

**SUNRISE UNIVERSITY ALWAR**  
**COURSE CURRICULUM FOR**  
**BACHELOR OF SCIENCE**  
**RADIO IMAGING TECHNOLOGY**



**SUNRISE**  
**UNIVERSITY**

**B.Sc Semester I, II (2025-26)**

**B. Sc Semester III, IV (2026-27)**

**B. Sc Semester V and VI (2027-28)**

## FIRST SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	Credits
BSRIT101	HUMAN ANATOMY- PART I	40	60	100	4
BSRIT102	HUMAN PHYSIOLOGY- PART I	40	60	100	4
BSRIT103	BIOCHEMISTRY	40	60	100	4
BSRIT104	RADIATION PHYSICS	40	60	100	4
BSRIT105	ENGLISH COMMUNICATION AND SOFT SKILLS-I	40	60	100	2
BSRIT106	PREVENTIVE MEDICINE, HEALTHCARE AND RADIATION PROTECTION	40	60	100	2
<b>PRACTICAL</b>					
BSRIT107	PRACTICAL-HUMAN ANATOMY	60	40	100	2
BSRIT108	PRACTICAL-HUMAN PHYSIOLOGY	60	40	100	2
BSRIT109	PRACTICAL-BIOCHEMISTRY	60	40	100	2
<b>Total</b>		<b>420</b>	<b>480</b>	<b>900</b>	<b>26</b>

## SECOND SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	credits
BSRIT201	HUMAN ANATOMY- PART II	40	60	100	4
BSRIT202	HUMAN PHYSIOLOGY- PART II	40	60	100	4
BSRIT203	RADIOGRAPHIC POSITIONING-PART I	40	60	100	4
BSRIT204	COMPUTER FUNDAMENTALS	40	60	100	4
BSRIT205	MEDICAL LAW AND ETHICS	40	60	100	2
BSRIT206	ENGLISH COMMUNICATION &SOFT SKILLS-II	40	60	100	2
<b>PRACTICAL</b>					
BSRIT207	PRACTICAL-HUMAN ANATOMY	60	40	100	2
BSRIT208	PRACTICAL-HUMAN PHYSIOLOGY	60	40	100	2
BSRIT209	PRACTICAL-RADIOGRAPHIC POSITIONING-PART I	60	40	100	2
<b>Total</b>		<b>420</b>	<b>480</b>	<b>900</b>	<b>26</b>

### THIRD SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	Credits
BSRIT301	RADIOGRAPHIC POSITIONING-PART II	40	60	100	4
BSRIT302	CONVENTIONAL RADIOGRAPHIC TECHNIQUES- PART I	40	60	100	4
BSRIT303	BASICS OF USG AND MAMMOGRAPHY	40	60	100	4
BSRIT304	ORIENTATION IN PARA CLINICAL SCIENCES.	40	60	100	4
BSRIT305	ENVIRONMENTAL SCIENCES	40	60	100	2
<b>PRACTICAL</b>					
BSRIT306	PRACTICAL- RADIOGRAPHIC POSITIONING-PART II	60	40	100	2
<b>Total</b>		<b>260</b>	<b>340</b>	<b>600</b>	<b>20</b>

### FOURTH SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	Credits
BSRIT401	CONVENTIONAL RADIOGRAPHIC TECHNIQUES- PART II	40	60	100	4
BSRIT402	SPECIAL RADIOGRAPHIC PROCEDURE	40	60	100	4
BSRIT403	COMPUTED TOMOGRAPHY	40	60	100	4
BSRIT404	RADIATION PROTECTION AND QUALITY ASSURANCE.	40	60	100	2
BSRIT405	ORIENTATION IN CLINICAL SCIENCES	40	60	100	2
<b>PRACTICAL</b>					
BSRIT406	PRACTICAL- SPECIAL RADIOGRAPHIC PROCEDURE	60	40	100	2
BSRIT407	PRACTICAL- COMPUTED TOMOGRAPHY	60	40	100	2
<b>Total</b>		<b>320</b>	<b>380</b>	<b>700</b>	<b>20</b>

