during their routine work. • **CO4:** Common changes seen in these diseased persons in different organs/tissues/bodyfluids. • **CO5:** Names of the common laboratory tests done to diagnose the diseases like examination of urine, blood, other body fluids and tissues. • **CO6:** Enumerate the proper methods of collection, preservation and delivery of the samples to the respective laboratories. • **CO7:** Describe the procedures of procuring the whole blood or blood components from blood bank and the complications of blood transfusion.					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Introduction to Pathology**, Cell membrane, Cytoplasm, contents and nucleus Various injuries – Cell changes – Reversible changes, fatty liver, hydropic changes and Irreversible changes Irreversible changes – Necrosis. Types with examples. Apoptosis Pigments – Classification. Bilirubin, melanin, pathological calcification Inflammation – Definition, classification, signs, vascular & cellular events in acute inflammation Repair and wound healing, fracture healing, complications, factors influencing healing Infectious diseases – Tuberculosis, leprosy, fungal diseases, malaria	**07**
II	**Oedema –** Definition, classification, causes, pathogenesis. Pulmonary oedema, cardiac oedema, Renal oedema, Lymphedema **Thrombosis –** Definition, classification, pathogenesis, venous and arterial thrombosis, fate of thrombus Embolism – Definition, classification and clinical manifestations – Infarction, gangrene Cellular adaptations and Growth disorders: Atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia and neoplasia **Neoplasia (Tumors) –** Definition, nomenclature, differences between benign and malignant tumors metastasis Causes (carcinogens), clinical features and lab diagnosis of cancers Genetics – Genetic diseases, cause, Common cytogenic diseases – Klinefelter, Downs and Turners syndrome. Complete urine examination – physical, chemical, microscopy of sediment Liver function tests, Renal function tests Cytology, FNAC, Surgical pathology, biopsy, resected specimen preservation, fixation and filling of	**08**

	request forms	
III	**Blood collection for investigations, anticoagulant.** Sample collection, labeling, transportation to labs Common hematological tests – Peripheral blood smear, Haemoglobin, Packed cell volume, WBC count – variation of total and differential leukocyte count, Platelet count Bone marrow Aspiration and biopsy; Indications, procedure, contraindications and complications Anemias – Definition, classification, Iron deficiency anemia, causes, clinical features and lab diagnosis Megaloblastic anemia – cause, classification, diagnosis. Briefly hemolytic anemia Leukemia – Definition, classification, lab diagnosis of Acute Leukemias (AML & ALL) and Chronic Leukemias (CML & CLL) Bleeding disorders – Classification, Vascular, Platelet and coagulation factors contribution in clotting. Common Platelet disorders Common coagulation disorders (Hemophilia, DIC). BT, CT, Prothrombin time and APTT for diagnosis Blood grouping, cross matching, collection of blood from blood donors. Mandatory tests done in blood bank, blood components, complications of blood transfusion and its evaluation	**07**
IV	**Osteomyelitis –** Acute and chronic, Tubercular, causes, pathology & its complications Diseases of joints – Osteoarthritis and Rheumatoid arthritis – causes, aetiopathogenesis, pathology, complications Metabolic disease of bones – Osteoporosis, Osteomalacia, Rickets Cardiovascular diseases – Introduction, Atherosclerosis – definition, risk factors, sites/ organs, pathology manifestations, complications. Aneurysms – types, causes and complications Ischemic heart disease (IHD) – Types, Pathogenesis of Angina, Myocardial infarctions and its complications Rheumatic heart disease – etiology, pathogenesis and morphology of the heart Hypertension – definition, causes, complications Heart failure – Causes, pathophysiology, clinical manifestations and complications	**07**
V	**Respiratory diseases** – Chronic obstructive pulmonary airway diseases – causes, pathology and complications of each (asthma, chronic bronchitis, emphysema, Broncheictasis in brief). Pneumonia – classification, clinical features and morphology Pulmonary tuberculosis – classification/ types, primary, complex, miliary TB and cavitatory TB, complications Pleural effusion – definition, causes, clinical features and diagnosis Renal system; Glomerulonephritis, nephritic and nephrotic syndrome. Tubulointerstitial diseases, Renal failure – Acute and chronic Pyelonephritis – Types, causes, organ changes and complications. Renal stones – Causes, pathogenesis, clinical features. Hydronephrosis – causes, clinical features and diagnosis	**07**
	Total	**36**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Textbook of Pathology with Pathology	Harsh Mohan	Jaypee Brothers Medical Publishers (P) Ltd
2	Pathology Basis of Disease	Robbins and Cotran	Saunders Elsevier
3	Text book on Pathology for DMLT & Paramedical Courses	Dr. I Clement	Emmess medical publishers
4	Text book of Pathology & Microbiology for Paramedical Students	Aruna Singh	Notion Press

Semester: III

Course Name: Clinical Radiography Positioning (Part- II)		**Course Code: 050603002**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: III**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 03**
			3	0	0	3	**Total Hrs.: 54**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic understanding of human anatomy and successful completion of Clinical Radiography Positioning (Part-I).					
Course Objectives		The course aims to enhance students' knowledge of advanced radiographic positioning techniques for accurate diagnostic imaging. It focuses on proper patient positioning, safety, and image evaluation across various anatomical regions.					
Course Outcomes		• **CO1:** Prepare management and positioning of patients • **CO2:** Correlate of indications, contraindications of the patient • **CO3:** Understand the patient preparations needed before any radiological examination. • **CO4:** Generalize knowledge of post procedural care. • **CO5:** Students will be able position the patients for radiological procedures. • **CO6**: Knowledge of image quality in radiological images. • **CO7**: Management of patients in radiology department for various procedures. • **CO8:** Ability to handle emergency situations in radiology department.					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	Dental Radiography : Technique for intra oral full mouth. - Occlusal projections. - Extra oral projections including orthopantomography. - Supplementary techniques. **Upper respiratory system :** Technique for postnasal airways, larynx, trachea, thoracic inlet, Valsalva maneuver. - Phonation.	**08**
II	**Lung and Mediastinum:** Supplementary projections: Antero-posterior, obliques, lordotic, apical projection, use of penetrated postero-anterior projection. - Expiration technique. - Technique for pleural fluid levels and adhesions. **Abdominal viscera-** Technique for plain film examination. - Projection for acute abdomen patients. - Technique to demonstrate: Foreign bodies, Imperforate anus.	**06**
III	**Radiography using mobile X-ray equipment- Radiography in the ward:** Radiography in the specialized unit, such as: Intensive care unit, Coronary care, Neonatal unit Radiography in the operating theatre. **Mammography:** Basic views, special views, wire localization. **Localization of foreign bodies.** Various techniques	**08**
IV	**Ward /mobile radiography –** electrical supply, radiation protection, equipment and instructions to be followed for portable/ward radiography. **Operation theatre techniques:** General precautions, Asepsis in techniques - Checking of mains supply and functions of equipment, selection of exposure factors, explosion risk, radiation protection and rapid processing techniques. **Trauma radiography/Emergency radiography**	**08**

V	**Neonatal and Pediatric Radiography, Forensic Radiography, Microradiography:** General principles, Requirement, Equipment, Technique.	**08**
VI	**Soft Tissue Radiography:** High and low kilo voltage technique; differential filtration. Non - screen technique - simultaneous screen and non -screen technique. **Multiple radiography.** Uses of soft tissue radiography. **High kV Radiography:** General principles Relation to patient dose Change in radiographic contrast. **Scatter elimination; beam collimation; grid ratio. Speed and type of grid movement. Radiographic factor; application and uses.**	**08**
VII	**Localization of foreign bodies:** General location principles. Ingested; inhaled; inserted; embedded foreign bodies. Foreign bodies in eye. Preparation of the area to be investigated. Appropriate projection for all Techniques to locate non-opaque foreign body.	08
	Total	**54**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Radiological positioning	Merils	Mosby
2	A guide to radiological positioning	Clarks	CBS publishers and distributors pvt. Ltd
3	Radiology Of Positioning And Applied Anatomy For Students And Practitioners	GarkalGs	Jaypee Brothers Medical Publishers
4	Bontrager's Textbook of Radiographic Positioning and Related Anatomy	John Lampignano), Leslie E. Kendrick	Mosby
5	A Concise Guide on Basic Radiographic Physics Darkroom Procedures, Radiographic Positioning & Techniques	Lalit Agarwal	JBD Publications

Semester: III

Course Name: Clinical Radiography Positioning (Part- II)-Practical		**Course Code: 050603005**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: III**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 06**
			0	0	6	3	**Total Hrs.: 108**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic understanding of human anatomy and successful completion of Clinical Radiography Positioning (Part-I).					
Course Objectives	The course aims to enhance students' knowledge of advanced radiographic positioning techniques for accurate diagnostic imaging. It focuses on proper patient positioning, safety, and image evaluation across various anatomical regions.						
Course Outcomes	• **CO1:** Prepare management and positioning of patients • **CO2:** Correlate of indications, contraindications of the patient • **CO3:** Understand the patient preparations needed before any radiological examination. • **CO4:** Generalize knowledge of post procedural care. • **CO5:** Students will be able position the patients for radiological procedures. • **CO6**: Knowledge of image quality in radiological images. • **CO7**: Management of patients in radiology department for various procedures. • **CO8:** Ability to handle emergency situations in radiology department.						

Sr. No		Hours
1.	**Dental Radiography; Upper respiratory system**	20
2.	**Lungs and Mediastinum; Abdominal viscera**	20
3.	**Radiography in the ward; Mammography**	20
4.	**Operation theatre techniques; C-arm**	20
5.	**Neonatal and Paediatric Radiography; Forensic Radiography Microradiography**	10
6.	**Soft Tissue Radiography Multiple radiography High kV Radiography Scatter elimination; beam collimation; grid ratio Speed and type of grid movement Radiographic factor; application and uses**	10

7.	Localization of foreign bodies	8
	Total	108

Semester: III

Course Name: Radiography and Image Processing Techniques		Course Code: 050603003					
Batch: 2024-25 onwards	Programme : BRIT	Semester: III	L	T	P	Credit	Contact Hrs. per Week: 02
			2	-	-	2	Total Hrs.: 36
Total Evaluation Marks: 100		Examination Duration: 3 HRS					
		Pre-requisite of course: Basic knowledge of human anatomy and medical imaging principles. Familiarity with physics and computer fundamentals is recommended.					
Course Objectives		The course aims to provide foundational knowledge of radiographic imaging techniques and the principles behind image acquisition. It also focuses on image processing methods to enhance, analyze, and interpret medical images effectively.					
Course Outcomes		• CO1: Know basic physics of radiography processing system • CO2: Describe construction and working of film, intensifying screen, cassette, dark room and automatic processor • CO3: Explain radiographic film Processing chemistry • CO4: Discuss the factors affecting image quality in radiographic image and their application • CO5: Operate the workflow in x-ray imaging • CO6: Apply knowledge for the use of radiation factors • CO7: Demonstrate process the radiographic film in different systems • CO8: Prepare care and maintenance of radiographic films, cassettes, intensifying screens, darkroom accessories and X-ray equipment					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Photographic Principles:** Radiographic film- construction and types; Photographic effect and latent image formation; Film density and log relative exposure; Characteristic curve – its formation and features; Spectral response; Film faults and Artifacts **Intensifying Screens:** Luminescence-fluorescence and phosphorescence; Construction and types of Intensifying Screens; Intensification Factor, quantum detection and conversion efficiency; Film screen matching; Resolving power of Intensifying Screens; Speed of intensifying screen; Screen film contact tests; Advantages and limitations of Intensifying Screens **X-ray Cassette:** Construction of X-ray cassettes; Types of cassettes; Mounting Intensifying Screens on cassettes; Care and maintenance of cassettes	**09**
II	**Dark Room – Planning & Construction:** Planning for a small & large Hospital; Location of Dark Room; Construction of Dark Room; Ventilation; Wall Protection; Entrance to Dark Room - Single Door, Double Door, Labyrinth Dark Room Accessories: Dry bench; Hopper, Drawer, Cupboard; Loading and unloading cassettes; Hangers, types of hangers and storage of hangers; Wet bench; Cleanliness, control of dust, dark room sinks; Hatches; Drier; Safe Lights-types and uses, factors affecting safelight performance, safelight	**07**

	Tests; Viewing room, Film dispensing	
III	**Film Processing: Photochemistry;** Developer; Rinsing; Fixer; Washing and drying; Preparation of processing solutions; Manual processing apparatus; Effect of temperature in processing; Rapid processing **Automatic processor:** Principle of working and features, thermal regulation and replenishment system; Care and maintenance of automatic processor; Advantages and limitations of automatic processor	**07**
IV	Day Light Film handling; Xeroradiography, Stereoscopy	**05**
V	**The Radiographic Image:** The emergent beam related to densities on film contrast – objective and subjective Radiation contrast, film contrast and Radiographic contrast- Density, Sharpness, Unsharpness **Resolution:** Factors affecting resolution, choice of Kilovolt age and Mill amperage, Choice of Short Focus and Broad Focus, selection of Focus to Film Distance and Object to Film Distance selection of cassettes, Avoiding scatter radiation, magnification, distortion, penumbra **Reproduction of Radiographs:** Copying Radiographs, Magnification and Minification Radiography Imaging Communication: Hospital Information System, Radiology Information System, PACS, DICOM	**08**
	Total	**36**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Radiographic Imaging (Cbs)I.C.R.P.	D.N. Chesney & M.O Chesney	Blackwell Scientific
2	An Introduction Of Physics to Diagnostic Radiography	Christensen, Curry & Dowdey	Lea & Febiger
3	Radiological Science for technologists	Stewart C. Bushong	Mosby
4	A Concise Guide on Basic Radiographic Physics Darkroom Procedures, Radiographic Positioning & Techniques	Lalit Agarwal	JBD Publications

Semester: III

Course Name: Radiography and Image Processing Techniques- Practical		Course Code: 050603006					
Batch: 2024-25 onwards	Programme : BRIT	Semester: III	L	T	P	Credit	Contact Hrs. per Week: 02
			-	-	2	1	Total Hrs.: 36
Total Evaluation Marks: 100		Examination Duration: 3 HRS					
		Pre-requisite of course: Basic knowledge of human anatomy and medical imaging principles. Familiarity with physics and computer fundamentals is recommended.					
Course Objectives		The course aims to provide foundational knowledge of radiographic imaging techniques and the principles behind image acquisition. It also focuses on image processing methods to enhance, analyze, and interpret medical images effectively.					
Course Outcomes		• CO1: Know basic physics of radiography processing system • CO2: Describe construction and working of film, intensifying screen, cassette, dark room and automatic processor • CO3: Explain radiographic film Processing chemistry • CO4: Discuss the factors affecting image quality in radiographic image and their application • CO5: Operate the workflow in x-ray imaging • CO6: Apply knowledge for the use of radiation factors • CO7: Demonstrate process the radiographic film in different systems • CO8: Prepare care and maintenance of radiographic films, cassettes, intensifying screens, darkroom accessories and X-ray equipment					

Sr. No		Hours
1.	**Radiographic film; IntensifyingScreens; X-ray Cassette**	20
2.	**Dark Room – Planning & Construction**	6
3.	**Film Processing; Photochemistry;**	5
4.	**The emergent beam related to densities on film contrast – objective and subjective Radiation contrast, film contrast and Radiographic contrast- Density, Sharpness, Unsharpness; Factors affecting resolution; Reproduction of Radiographs**	5
	Total	36

Semester: III

Course Name: Contrast and Special Radiological Procedures		**Course Code: 050603004**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: III**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 03**
			3	0	0	3	**Total Hrs.: 54**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and physiology is required. Understanding of fundamental radiographic techniques is essential.					
Course Objectives		The course aims to provide in-depth knowledge of contrast media and their applications in diagnostic imaging. It also focuses on training students in special radiological procedures for accurate disease detection and patient care.					
Course Outcomes		• **CO1:** Prepare management and positioning of patients while performing radiological procedures. • **CO2:** Correlate of indications, contraindications, contrast media, radiation dose, exposure timing and radiation safety measures for different radiological procedures. • **CO3:** Understand the patient preparations needed before any radiological examination. • **CO4:** Generalize knowledge of post procedural care. • **CO5:** Students will be able position the patients for radiological procedures. • **CO6**: Knowledge of image quality in radiological images. • **CO7**: Management of patients in radiology department for various procedures. • **CO8:** Ability to handle emergency situations in radiology department. • **CO9:** Precautions and care required in interventional suits.					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Introduction: General approach to Special Radiographic procedures**, Responsibility of Radiology Technologist during radiological procedures, Preparation of patient for different procedures, Room layout in interventional radiology and fluoroscopy. Contrast Media: Positive and Negative, Ionic & Non Ionic, Adverse Reactions to contrast media and patient management. Emergency Equipment in the Radiology Department	15
II	**Gastro Intestinal Tract: Barium Swallow; Barium Meal -** Single and Double Contrast; Barium Meal Follow Through; Small Bowel Enema (Enteroclysis); Barium Enema - Gastrograffin Enema; Loopogram Biliary Tract: Oral & Intravenous Cholecystography; Percutaneous Transhepatic Cholengiography; Percutaneous Transhepatic Biliary Drainage; Endoscopic Retrograde Cholengiopancreatography	**15**
III	**Urinary System: IVU (Intravenous Urography),** Retrograde Pyeloureterography (RGU), Micturating Cysto Urethrography, Ascending Urethrography Reproductive System: HysteroSalpingogram, FTR (Fallopian Tube Recanalization)	**09**
IV	**Central Nervous System: Cervical Myelography -** Cisternal Puncture and Lateral Cervical Puncture, Lumbar Myelography, Myelography with water soluble and oily contrast media Respiratory System: Bronchography, Percutaneous Lung Biopsy Other procedures in radiology: Arthrography, Sialography, Lymphography, Sinography & Fistulography, Dacryocystography, Embolization & embolic agents	**15**