### FIFTH SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	CREDITS
BSRIT501	MAGNETIC RESONANCE IMAGING	40	60	100	4
BSRIT502	NUCLEAR MEDICINE TECHNOLOGY	40	60	100	4
BSRIT503	PATIENT CARE AND MANAGEMENT	40	60	100	4
BSRIT504	INTERVENTIONAL PROCEDURE AND TECHNIQUES	40	60	100	4
<b>PRACTICAL</b>					
BSRIT505	PRACTICAL- MAGNETIC RESONANCE IMAGING	60	40	100	2
BSRIT506	PRACTICAL-NUCLEAR MEDICINE TECHNOLOGY	60	40	100	2
<b>Total</b>		<b>280</b>	<b>320</b>	<b>600</b>	<b>20</b>

### SIXTH SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL	CREDITS
BSRIT601	BIO-STATISTICS AND RESEARCH METHODOLOGY	40	60	100	4
BSRIT602	CLINICAL ASPECTS IN RADIO-IMAGING	40	60	100	4
BSRIT603	ADVANCE CT, MRI AND USG	40	60	100	4
<b>PRACTICAL</b>					
BSRIT604	SEMINARS, JOURNAL CLUBS AND PROCEDURES	60	40	100	6
BSRIT605	PRACTICAL-CLINICAL RADIO-IMAGING	60	40	100	2
<b>Total</b>		<b>240</b>	<b>260</b>	<b>500</b>	<b>20</b>

## **B.Sc.RIT–1<sup>st</sup> Semester (1<sup>st</sup>Year)**

**Course/Paper: Human Anatomy-Part I**

**Course Code: BRIT-101**

**Learning Objective-** Anatomy is a key component of all education programs for RITs. To develop the basic concept of gross, functional and applied anatomy and should have a strong focus on organ position, orientation and relationships.

### **Unit-1**

Terminology and General Plan of the Body, Body Parts and Areas,

Terms of Location and Position, Body Cavities and Their Membranes, Dorsal cavity, Ventral cavity, Planes and Sections

### **Unit-II**

Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division

Tissue, Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle Tissue, Nerve Tissue, Membranes, Glandular tissue

The Integumentary System: structure and function of The Skin, Subcutaneous Tissue

### **Unit-III**

Musculoskeletal System: Basic anatomy of important muscles and bones

### **Unit-IV**

Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs

### **Unit-V**

Digestive system: basic anatomy of esophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas.

**Learning Outcome-** At the end, the topic provides the student with an understanding of the structure and relationships of the systems and organs of the body which is essential in patient preparation and positioning. The radiographic anatomy component will enable RITs to evaluate images prior to reporting by the radiologist.

### **Suggested Readings:**

1. Waugh A, Grant A. Ross & Wilson Anatomy and Physiology in Health and Illness E-Book. Elsevier Health Sciences; 2010 May 7. Chaurasia BD, Garg K. BD
2. Charisa's Human Anatomy: Lower limb, abdomen & pelvis. CBS Publishers & Distributors; 2004.

**Course/Paper: Human Physiology-Part I**

**Course Code: BRIT-102**

**Learning Objective-**To enable the students to understand then or malfunctioning of various organ systems of the body, and their interactions.

**Unit-I**

Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis, Tonicity, Homeostasis

**Unit-II**

Blood-composition, function, cellular component & their function, hemoglobin & anemia, blood groups and coagulation  
Lymphatic system-Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus

**Unit-III**

Cardiovascular system-general arrange, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension shock

**Unit-IV**

Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive air ways diseases

**Unit-V**

Gastrointestinal physiology: Organs of GIT and their structure & function, secretion, digestion, absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins & lipids, structure & function of liver, spleen, gallbladder & pancreas, jaundice, cirrhosis & pancreatitis.

**Learning Outcome-** Basics of Physiology provides the students with knowledge of the function of systems and organs and their relationships and underpins the understanding of how various imaging modalities are to be selected depending upon the clinical history.

Suggested Readings:

1. Sembulingam K, Sembulingam P. Essentials of medical physiology. JP Medical Ltd; 2012.
2. Arthur C, Guyton MD, Hall JE. Text book of medical physiology. WB Saunders, Philadelphia.2000:392-401.