	Total	54

SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Radiographic Imaging (Cbs)I.C.R.P.	Bhushan and Lakkhar	Arya Publications
2	A guide to radiological procedures	Chapman	Elsevier

Semester: III

Course Name: Contrast and Special Radiological Procedures-Practical		**Course Code: 050603007**					
Batch: 2024-25 onwards	**Programme : BRIT**	**Semester: III**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 06**
			0	0	6	3	**Total Hrs.: 108**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and physiology is required. Understanding of fundamental radiographic techniques is essential.					
Course Objectives	The course aims to provide in-depth knowledge of contrast media and their applications in diagnostic imaging. It also focuses on training students in special radiological procedures for accurate disease detection and patient care.						
Course Outcomes	• **CO1:** Prepare management and positioning of patients while performing radiological procedures. • **CO2:** Correlate of indications, contraindications, contrast media, radiation dose, exposure timing and radiation safety measures for different radiological procedures. • **CO3:** Understand the patient preparations needed before any radiological examination. • **CO4:** Generalize knowledge of post procedural care. • **CO5:** Students will be able position the patients for radiological procedures. • **CO6**: Knowledge of image quality in radiological images. • **CO7**: Management of patients in radiology department for various procedures. • **CO8:** Ability to handle emergency situations in radiology department. • **CO9:** Precautions and care required in interventional suits.						

Sr. No	CONTENT	Hours
1.	**General approach to special radiographic procedures,** responsibility of radiology technologist during radiological procedures Contrast media and their adverse reactions to contrast media and patient management	25
2.	**Procedures for gastrointestinal tract including barium studies** **Procedures for biliary tract**	29
3.	**Procedures for urinary system and reproductive system**	29
4.	**Procedures for central nervous system and respiratory system**	25
	Total	108

BRIT
SEMESTER IV

4th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Cross Sectional Anatomy	050604001	70	30			100	2
2	Modern Radiological Imaging Equipment and Physics	050604002	70	30			100	3
3	Interventional Radiology Techniques	050604003	70	30			100	3
4	Patient Care in radiology	050604004	70	30			100	2
5	Cross Sectional Anatomy-Practical	050604005			70	30	100	3
6	Modern Radiological Imaging Equipment and Physics-Practical	050604006			70	30	100	1
7	Interventional Radiology Techniques- Practical	050604007			70	30	100	2
8	Patient Care in radiology-Practical	050604008			70	30	100	2
9	BRIT Radiology Clinical Education – part IV (studentship)	050604009						4
Total Credit								**22 Credit**

Semester: IV

Course Name: Cross Sectional Anatomy		**Course Code:** 050604001					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester:** IV	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			2	-	-	2	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Understanding of basic human anatomy and physiology is required. Familiarity with medical imaging techniques is beneficial.					
Course Objectives		The objective of the Cross-Sectional Anatomy course is to develop the ability to identify and interpret anatomical structures in transverse, sagittal, and coronal planes. It enhances understanding of human anatomy through CT, MRI, and other imaging modalities for clinical application.					
Course Outcomes		• **CO1:** Identify cross-sectional anatomy in the sagittal, coronal and axial planes on CT and MR images. • **CO2:** Describe anatomical structural relationships. • **CO3:** Recognize normal anatomy and build a personal resource system for future study. • **CO4:** Locate and identify pertinent cerebral, upper thorax, mid-thorax, and abdominal anatomy. • **CO5:** On CT and MR images, identify anatomical structures of the body and of the head. • **CO6:** Distinguish between arterial and venous anatomy of the entire body's vascular system. • **CO7:** Classify the various sections of anatomical regions and their associated parts.					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Introduction to Sectional Anatomy & Terminology-** Sectional planes, Anatomical relationships/terminology Anatomy of the upper thorax-Surface anatomy relationships, Bony structures and muscles, Blood vessels. Divisions of the mid-thorax, heart and great vessels-Lungs, heart and great vessels, Esophagus	12
II	**CT/MRI Images of the Thorax -** Normal and abnormal imaging **Anatomy of the Abdomen-** Major organs and their accessories, Abdominal blood vessels **CT/MR Images of Abdomen –** Normal and pathologic anatomy of the Pelvis- Bony structures and associated muscles, Digestive and urinary systems **Reproductive Organs -** Normal and abnormal imaging	12
III	**CT/MR Images of the Male/Female Pelvis- Normal and pathologic** **Neuro Anatomy-**Scan planes **Brain –**Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves	12

	Spine- Vertebra and disc, Spinal cord and meninges **Neck-**Arterial/venous systems, Muscles, Glands and pharynx	
	Total	**36**

SUGGESTED LEARNING RESOURCES

S. No.	**Title of Book**	**Author**	**Publication**
1	Cross Sectional Anatomy CT & MR	G Bhavin Jhankaria	Jaypee Brothers Medical Publishers;
2	Step by step Cross-sectional Anatomy	D Karthikeyan	Jaypee brother medical publishers
3	Atlas of Cross Sectional Anatomy and Radiological Imaging	Dr David J. Jackowe	Anshan Ltd
4	Fundamentals of Sectional Anatomy: An Imaging Approach	Denise L. Lazo	Cengage Learning

Semester: IV

Course Name: Cross Sectional Anatomy-Practical		**Course Code:050604005**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: IV**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 06**
			0	-	6	3	**Total Hrs.: 108**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Understanding of basic human anatomy and physiology is required. Familiarity with medical imaging techniques is beneficial.					
Course Objectives	The objective of the Cross-Sectional Anatomy course is to develop the ability to identify and interpret anatomical structures in transverse, sagittal, and coronal planes. It enhances understanding of human anatomy through CT, MRI, and other imaging modalities for clinical application.						
Course Outcomes	• **CO1:** Identify cross-sectional anatomy in the sagittal, coronal and axial planes on CT and MR images. • **CO2:** Describe anatomical structural relationships. • **CO3:** Recognize normal anatomy and build a personal resource system for future study. • **CO4:** Locate and identify pertinent cerebral, upper thorax, mid-thorax, and abdominal anatomy. • **CO5:** On CT and MR images, identify anatomical structures of the body and of the head. • **CO6:** Distinguish between arterial and venous anatomy of the entire body's vascular system. • **CO7:** Classify the various sections of anatomical regions and their associated parts.						

Sr. No	CONTENT	**Hours**
1.	**Introduction to Sectional Anatomy & Terminology-** Sectional planes, Anatomical relationships/terminology Anatomy of the upper thorax-Surface anatomy relationships, Bony structures and muscles, Blood vessels. Divisions of the mid-thorax, heart and great vessels-Lungs, heart and great vessels, Esophagus	36
2.	**CT/MRI Images of the Thorax -** Normal and abnormal imaging **Anatomy of the Abdomen-** Major organs and their accessories, Abdominal blood vessels **CT/MR Images of Abdomen –**	36

	Normal and pathologic anatomy of the Pelvis- Bony structures and associated muscles, Digestive and urinary systems **Reproductive Organs -** Normal and abnormal imaging	
3.	**CT/MR Images of the Male/Female Pelvis- Normal and pathologic** **Neuro Anatomy-**Scan planes **Brain –**Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves **Spine-** Vertebra and disc, Spinal cord and meninges **Neck-**Arterial/venous systems, Muscles, Glands and pharynx	36
	Total	108

Semester: IV

Course Name: Modern Radiological Imaging Equipment and Physics		**Course Code: 050604002**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: IV**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 03**
			3	0	0	3	**Total Hrs.: 54**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic understanding of human anatomy and physiology, and foundational knowledge of physics concepts like waves and radiation.					
Course Objectives		To provide foundational knowledge of the physics principles behind modern radiological imaging technologies. To understand the working, applications, and safety aspects of equipment like X-ray, CT, MRI, and ultrasound.					
Course Outcomes		• **CO001:** Describe the special radiological equipments • **CO002:** Describe the digital and computed radiography • **CO003:** Describe PACS, RIS and HIS					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Modern x-ray tube. Digital Mammography and Tomosynthesis, Stitch radiography, Dual energy x-ray absorptionometry (DEXA) scan.**	10
II	**Computed radiography: its principle, physics & equipment. Digital Radiography: its principle, physics & equipment. Flat panel digital fluoroscopy and radiography system, Direct and indirect digital radiography and fluoroscopy systems. Digital radiography and Computed radiography its advantages, disadvantages and applications. Digital Portable and mobile x-ray units.**	15
III	**Modern dental equipments. Cone beam dental CT.**	**15**
IV	**Picture archiving and communication system (PACS), RIS and HIS.**	**14**
	Total	**54**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Textbook of Radiology: Physics	Amol Sasane, Hariqbal Singh , Roshan Lodha	Jaypee Brothers Medical Publishers
2	The Physics Of Radiology And Imaging	THAYALAN K	Jaypee Brothers Medical Publishers
3	Christensen's Physics of Diagnostic Radiology	Thomas S. Curry, James E. Dowdey, Robert E. Murry	Lea & Febiger,U.S
4	Textbook Of Radiology For Residents And Technicians	BHARGAVA S. K (Author	CBS; publishers
5	Concise Text Book on Imaging Modalities & Recent Advances In Diagnostic Radiology	Lalit Agarwal, Dr. K.B. Gehlot	JBD Publications

Semester: IV

Course Name: Modern Radiological Imaging Equipment and Physics-Practical		**Course Code: 050604006**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: IV**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			-	-	2	1	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic understanding of human anatomy and physiology, and foundational knowledge of physics concepts like waves and radiation.					
Course Objectives	To provide foundational knowledge of the physics principles behind modern radiological imaging technologies. To understand the working, applications, and safety aspects of equipment like X-ray, CT, MRI, and ultrasound.						
Course Outcomes	• **CO001:** Describe the special radiological equipments • **CO002:** Describe the digital and computed radiography • **CO003:** Describe PACS, RIS and HIS						

Sr. No	CONTENT	Hours
1.	Modern x-ray tube. Digital Mammography and Tomosynthesis, Stich radiography, Dual energy x-ray absorptionometry (DEXA) scan.	**9**
2.	Computed radiography: its principle, physics & equipment. Digital Radiography: its principle, physics & equipment. Flat panel digital fluoroscopy and radiography system, Direct and indirect digital radiography and fluoroscopy systems. Digital radiography and Computed radiography its advantages, disadvantages and applications. Digital Portable and mobile x-ray units.	**9**
3.	Modern dental equipments. Cone beam dental CT.	**9**
4.	Picture archiving and communication system (PACS), RIS and HIS.	**9**
	Total	**36**

Semester: IV

Course Name: Interventional Radiology Techniques		**Course Code: 050604003**					
Batch: 2024-25 onwards	**Programme : BRIT**	**Semester: IV**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 03**
			3	-	-	3	**Total Hrs.: 54**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Interventional Radiology Techniques course requires a basic understanding of human anatomy and medical imaging. Prior knowledge in radiology or clinical medicine is highly recommended.					
Course Objectives	To provide foundational knowledge and hands-on skills in minimally invasive image-guided diagnostic and therapeutic procedures. To prepare learners for clinical application of interventional radiology techniques across various medical specialties.						
Course Outcomes	• **CO1**: Know the basic principle and physics of interventional equipment. • **CO2**: Know the management and positioning of patients while performing interventional radiological procedure. • **CO3:** Have knowledge about the indications, contraindications, contrast media, radiation dose, exposure timing and radiation safety measures for the different interventional radiological procedure. • **CO4**: Understand the patient preparation needed before any interventional radiological procedures. • **CO5**: Have knowledge about the post procedural care and safety.						

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	Introduction to interventional procedures **DSA:** basic principles and types **Equipment:** Basics of angiographic equipment, single and biplane angiographic equipments, angiographic table, image intensifier, flat panel detectors, recording systems, pulse oximetry, cardiac resuscitation measure-ECG, pressure injector, catheters, needle and other tools, 3D rotational angiography, image processing, patient monitor, CO2 angiography	10
II	Interventional procedures: Catheter- classification, types and applications, Guide wire- classification, types and applications, Pressure Injector and Accessories, Percutaneous catheterization, Digital Subtraction Angiography, Catheterization Sites, Asepsis	10
III	Arteriography: Head and Neck Arteriography, Pulmonary Arteriography, Coronary Arteriography, Ascending Aortography, Trans Lumbar Aortography, Renal Arteriography, Trans Femoral Arteriography Venography: Peripheral Venography- Lower Limb, Upper Limb, Central Venography, Superior Venacavography, Inferior Venacavography, Pelvic Venography	10
IV	**Safety considerations in angiography room**; room design, protective devices, radiation monitoring	**10**

V	**Care and maintenance tests:** General care, functional test **Quality assurance program:** Acceptable limits of variation, corrective action	**14**
	Total	**54**

SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	The practice of interventional radiology	Karim valji	
2	Interventional radiology: a survival guide	EBIR Kessel, David, Robertson, Iain	Elsevier Health Sciences
3	Handbook of Interventional Radiologic Procedures	Krishna kandarpa, lindsay machan, janettedurham	Lippincott Williams and Wilkins
4	Interventional Radiology: A Survival Guide	David Kessel , Iain Robertson	sevier Health Sciences
5	A Guide on Special Radiographic Investigations & Techniques	Lalit Agarwal	JBD Publications

Semester: IV

Course Name: Interventional Radiology Techniques- Practical		**Course Code: 050604007**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester:** IV	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 04**
			-	-	4	2	**Total Hrs.: 72**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Interventional Radiology Techniques course requires a basic understanding of human anatomy and medical imaging. Prior knowledge in radiology or clinical medicine is highly recommended.					
Course Objectives	To provide foundational knowledge and hands-on skills in minimally invasive image-guided diagnostic and therapeutic procedures. To prepare learners for clinical application of interventional radiology techniques across various medical specialties.						
Course Outcomes	• **CO1**: Know the basic principle and physics of interventional equipment. • **CO2**: Know the management and positioning of patients while performing interventional radiological procedure. • **CO3:** Have knowledge about the indications, contraindications, contrast media, radiation dose, exposure timing and radiation safety measures for the different interventional radiological procedure. • **CO4**: Understand the patient preparation needed before any interventional radiological procedures. • **CO5**: Have knowledge about the post procedural care and safety.						

Sr. No	Practicles	**Hours**
1.	**Basics of angiographic equipments**	18
2.	**Catheter and guide wires**	18
3.	**Arteriography and venography procedures**	18
4.	**Safety considerations in angiography room**	18
	Total	72

Semester: IV

Course Name: Patient Care in radiology		**Course Code: 050604004**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester:** IV	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			2	-	-	2	**Total Hrs.: 36**
Total Evaluation Marks: 50		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and medical terminology is required. Familiarity with hospital workflow and patient interaction is recommended.					
Course Objectives		To equip students with essential knowledge and skills for ensuring safe, compassionate, and effective patient care in radiology settings. To promote understanding of patient communication, preparation, positioning, and radiation safety protocols.					
Course Outcomes		• **CO1**: Understand the responsibility of the imaging technologist and other health care facility. • **CO2**: Understand the management and care of patient during different procedures and emergency situations. • **CO3**:Know about different patient transfer techniques and to restrain the uncooperative patients during radiological examination • **CO4**: Differentiate the types of consent forms • **CO5**: Know about infection control, infection source and isolation techniques • **CO6**: Describe sterilization techniques • **CO7**: Understand the radiation safety and protection					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Introduction to Patient Care:** Responsibilities of Medical Imaging Technologist, Obtaining Consents and history for different radiological examinations, Patient transfer and Restraining techniques, Obtaining vital signs, Ergonomics and body mechanism **Communication:** Patient education, Communication with the patient, Professional role and behavior	05
II	**Hospital procedure:** Hospital staffing and organization; records relating to patients and departmental statistics; professional attitude of the technologist to patients and other members of the staff; medico-legal aspects; accidents in the departments, appointments, organization; minimizing waiting time; out-patient and follow-up clinics; stock-taking and stock keeping.	05
III	**Care of the patient :** FIRST contact with patients in the department; management of chair and stretcher patients and aids for this, management of the unconscious patient; elementary hygiene; personal cleanliness; hygiene in relation to patients.	05
	Nursing procedures in Radiology: Injection- methods and their routes of administration, Clothing of patient, Administering rectal enema. **First aid:** Aims and objectives of first aid; wounds and bleeding, dressing and bandages; pressure and splints, supports etc. Shock; insensibility; asphyxia; convulsions; resuscitation, use of suction	05