3. Torture GJ, Derrick son BH. Principles of an to my and physiology. John Wiley & Sons; 2008.

**Course/Paper Code: Bio**

**chemistry Paper Code: BRIT-103**

**Learning Objective-**To enable the students to understand about the equipment sused in labs and their applications. To develop the basic concepts of Lab diagnosis for Radiology.

**Unit-I**

Introduction to Fundamental and Clinical Bio chemistry, First aiding laboratory accidents. Principle, working, care & maintenance of Weighing balance, hotplate, centrifuges, incubator, hotairoven, colorimeter, spectra photometer , Ph meter.

**Unit II**

Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, concepts of acid and base, units of measurement: SI unit, reference range, conversion factor, units for measurement of enzymes, protein, osmolarity, drugs, hormones, vitamins..

**Unit-III**

Car bohy drates: Structure, Classification and their function in biological system.  
Proteins: Classification, Primary, secondary and tertiary structure and functions of protein.  
Amino acids: classification, Structure, properties and biological functions.  
Lipids: Classification of lipids, Classification of fatty acids , their biological functions.  
Enzymes: Definition, classification of enzyme, units form ensuring genzy me activity.

**Unit-IV**

Nucleic acids: Structure, function and types of DNA and RNA. Nucleotides, Nucleosides, Nitrogen bases, and role of Nucleic acid.

**Unit-V**

Vitamins: classification, function and disease associated with vitamins.  
Role of Mineral sandions : Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Potassium, Zinc.

**Learning outcome-** At the end of the course, the students will have enough knowledge on the equipments and their applications as well as taking care & maintenance of equipments and samples.

**Suggested Readings:**

1. Vasudevan DM, SreekumariS, Vaidyanathan K. Text book of biochemistry for

medical students. JP Medical Ltd; 2013 Aug 31.

2. Hames BD, Hooper NM, HamesBD. In stanntote sin bio chemistry.Biochemicaleducation.1997; 25:253-4.
3. Devlin TM, editor. Text book of biochemistry: with clinical correlations.



## **Course/Paper: Radiation Physics**

### **Paper Code: BRIT-104**

**Learning Objective-**To enable the student to gain knowledge on the field of radiation along with the basic atomic and electric physics to the designing of x-ray circuits and its system.

#### **Unit I**

**The Atom-**Definition, Thomson Atom, Bohr Atom, Atomic Structure, Electron Binding Energy, Radioactivity, laws of radioactivity and decay schemes of different alpha, Beta, gamma ray.

#### **Unit-II**

**Electromagnetic Radiation-**Photon, Velocity and amplitude, Frequency and wavelength, Electromagnetic Spectrum, Inverse square law, Units and quantities of radiation, dose measurement for various diagnostic procedures.

#### **Unit-III**

**Electricity and Magnetism-** Electrostatics, Laws of electrostatics, Coulomb's law, Electrodynamics, Ohm's laws, Alternative & Direct Current, Magnet, Classification of magnets, Magnetic laws.

**Electromagnetism-**Electromagnetic Effect, Faraday's & Lenz's law of Electro magnetic Induction, Generator, Transformers, Laws of Transformers, Types of Transformers

#### **Unit IV**

**X-ray Imaging System-** Operating console, Autotransformers, Control of KVP, MAS, Exposure Timers, Voltage Rectification

**Image Quality-**Exposure, attenuation, absorption, contrast, resolution, sharpness, noise, various factors determining image quality.

#### **Unit-V**

**X-Ray circuits Components-**Filament Circuit, High voltage circuit, Switched, Fuses, Circuit Breakers **Beam limiting Devices-** Cones, Cylinders, collimator, Grids, Filters.

**Learning outcome-** At the end of the course, the students will be able to differentiate different types of radiation and its uses for medical diagnosis and the therapy.

#### ***Suggested Readings:***

1. Curry TS, Dowdy JE, Murry RC. Christensen's physics of diagnostic radiology

- .Lippincott Williams & Wilkins;1990.
2. Holmberg O, Malone J, Rhenium, McLean, Czerwinski. Current issues and action sin radiation protection of patients.
  3. Dendy PP, Heaton B. Physics for diagnosticradiology.CRCpress;2011Aug4.