IV	apparatus, drug reactions; prophylactic measures; administration of oxygen; electric shock; burns; scalds; hemorrhage; pressure points; compression band. Fractures; splints, bandaging; dressing, foreign bodies; poisons.	
V	**Infection:** Bacteria, their nature and appearance; spread of infections; auto-infection or cross-infection; the inflammatory process; local tissue reaction, general body reaction; ulceration; asepsis and antisepsis. Universal precautions, hospital acquired infections- HIV, Hepatitis B, C, and MRSA etc. **Principles of asepsis:** Sterilization - methods of sterilization; use of central sterile supply department; care of identification of instruments, surgical dressings in common use, including filamented swabs, elementary operating theatre procedure; setting of trays and trolleys in the radio imaging department (for study by radio imaging students only)	**06**
VI	**Patient care in following investigations:** GIT, Respiratory system, Cardiovascular system, CNS; Sterilization; Infection control **Departmental procedures:** Department staffing and organizations; records relating to patients and departmental statistics; professional attitudes of the technologist to patients and other members of the staff, medico-legal aspects accidents in the department; appointments; organisations; minimizing waiting time; out-patient and follow-up clinics; stock taking and stock keeping.	**05**
VII	**Drugs in the department and Storage:** classification; labelling and checking, regulations regarding dangerous and other drugs; units of measurement, special drugs, anti-depressive, anti- hypertensive etc. crash cart. **Medical ethics and records:** Medico legal implication of MLC cases, Importance of consent, Consent in detail, Precaution while dealing with female patient, Medical records	**05**
	Total	**36**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Patient care in radiography	Ruth Ann Ehrlich, Dawn M Coakes	Mosby
2	Concise Textbook on Hospital Management & Patient Care in Diagnostic Radiology	N.K.Kardam,, Lalit Agarwal	JBD Publications
3	Patient care in radiography: with an introduction to medical imaging	Ruth Ann Ehrlich and Joan A. daly	St. Louis, Mo. : Mosby Elsevier
4	Introduction To Radiologic And Imaging Sciences And Patient Care	Adler A M	Elsevier
5	Concise Text Book on Hospital Management & Patient Care In Diagnostic Radiology	Lalit Agarwal , Dr. N.K. Kardam	JBD Publications

Semester: IV

Course Name: Patient Care in radiology-Practical		**Course Code:** 050604008					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: IV**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 04**
			-	-	4	2	**Total Hrs.: 72**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and medical terminology is required. Familiarity with hospital workflow and patient interaction is recommended.					
Course Objectives		To equip students with essential knowledge and skills for ensuring safe, compassionate, and effective patient care in radiology settings. To promote understanding of patient communication, preparation, positioning, and radiation safety protocols.					
Course Outcomes		• **CO1**: Understand the responsibility of the imaging technologist and other health care facility. • **CO2**: Understand the management and care of patient during different procedures and emergency situations. • **CO3**:Know about different patient transfer techniques and to restrain the uncooperative patients during radiological examination • **CO4**: Differentiate the types of consent forms • **CO5**: Know about infection control, infection source and isolation techniques • **CO6**: Describe sterilization techniques • **CO7**: Understand the radiation safety and protection					

Sr. No	CONTENT	**Hours**
1.	**Introduction to Patient Car and Communication**	10
2.	**Hospital staffing and organization; records relating to patients and departmental statistics; professional attitude of the technologist to patients and other members of the staff; medico- legal aspects; accidents in the departments, appointments, organization; minimizing waiting time; out- patient and follow-up clinics; stock-taking and stock keeping.**	11
3.	**Care of the patient**	10
4.	**Nursing procedures in Radiology and first aid**	11
5.	**Infection and Principles of asepsis**	10
6.	**Patient care in following investigations: GIT, Respiratory system, Cardiovascular system, CNS; Sterilization; Infection control.**	10
7.	**Drugs in the department and Storage and medical ethics and records**	10

	Total	72

BRIT
SEMESTER V

5th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Basics Techniques in CT Technology	050605001	70	30			100	5
2	Radiation Safety in Diagnostic Radiology	050605002	70	30			100	3
3	Quality Assurance in Diagnostic Radiology and Regulatory Requirements	050605003	70	30			100	2
5	Basics Techniques in CT Technology- Practical	050605004			70	30	100	4
6	Radiation Safety in Diagnostic Radiology- Practical	050605005			70	30	100	2
7	Quality Assurance in Diagnostic Radiology and Regulatory Requirements - Practical	050605006			70	30	100	1
8	BRIT Radiology Clinical Education – part V (studentship)	050605007						4
Total Credit								**21 Credit**

Semester: V

Course Name: Basics Techniques in CT Technology		**Course Code:** 050605001					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester:** V	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 05**
			5		-	5	**Total Hrs.: 90**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and medical imaging terminology.					
Course Objectives		The course aims to provide foundational knowledge of Computed Tomography (CT) imaging principles and operation. It also focuses on developing skills in image acquisition, reconstruction, and patient safety practices.					
Course Outcomes		• **CO1:** Define basic principle and physics of Computed Tomography scan • **CO2:** Recognize protocols needed for Computed Tomography examination • **CO3:** Prepare and positioning for Computed Tomography examination • **CO4:** Interpret post processing of raw Computed Tomography images • **CO5:** Prepare and position the patients for Computed Tomography examination • **CO6:** Categorize knowledge of improving image quality in Computed Tomography images • **CO7:** Plan of scanning with various Computed Tomography protocols for better representation of images • **CO8:** Systematize post processing for Computed Tomography scan • **CO9:** Management of patient for any post contrast reactions					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Introduction and history,** CT principle, CT generations, CT Instrumentation, CT detectors, Axial & Helical CT – Slip ring technology	20
II	**Data acquisition, Image pre-processing/reconstruction techniques,** Algorithms for image reconstruction, Image display, Image post-processing techniques, CT artifacts, Image quality	17
III	**CT Protocols for different body parts & Dental scan,** CT Protocols for Angiography & Perfusion, CT contrast media and administration, CT guided interventional procedures	**17**
IV	**Multi-detector CT** Isotropic imaging, Cardiac CT, Flash CT, Advanced CT scanners, Dual energy & Dual Source Scanners, CT- fluoroscopy	**16**
V	**Safety consideration,** Documentation in CT, Role of Medical Imaging technologist in CT scan procedures, Quality assurance in CT	**20**
	Total	**90**

SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication

1	Computed Tomography: Physical Principles, Clinical Applications, and Quality Control	Euclid Seeram RT(R) BSc MSc FCAMRT (Author)	Saunders
2	Computed Tomography for Technologists: A Comprehensive Text	Lois Romans	Lippincott Williams and Wilkins;
3	Computed Tomography: Physics and Technology. A Self Assessment Guide	Euclid Seeram	Wiley-Blackwell
4	The CT Handbook: Optimizing Protocols for Today's Feature-Rich Scanners	Timothy P. Szczykutowicz	Medical Physics Publishing Corporation
5	CT PROTOCOLS	Manjot Kaur, Maajid Mohi Ud Din Malik	JBD Publications

Semester: V

Course Name: Basics Techniques in CT Technology- Practical		**Course Code:** 050605004					
Batch: 2024-25 onwards	**Programme : BRIT**	**Semester: V**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 08**
			-	-	8	4	**Total Hrs.: 144**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and medical imaging terminology.					
Course Objectives	The course aims to provide foundational knowledge of Computed Tomography (CT) imaging principles and operation. It also focuses on developing skills in image acquisition, reconstruction, and patient safety practices.						
Course Outcomes	• **CO1:** Define basic principle and physics of Computed Tomography scan • **CO2:** Recognize protocols needed for Computed Tomography examination • **CO3:** Prepare and positioning for Computed Tomography examination • **CO4:** Interpret post processing of raw Computed Tomography images • **CO5:** Prepare and position the patients for Computed Tomography examination • **CO6:** Categorize knowledge of improving image quality in Computed Tomography images • **CO7:** Plan of scanning with various Computed Tomography protocols for better representation of images • **CO8:** Systematize post processing for Computed Tomography scan • **CO9:** Management of patient for any post contrast reactions						

Sr. No		**Hours**
1.	**Introduction and history,** CT principle, CT generations, CT Instrumentation, CT detectors, Axial & Helical CT – Slip ring technology	30
2.	**Image post-processing techniques**, CT artifacts	20
3.	CT Protocols for different body parts & Dental scan, CT Protocols for Angiography & Perfusion, CT contrast media and administration, CT guided interventional procedures	54
4.	**Multi-detector CT**	20
5.	**Safety consideration,** Documentation in CT, Role of Medical Imaging technologist in CT scan procedures, Quality assurance in CT	20
	Total	**144**