**Course/Paper: English Communication & Soft Skills –**

**IPaperCode:BRIT-199**

**Learning Objective:** To comprehend and communicate in simple English.

**Course Content**

**Module-1: Introduction to English language (6Lectures)**

- a) Role and significance of English language in the present scenario
- b) English Language: Its relevance for the Indian industry
- c) Introduction to Listening, Speaking, Reading, Writing (LSRW) and benchmarking of the class  
*[Note: As part of class room activity, assign lecture from an industry representative /Director (CRC) and maintaining progress card for each student on LSRW for future reference]*

**Module-2: Phonetics & Functional Grammar (14Lectures)**

- a) Pronunciation and daily usage correction (speak with differences between p/b, s/s h ,f/ph ,t/d ,v/w sounds)
- b) Parts of speech, articles, tenses, verbs and modals
- c) Practice of daily use words ,numerals and tongue twisters
- d) Vocabulary building, Construction of simple sentences: Basic sentence pattern, subject and Predicate  
*[Note: As part of classroom activity, language games, tongue & jaw exercises, simple passages from the news papers for oral drills in the class room and practice tests (written and oral)]*

**Module-3: English Communication- About Myself (14Lectures)**

- a) Let's talk, making conversation, meeting and greeting
- b) Introducing my self, my family and my friends
- c) My opinions, my likes and dislikes
- d) Life at college ,hostel and work place  
*[Note: As part of classroom activity, use the Workbook for reference for classroom and home assignments; carry out practice tests (written and oral)]*

**Module-4: Personality Development-I (8Lectures)**

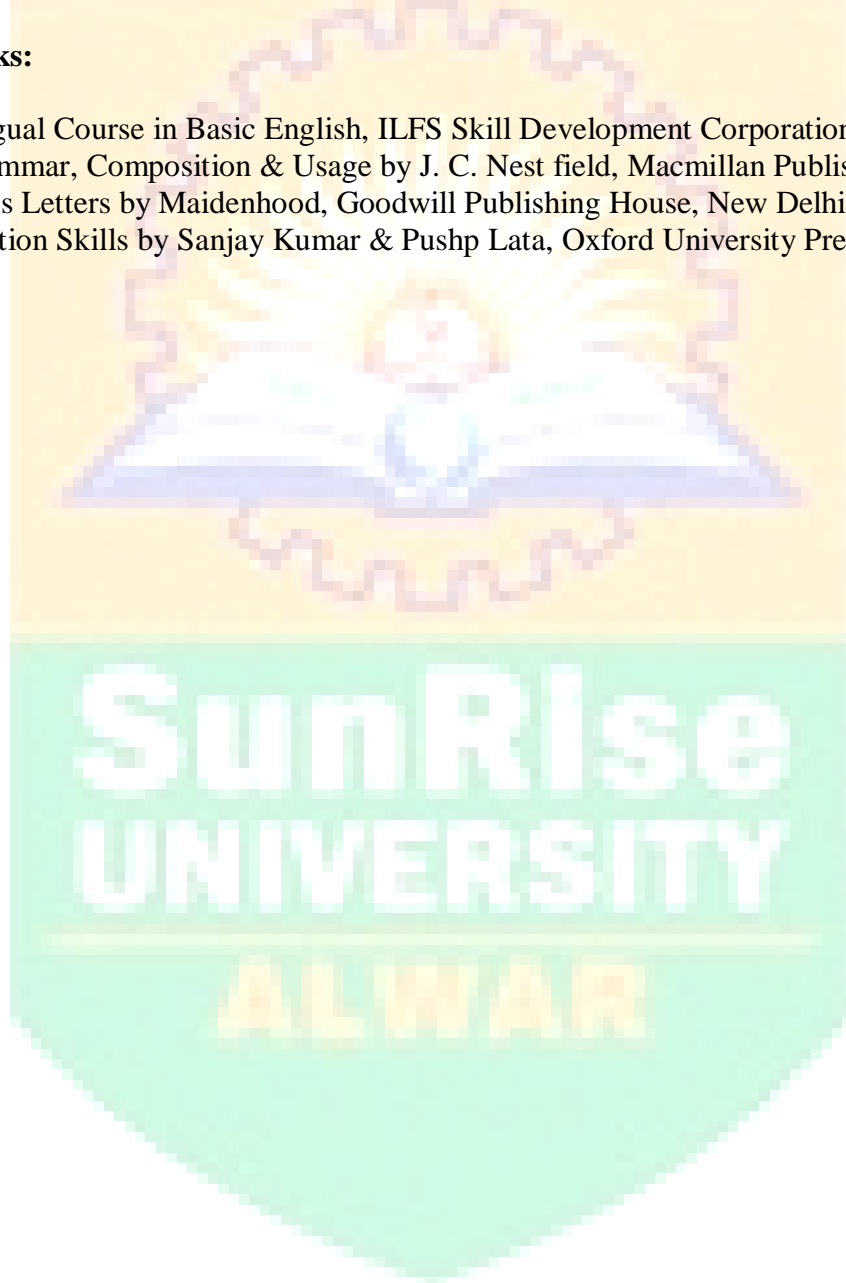
- a) First impression: Dressing sense, good manners, speaking well and respectably
- b) Positive Attitude: Being happy and alert, a good listener and a good friend
- c) Consultation among peers: Soliciting advice and giving advice
- d) Goal setting, confidence building & handling rejection  
*[Note: As per to class room activity, refer Work book for class room and home assignments, carry out practice tests (written and oral)]*

### **Learning Out come-**

1. Students will realize the significance of English for their career progression.
2. Benchmarking the students in the first semester to observe their progression in terms of L S R W.
3. Students will be able to understand distinct sounds and improve pronunciation.
4. Students will improve their English vocabulary of daily usage.
5. Students will be able to form simple sentences to talk about themselves, friends and relatives.
6. Students will be able to imbibe the pre-requisites of personality development.

### **Reference Books:**

1. ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation.
2. English Grammar, Composition & Usage by J. C. Nest field, Macmillan Publishers.
3. The Business Letters by Maidenhood, Goodwill Publishing House, New Delhi.
4. Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press.



**Course/Paper: Preventive Medicine, Health care and Radiation Protection**

**PaperCode:BRIT-106**

**Learning Objective-** The objective of this particular section of the foundation course is to sensitize potential learners with essential knowledge on basic concept of health and universal disease conditions and basic idea on radiation protection.

**Unit-I**

Definition and concepts of health, important public health acts, health problem in developed and developing countries, environment and health.

Definition and concepts of epidemiology, diseases, types and use of epidemiology. Basic emergency care and first aid. Epidemiology, aetiology, control of communicable disease like malaria, cholera, tuberculosis, leprosy, diarrhea, poliomyelitis, viral hepatitis, measles, dengue, rabies, AIDS

**Unit-II**

National Health Policy and Programs, DOTS, National AIDS control programme, National cancer control programme, universal immunization programme.

Nutrition and major nutritional problems, etiology, manifestations and prevention, components of RCH care. Examination of water, food adulteration, role of regular exercise and yoga in prevention and management of various diseases.

**Unit-III**

Population, problems of population growth, birth rates, death rates, fertility rates, MMR, CPR, Approaches and methods of contraception, Reproductive and child health. Hygiene and sanitation, sanitation barriers, excreta disposal.

**Unit-IV**

Immunization programme, various national immunization programs and vaccine schedules, Family welfare and planning, communicable and non-communicable disease, Health planning in India including various committees, national health policy and health goals. Objectives and goals of WHO, UNICEF, Indian Red Cross Society, UNFPA, FAO, ILO