Course Name: Radiation Safety in Diagnostic Radiology		**Course Code: 050605002**					
Batch: 2024-25 onwards	**Programme : BRIT**	**Semester: V**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 03**
			3		-	3	**Total Hrs.: 54**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic understanding of human anatomy and medical imaging techniques. Familiarity with fundamental physics concepts related to radiation.					
Course Objectives	The course aims to provide knowledge on radiation physics, protection principles, and safe practices in diagnostic radiology. It equips healthcare professionals to minimize radiation exposure and ensure patient and staff safety.						
Course Outcomes	• **CO1:** Aim and need of radiation protection • **CO2:** Introduction to Radiation units and quantities • **CO3:** Understanding of various Radiation protection regulations and the dose limits • **CO4:** Radiation protection to patients, occupational workers and general public in Diagnostic Radiology • **CO5:** Layout of Radiology department • **CO6:** Use of protective devices and awareness of radiation with radiation signages • **CO7:** Dose reduction measures with technical protective considerations during radiology • **CO8:** Different radiation measuring devices • **CO9:** Effects of radiation on biological tissue						

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Radiation Quantities and Units: Radiation**- Radioactivity- Sources of radiation - natural radioactive sources -cosmic rays terrestrial radiation - - man made radiation sources. Units of radiation - Quality factor - Flux- Fluence-Kerma- Exposure- Absorbed dose- Equivalent Dose- Weighting Factors-Effective Dose - Occupational Exposure Limits - Dose limits to public.	12
II	**Biological Effects of radiation:** Ionization, excitation and free radical formation, hydrolysis of water, action of radiation on cell-Chromosomal aberration and its application for the biological dosimetry- Effects of whole body and acute irradiation, dose fractionation, effects of ionizing radiation on each of major organ system including fetus -Somatic effects and hereditary effects- stochastic and deterministic effects-Acute exposure and chronic exposure-LD50 - factors affecting radio sensitivity. Biological effects of non-ionizing radiation like ultrasound, lasers, IR, UV and magnetic fields.	12
III	**Radiation detection and Measurements:** Ionization of gases- Fluorescence and Phosphorescence - Effects on photographic emulsion. Ionization Chambers – proportional counters- G.M counters- scintillation detectors – liquid semiconductor detectors – Gamma ray spectrometer. Measuring systems – free air ionization chamber – thimble ion chamber – condenser chamber – Secondary standard dosimeters – film dosimeter – chemical dosimeter- Thermoluminescent Dosimeter. -Pocket dosimeter- Radiation survey meter- wide range survey meter -zone monitor-contamination monitor -their principle function and uses. Advantages & disadvantages of various detectors &its appropriateness of different detectors for different type of radiation measurement. Dose and Dosimetry, CT Dose Index (CTDI, etc.), Multiple Scan Average Dose (MSAD), Dose Length Product (DLP), Dose Profile, Effective Dose, Phantom Measurement Methods, Dose for Different Application Protocols, Technique Optimization. Dose area product in fluoroscopy and angiography systems, AGD in mammography	**10**

	Artificial Intelligence in Radiation Safety	
IV	**Radiation protection**: Radiation protection of self and patient- Principles of radiation protection, time - distance and shielding, shielding - calculation and radiation survey –ALARA- personnel dosimeters (TLD and film batches) - occupational exposure.	**10**
V	**Radiation Hazard evaluation and control:** Philosophy of Radiation protection, effects of time, Distance & Shielding. Calculation of Work load, weekly calculated dose to radiation worker & General public Good work practice in Diagnostic Radiology. Planning consideration for radiology, including Use factor, occupancy factors, and different shielding material.	**10**
	Total	**54**

SUGGESTED LEARNING RESOURCES

S. No.	**Title of Book**	**Author**	**Publication**
1	Radiation Protection In Diagnostic X-Ray Imaging	Euclid Seeram, Patrick C. Brennan	Jones and Bartlett Publishers
2	Development of Radiation Protection in Diagnostic Radiology	Stewart C. Bushong	CRC Press Inc.,U.S.
3	Textbook of adiological Safety	Thayalan K	Jaypee Brothers Medical Publishers
4	Radiation Protection in Medical Radiography	Statkiewicz Sherer	Elsevier Health - US;
5	Basics of Radiation, Hazards and Prevention In Diagnostic Radiology	Prashant Kumar Jha	JBD Publications

Semester: V

Course Name: Radiation Safety in Diagnostic Radiology- Practical		**Course Code: 050605005**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: V**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 04**
			-	-	4	2	**Total Hrs.: 72**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic understanding of human anatomy and medical imaging techniques. Familiarity with fundamental physics concepts related to radiation.					
Course Objectives	The course aims to provide knowledge on radiation physics, protection principles, and safe practices in diagnostic radiology. It equips healthcare professionals to minimize radiation exposure and ensure patient and staff safety.						
Course Outcomes	• **CO1:** Aim and need of radiation protection • **CO2:** Introduction to Radiation units and quantities • **CO3:** Understanding of various Radiation protection regulations and the dose limits • **CO4:** Radiation protection to patients, occupational workers and general public in Diagnostic Radiology • **CO5:** Layout of Radiology department • **CO6:** Use of protective devices and awareness of radiation with radiation signages • **CO7:** Dose reduction measures with technical protective considerations during radiology • **CO8:** Different radiation measuring devices • **CO9:** Effects of radiation on biological tissue						

Sr. No	CONTENT	Hours
1.	**Radiation Quantities and Units**	15
2.	**Biological Effects of radiation**	15
3.	**Radiation detection and Measurements Survey meter and personal dosimeter** **Artificial Intelligence in Radiation Safety**	15
4.	**Radiation protection; Principles of radiation protection; ALARA**	15
5.	**Radiation Hazard evaluation and control**	12
		72

Semester: V

Course Name: Quality Assurance in Diagnostic Radiology and Regulatory Requirements		**Course Code:** 050605003					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester:** V	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			2			2	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and medical imaging principles; familiarity with radiology equipment and healthcare safety standards.					
Course Objectives		To ensure the accuracy, safety, and consistency of diagnostic radiology procedures through effective quality assurance practices. To understand and comply with national and international regulatory standards governing diagnostic radiology.					
Course Outcomes		• **CO1:** Aim and need of radiation protection • **CO2:** Introduction to quality assurance • **CO3:** Understanding of regulatory requirements • **CO4:** Follow radiation protection regulations and apply practically					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Objectives of quality Control**: Improve the quality of imaging thereby increasing the diagnostic value; to reduce the radiation exposure; Reduction of film wastage and repeat examination; to maintain the various diagnostic and imaging units at their optimal performance. Quality assurance activities: Equipment selection phase; Equipment installation and acceptance phase; Operational phase; Preventive maintenance. Quality assurance programme at the radiological faculty level: Responsibility; Purchase; Specifications; Acceptance; Routine testing; Evaluation of results of routine testing; Quality assurance practical exercise in the X ray generator and tube; Image receptors from processing; Radiographic equipment; Fluoroscopic equipment; Mammographic equipment; Conventional tomography; Computed tomography; Film processing, manual and automatic; Consideration for storage of film and chemicals; Faults tracing; Accuracy of imaging- image distortion for digital imaging devices. LASER printer calibration	**08**
II	**QA in Diagnostic Radiology** filtration Contact between film and intensifying screen Contrast Verification of Optical and Radiation field congruence Beam alignment Focal spot size Linearity of tube current mA and Timer Applied potential HVT and total tube Resolution Grid alignment QA in mammography QA in CT	**08**

	QA in Digital Radiography	
III	**Regulatory requirements in Diagnostic Radiology** National Regulatory Body Responsibilities and organization Safety Standards Codes and Guides Care and maintenance of diagnostic equipment: General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special care of mobile equipment	**08**
IV	**Responsibilities of licensees, registrants and employers Enforcement of Regulatory requirements** Role of technologist in radiology department Maintenance and care of equipment: Safe operation of equipment; Routine cleaning of equipment and instruments; Cassette, screen maintenance; Maintenance of automatic processor and manual processing units; Routine maintenance of equipments; Record keeping and log book maintenance; Reject analysis and objectives of reject analysis programme.	**06**
V	**Care and maintenance of diagnostic equipment**: General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special care of mobile equipment.	**06**
	Total	**36**

SUGGESTED LEARNING RESOURCES

S. No.	**Title of Book**	**Author**	**Publication**
1	Quality Assurance and Control in Diagnostic Radiology and Imaging	Bhargava	CBS Publishers and Distributors
2	Quality Assurance	Dr. R. Sundhararajan, M.V.Kumudhavalli, Minal T. Harde	Thakur Publications Pvt Ltd
3	Quality Assurance in Diagnostic Radiology	J. McLemore (Author	Imprint unknown
4	An Introduction to Quality Assurance in Radiology	Zafar Neyaz	JBD Publications

Semester: V

Course Name: Quality Assurance in Diagnostic Radiology and Regulatory Requirements- Practical		**Course Code:** 050605006					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester:** V	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
					2	1	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and medical imaging principles; familiarity with radiology equipment and healthcare safety standards.					
Course Objectives	To ensure the accuracy, safety, and consistency of diagnostic radiology procedures through effective quality assurance practices. To understand and comply with national and international regulatory standards governing diagnostic radiology.						
Course Outcomes	• **CO1:** Aim and need of radiation protection • **CO2:** Introduction to quality assurance • **CO3:** Understanding of regulatory requirements • **CO4:** Follow radiation protection regulations and apply practically						