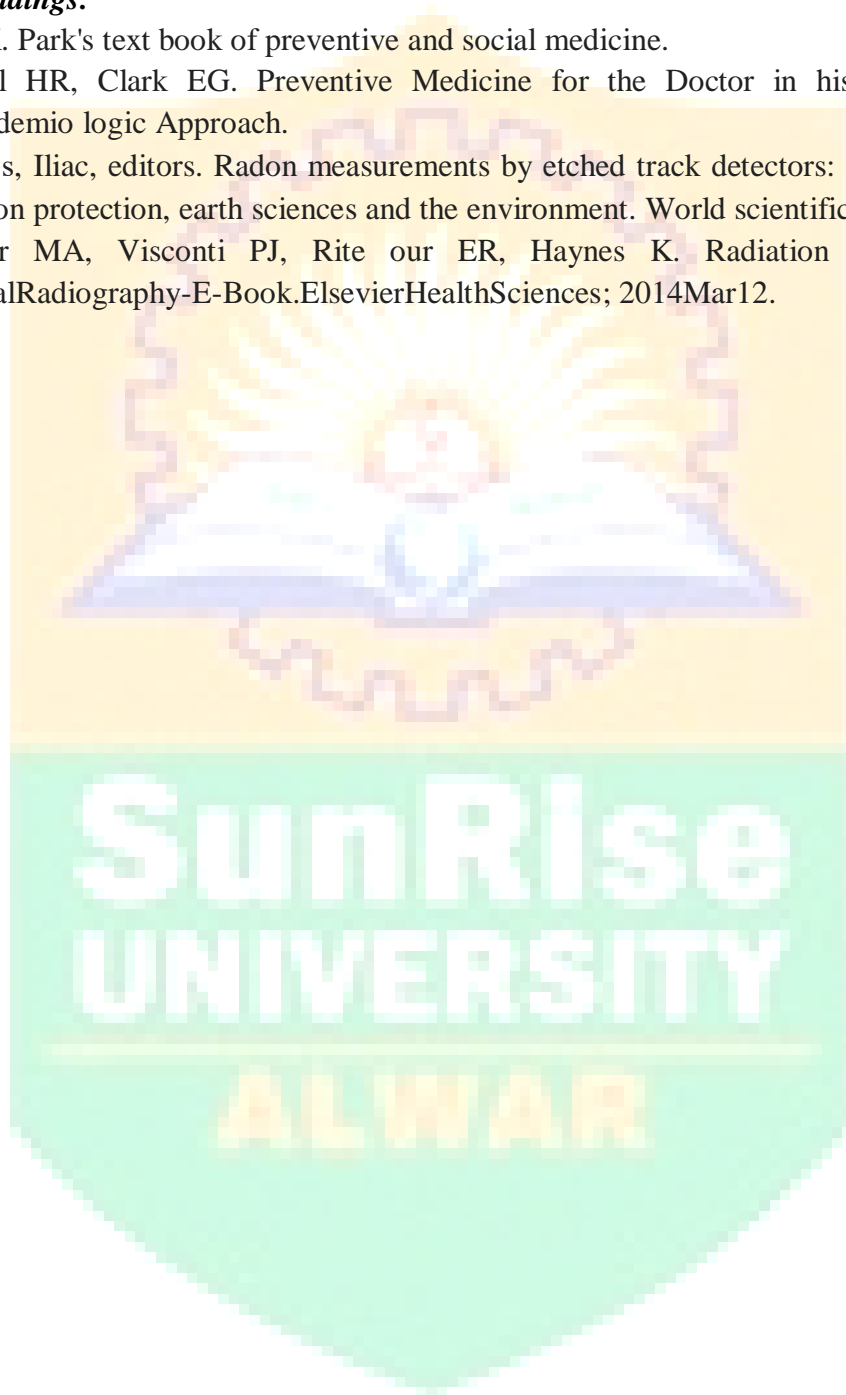
**Unit-V**

- General Principles and Materials.
- Departmental protection.
- Protection instruments and personal monitoring.
- Radiation signage's.

**Learning outcome-** At the end of the course, student will be able to understand and work under various health organization like(WHO,UNICEF, REDCROSS SOCIETY, ICRP, AERB, UNESCAR etc...) and also will be able to give and apply protection from different types of radiation causing health hazards.

***Suggested Readings:***

1. Park K. Park's text book of preventive and social medicine.
2. Leavell HR, Clark EG. Preventive Medicine for the Doctor in his Community. AnEpidemiologic Approach.
3. Duran's, Iliac, editors. Radon measurements by etched track detectors: application in radiation protection, earth sciences and the environment. World scientific ;1997Jun9.
4. Sheerer MA, Visconti PJ, Rite our ER, Haynes K. Radiation Protection in MedicalRadiography-E-Book.ElsevierHealthSciences; 2014Mar12.



## Practical Syllabus

**Course/ Paper: Human Anatomy (Practical)**

**PaperCode:BRIT-111**

**Course Contents:** Demonstration of

1. Major organs through models and permanent slides.
2. Parts of circulatory system from models.
3. Parts of respiratory system from models.
4. Digestive system from models.
5. Excretory system from models.

**Course/ Paper : Human Physiology**

**(Practical)Paper Code: BRIT-112**

**Course Contents:**

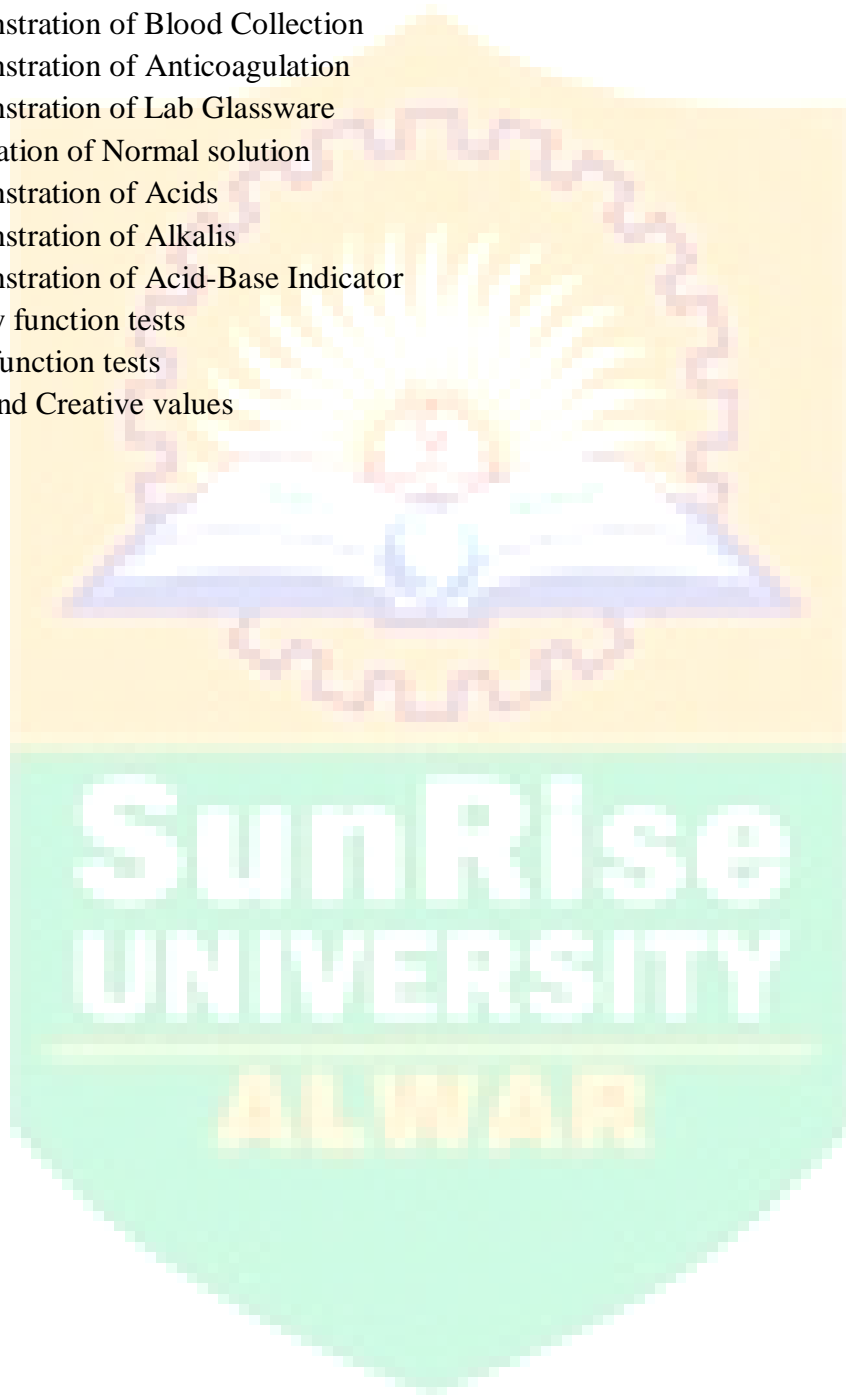
1. To measure pulse rate
2. To measure blood pressure
3. To measure temperature
4. Measurement of the Vital capacity
5. Determination of blood groups
6. Transport of food through esophagus
7. Calculation and evaluation of daily energy and nutrient intake.
8. Measurement of basal metabolic rate
9. Demonstration of ECG
10. Bilejuicese creation and excretion
11. Urine formation and excretion