Sr. No	CONTENT	Hours
1.	**Quality assurance programme** at the radiological faculty level: Responsibility; Purchase; Specifications; Acceptance; Routine testing; Evaluation of results of routine testing; Quality assurance practical exercise in the X ray generator and tube; Image receptors from processing; Radiographic equipment; Fluoroscopic equipment; Mammographic equipment; Conventional tomography; Computed tomography; Film processing, manual and automatic; Consideration for storage of film and chemicals; Faults tracing; Accuracy of imaging- image distortion for digital imaging devices. LASER printer calibration	7

2.	**QA in Diagnostic Radiology** filtration Contact between film and intensifying screen Contrast Verification of Optical and Radiation field congruence Beam alignment Focal spot size Linearity of tube current mA and Timer Applied potential HVT and total tube Resolution Grid alignment QA in mammography QA in CT QA in Digital Radiography	8
3.	**Regulatory requirements in Diagnostic Radiology**	7
4.	**Responsibilities of licensees, registrants and employers** Enforcement of Regulatory requirements	7
5.	**Care and maintenance of diagnostic equipment:** General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special care of mobile equipment.	7
	Total	**36**

SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Quality Assurance and Control in Diagnostic Radiology and Imaging	Bhargava	CBS Publishers and Distributors
2	Quality Assurance	Dr. R. Sundhararajan, M.V.Kumudhavalli, Minal T. Harde	Thakur Publications Pvt Ltd
3	Quality Assurance in Diagnostic Radiology	J. McLemore (Author	Imprint unknown
4	An Introduction to Quality Assurance in Radiology	Zafar Neyaz	JBD Publications

BRIT
SEMESTER VI

6th semester

S. No	Nomenclature of paper/ Course	Paper/ Course Code	Scheme					No of Credits
			External	Internal	External	Internal	Total	
1	Basics Techniques in MRI Technology	050606001	70	30			100	4
2	Introduction to Nuclear Medicine Techniques	050606002	70	30			100	2
3	Ultrasound Techniques	050606003	70	30			100	3
4	Biostatistics and Research Methodology	050606004	70	30			100	2
5	Basics Techniques in MRI Technology- Practical	050606005			70	30	100	4
6	Introduction to Nuclear Medicine Techniques-practical	050606006			70	30	100	1
7	Ultrasound Techniques-Practical	050606007						NC
8	BRIT Radiology Clinical Education – part VI (studentship)	050606008						5
Total Credit								**21 Credit**

Semester: VI

Course Name: Basics Techniques in MRI Technology		**Course Code:** 050606001					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: VI**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 04**
			4		-	4	**Total Hrs.: 72**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: A foundational understanding of human anatomy and physiology, along with basic knowledge of physics concepts like magnetism and electromagnetic waves.					
Course Objectives		To provide foundational knowledge of MRI principles, including imaging physics and system components. To develop practical skills for basic MRI operation, image acquisition, and patient safety protocols.					
Course Outcomes		• **CO1:** Define basic principle and physics of Magnetic Resonance Imaging. • **CO2:** Recognize protocols needed for Magnetic Resonance Imaging examination. • **CO3:** Prepare and positioning for Magnetic Resonance Imaging examination. • **CO4:** Interpret post processing of Magnetic Resonance Imaging images. • **CO5:** Prepare and position the patients for Magnetic Resonance Imaging examination. • **CO6:** Categorize knowledge of improving image quality in Magnetic Resonance Imaging . • **CO7:** Scanning of patient with various Magnetic Resonance Imaging protocols for better representation of images. • **CO8:** Plan of post processing for Magnetic Resonance Imaging data. • **CO9:** Management of patient for any post contrast reactions.					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Introduction to MRI;** Basic principle; Image weighting and contrast in MRI; Instrumentation of MRI-Magnets- classification, types, advantages, disadvantages, Gradient & Body Coils, RF coils, Shim coils, Ramping, Cryogen, RF shielding	15
II	**Encoding and Image formation-Encoding,** K-Space; Parameters and Trade-offs; MRI Pulse sequences-Spin Echo pulse sequence, Gradient Echo pulse sequence; Fast imaging sequences	15
III	**Flow phenomena;** Flow phenomena compensation; Vascular Imaging- Digital Subtraction MRA, TOF-MRA, PC-MRA, Velocity Encoding, MR-Angiogram, MR-Venogram	14
IV	**Cardiac Imaging;** Whole body MRI Protocols; MRI Artifacts and their compensation; MRI contrast agents-T1 contrast agent, T2 contrast agent	14
V	**MRI safety- Implants and pace-makers,** Electrical safety, Metallic safety, Instrumental safety, Bio-effects of MRI; Documentation; Quality assurance in MRI	14
	Total	72

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Tomography and Magnetic Resonance Imaging of the Whole Body (Vol.1& II) (Saunders).	John R. Haaga, Daniel Boll	Elsevier
2	MRI inPractice	Catherine Westbrook & Caralyn Kaut	Wiley–Blackwell
3	Protocols inMRI	Catherine Westbrook	Wiley-Blackwell
4	An Introduction to the Physics and Function of Magnetic Resonance Imaging	Dominik Weishaupt , Victor D. Koechli , Borut Marincek , J.M. Froehlich	Springer;
5	Concise Textbook of MRI Physics & Protocols	Maajid Mohi Ud Din Malik, Manjot Kaur	JBD Publications

Semester: VI

Course Name: Basics Techniques in MRI Technology- Practical		**Course Code:** 050606005					
Batch: 2024-25 onwards	**Programme :**BRIT	**Semester: VI**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 08**
			-	-	8	4	**Total Hrs.: 144**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: A foundational understanding of human anatomy and physiology, along with basic knowledge of physics concepts like magnetism and electromagnetic waves.					
Course Objectives	To provide foundational knowledge of MRI principles, including imaging physics and system components. To develop practical skills for basic MRI operation, image acquisition, and patient safety protocols.						
Course Outcomes	• **CO1:** Define basic principle and physics of Magnetic Resonance Imaging. • **CO2:** Recognize protocols needed for Magnetic Resonance Imaging examination. • **CO3:** Prepare and positioning for Magnetic Resonance Imaging examination. • **CO4:** Interpret post processing of Magnetic Resonance Imaging images. • **CO5:** Prepare and position the patients for Magnetic Resonance Imaging examination. • **CO6:** Categorize knowledge of improving image quality in Magnetic Resonance Imaging . • **CO7:** Scanning of patient with various Magnetic Resonance Imaging protocols for better representation of images. • **CO8:** Plan of post processing for Magnetic Resonance Imaging data. • **CO9:** Management of patient for any post contrast reactions.						

Sr. No	**CONTENT**	**Hours**
1.	**Instrumentation of MRI-Magnets-** classification, types, advantages, disadvantages, Gradient & Body Coils, RF coils, Shim coils, Ramping, Cryogen, RF shielding	30
2.	**MRI Pulse sequences-Spin Echo pulse** sequence, Gradient Echo pulse sequence; Fast imaging sequences	30
3.	**Flow phenomena;** Flow phenomena compensation	24
4.	**Whole body MRI Protocols;** MRI Artifacts and their compensation	30
5.	**MRI safety and Quality assurance** in MRI	30
Total		**144**

Semester: VI

Course Name: Introduction to Nuclear Medicine Techniques		**Course Code:** 050606002					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: VI**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			2		-	2	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic understanding of human anatomy and fundamental physics.					
Course Objectives		To provide foundational knowledge of nuclear medicine principles, including radiopharmaceuticals and imaging techniques. To develop practical understanding of diagnostic and therapeutic applications in clinical nuclear medicine.					
Course Outcomes		• **CO1:** Define basic principle and physics of nuclear medicine. • **CO2:** Apply precautions while handling radiopharmaceuticals. • **CO3:** Recognizing the artefacts associated with nuclear medicine. • **CO4:** Assess the knowledge of improving image quality in nuclear medicine. • **CO5:** Management of patient for any late reactions associated with radiotracers in nuclear medicine.					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**History; Isotopes and Radionuclides-** Production of Radionuclides, Transport of Radionuclides; Radio Activity- Radio Active transformations, Specific Activity; Radiopharmaceuticals- Preparation, Precautions while handling	12
II	**Gamma Camera instrumentation** - Collimator- classification and types; Single Photon Emission Computed Tomography (SPECT); Positron Emission Tomography (PET); Advanced techniques in NM - SPECT-CT, PET-CT, PET-MRI	12
III	**Safety Considerations & Radiation Dose** in Nuclear Medicine; Room layout in nuclear medicine	**12**
	Total	**36**

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Nuclear Medicine Textbook: Methodology and Clinical Applications	DuccioVolterrani , Paola Anna Erba , IgnasiCarrió , H. William Strauss	Springer;
2	Nuclear Medicine Instrumentation	Jennifer Prekeges (Author)	Jones and Bartlett Publishers
3	Nuclear Medicine Physics: The Basics	Ramesh Chandra & Arman Rahmim	Wolters Kluwer

4	Nuclear Medicine Technology: Procedures and Quick Reference	Pete Shackett BA CNMT ARRT(N) (Author)	LWW;
5	A Concise Guide on Basic Radiation Physics, radiotherapy Physics & Nuclear Medicine	Lalit Agarwal, Dr. Arvind Shukla	JBD Publications

Semester: VI

Course Name: Introduction to Nuclear Medicine Techniques- practical		**Course Code: 050606006**					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: VI**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			-	-	2	1	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic understanding of human anatomy and fundamental physics.					
Course Objectives		To provide foundational knowledge of nuclear medicine principles, including radiopharmaceuticals and imaging techniques. To develop practical understanding of diagnostic and therapeutic applications in clinical nuclear medicine.					
Course Outcomes		• **CO1:** Define basic principle and physics of nuclear medicine. • **CO2:** Apply precautions while handling radiopharmaceuticals. • **CO3:** Recognizing the artefacts associated with nuclear medicine. • **CO4:** Assess the knowledge of improving image quality in nuclear medicine. • **CO5:** Management of patient for any late reactions associated with radiotracers in nuclear medicine.					

Sr.No	CONTENT	**Hours**
1.	**History; Isotopes and Radionuclides-** Production of Radionuclides, Transport of Radionuclides; Radio Activity- Radio Active transformations, Specific Activity; Radiopharmaceuticals- Preparation, Precautions while handling	12
2.	**Gamma Camera instrumentation - Collimator- classification and types;** Single Photon Emission Computed Tomography (SPECT); Positron Emission Tomography (PET); Advanced techniques in NM - SPECT-CT, PET-CT, PET-MRI	12
3.	**Safety Considerations & Radiation Dose** in Nuclear Medicine; Room layout in nuclear medicine	12
Total		**36**

Semester: VI

Course Name: Ultrasound Techniques		**Course Code:** 050606003					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: VI**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 03**
			3	-	-	3	**Total Hrs.: 54**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of human anatomy and physiology; familiarity with medical terminology.					
Course Objectives		To provide foundational knowledge of ultrasound physics and instrumentation for accurate image acquisition. To develop practical skills in various ultrasound techniques for diagnostic and clinical applications.					
Course Outcomes		• **CO001:** Describethe Ultrasound properties, interaction of ultrasound with matter • **CO002:** Describe the transducer and types • **CO003:** Explain the concepts of image display • **CO004:** Describe Doppler imaging and ultrasound contrast agents • **CO005:** Describe the image characteristics and artefacts • **CO006:** explain the safety considerations in ultrasound and protocols					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Ultrasound:** Properties of ultrasound, interaction of ultrasound with matter	09
II	**Transducers:** Types of transducers, advances in the design of modern ultrasound transducers	09
III	**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	09
IV	**Doppler Imaging:** Doppler principles, continuous wave Doppler and pulsed Doppler, duplex scanning, colour flow imaging, power doppler, harmonic imaging, extended field of view Ultrasound contrast agents	09
V	**Image characteristics and artefacts:** vascular, interventional, intraoperative and ophthalmic ultrasonography, 3D and 4D ultrasound imaging Artificial Intelligence in Ultrasound	09
VI	**Bio-effects and safety considerations in ultrasound**, ultrasound system performance measurements, ultrasound equipments quality assurance – conventional Doppler system testing and documentation	09

	Total	54

SUGGESTED LEARNING RESOURCES

S.No.	Title of Book	Author	Publication
1	Ultrasound physics and technology	Vivien gibbs, davidcole, Antonio sassano	Churchill Livingstone;
2	Manual of Diagnostic Ultrasound	Philip E. S. Palmer (Author)	World Health Organization
3	Physics and Technical Aspects Diagnostic Ultrasound	DINESH K BAGHEL (Author	AITBS PUBLISHERS
4	Diagnostic Ultrasound	Carol M. Rumack (Author), Deborah Levine (Author)	Elsevier;
5	Ultrasound Imaging (1000 Multiple Choice Questions)	Yadav	JBD Publications

Semester: VI

Course Name: Ultrasound Techniques-Practical		**Course Code:** 050606007					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: VI**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			-	-	NC	-	**Total Hrs.: 36**
Total Evaluation Marks: NC		**Examination Duration: -**					
		Pre-requisite of course: Basic knowledge of human anatomy and physiology; familiarity with medical terminology.					
Course Objectives		To provide foundational knowledge of ultrasound physics and instrumentation for accurate image acquisition. To develop practical skills in various ultrasound techniques for diagnostic and clinical applications.					
Course Outcomes		• **CO001:** Describethe Ultrasound properties, interaction of ultrasound with matter • **CO002:** Describe the transducer and types • **CO003:** Explain the concepts of image display • **CO004:** Describe Doppler imaging and ultrasound contrast agents • **CO005:** Describe the image characteristics and artefacts • **CO006:** explain the safety considerations in ultrasound and protocols					

Sr. No	**Content**	**Hours**
1.	**Ultrasound** interaction of ultrasound with matter	6
2.	Types of transducers, advances in the design of modern ultrasound transducers	6
3.	**Image display:** Display modes, ultrasound instrumentation, controls	6
4.	**Doppler Imaging:** Doppler principles, continuous wave Doppler and pulsed Doppler, duplex scanning, colour flow imaging, power doppler, harmonic imaging, extended field of view Ultrasound contrast agents	6
5.	**Image characteristics and artefacts**	6
6.	**Bio-effects and safety considerations in ultrasound,** ultrasound system performance measurements, ultrasound equipments quality assurance	6
	Total	**36**

Semester: VI

Course Name: Biostatistics and Research Methodology		**Course Code:** 050606004					
Batch: 2024-25 onwards	**Programme :** BRIT	**Semester: VI**	**L**	**T**	**P**	**Credit**	**Contact Hrs. per Week: 02**
			2	-	-	2	**Total Hrs.: 36**
Total Evaluation Marks: 100		**Examination Duration: 3 HRS**					
		Pre-requisite of course: Basic knowledge of biology and fundamental mathematics is required to understand concepts in biostatistics and research methodology.					
Course Objectives		The course aims to provide foundational knowledge of biostatistical concepts and tools for analyzing health data. It also develops skills in research design, data interpretation, and evidence-based decision-making in healthcare.					
Course Outcomes		• **CO1:** Understand the Importance of statistics course in the curriculum • **CO2:** Understands Statistical Terms • **CO3:** Possess Knowledge and Skill in the use of Basic Statistics in the analysis and interpretation of data					

COURSE SYLLABUS

Unit	Topic and contents	Hours
I	**Introduction: Meaning**, Definition, Characteristics of Statistics; Importance of the Study of Statistics. Branches of Statistics; Descriptive and Inferential Statistics; Variables and Their Types. Measurement Scales.	06
II	**Tabulation of Data:** Raw Data, the Array, Frequency Distribution. Basic Principles of Graphical Representation; Types of Diagrams - Histograms, Frequency Polygons, Smooth Frequency Polygon, Commutative Frequency Curve, O give; Normal ProbabilityCurve.	06
III	**Measure of Central Tendency:** Need For Measures of Central Tendency; Definition and Calculation of Mean; Ungrouped and Grouped Meaning, Interpretation and Calculation of Median Ungrouped and Grouped; Meaning and Calculation of Mode; Comparison of the Mean, and Mode; Guidelines for the Use of Various Measures of Central Tendency.	06
IV	Measure of Variability: Need For Measure of Dispersion. The Range, the Average Deviation, The Variance and Standard Deviation; Calculation of Variance and Standard Deviation, Ungrouped and Grouped.	06
V	**Probability and Standard Distributions**: Meaning of Probability of Standard Distribution, The Binominal Distribution. The Normal Distribution; Divergence from Normality - Skewness,Kurtosis	06
VI	**Sampling Techniques:** Need For Sampling - Criteria for Good Samples. Application of Sampling in Community, Procedures of Sampling and Sampling Designs Errors. Sampling Variation and Tests of Significance.	06
	Total	36

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S. No.	Title of Book	Author	Publication
1	Elements of Health Statistics	Rao. N.S	
2	An introduction of Biostatistics	Sunder Rao	
3	Methods in Bio-Statistics	B.K. Mahajan	
4	Elementary Statistics in Medical Workers	Inderbir Singh	
5	An Introduction to. Statistical Methods, Ram Prasad &Sons	Gupta C.B	