**Course/Paper: Biochemistry (Practical)**

**PaperCode: BRIT-113**

**Course Contents:**

1. Demonstration of Blood Collection
2. Demonstration of Anticoagulation
3. Demonstration of Lab Glassware
4. Preparation of Normal solution
5. Demonstration of Acids
6. Demonstration of Alkalis
7. Demonstration of Acid-Base Indicator
8. Kidney function tests
9. Liver function tests
10. Urea and Creative values



## **B.Sc.RITYear1 (Semester–II)**

### **Paper Code: BRIT-201(Human Anatomy-Part II)**

**Learning Objective**-To develop and to ensure proper knowledge on description, orientation and positions of organs and the irrigations tooth brogans.

#### **Unit-I**

Cardiovascular system: Basic anatomy of heart and important blood vessels  
Brief introduction about Lymphatic System

#### **Unit–II**

The Nervous System: Basic anatomy of brain and spinal cord, meanings and cerebrospinal fluid, Cranial Nerves

#### **Unit-III**

Endocrine System: Brief anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal

#### **Unit-IV**

Special Senses: Basic anatomy of eye, ear and nose

#### **Unit-V**

Genitourinary system: Basic anatomy of kidney and associated organs, male reproductive organs, female reproductive organs

**Learning Outcome**-The students will have enough knowledge on anatomy of human body as well as the radiological anatomy which is essential in day to day routine as well as special procedures.

#### **Suggested Readings:**

1. Waugh A, Gretna. Ross&WilsonAnatomyandPhysiologyinHealthandIllnessE-Book.ElsevierHealthSciences;2010 May7.Chaurasia BD, Garg K.BD
2. Charisa's Human Anatomy: Lower limb, abdomen & pelvis. CBS Publishers & Distributors; 2004.
3. GargK. BD Chaurasia's Human Anatomy–Regionaland Applied Dissection and Clinical: Volume1 Upper Limb and Thorax.
4. Principles of Anatomy and Physiology, Gerard J. Torture and Bryan H. Derrick son

## Course/Paper Human Physiology-Part II

Course Code: BRIT-202

**Learning Objective-** To enable the students to recognize the anatomical structures and explain the physiological function of body systems.

### Unit-I

Organs of Excretory System: Kidneys, Nephron, and Mechanism of Excretion, Urine formation (Glomerular filtration and Tubular reabsorption), and Electrolytes: their balances and imbalances Introduction of acidosis and alkalosis

### Unit-II

Muscle nerve physiology, types of muscles, their gross structural and functional difference with reference to properties

### Unit-III

Nervous system- general organization of CNS, function of important structure and spinal cord, neuron, nerve impulse, type of nerves according to function, Autonomic nervous system- organization & function

Special senses- general organization & functions

### Unit-IV

Endocrine System: Brief introduction about endocrine glands and their secretion, common endocrine logical disorder such as diabetes mellitus, hyper & hypothyroidism, dwarfism, gigantism, titan.

### Unit-V

Reproductive System: male & female reproductive organs, sex hormones, secondary sexual characteristics, puberty, spermatogenesis, oogenesis, menstrual cycle, pregnancy, menopause, contraceptive measures.

**Teach Outcome-** This will provide the ability to integrate physiology from the cellular and molecular level to the organ system and organism level of the organization.

#### ***Suggested Readings:***

1. Sembulingam K, Sembulingam P. Essentials of medical physiology. JP Medical Ltd; 2012.
2. Arthur C, Guyton MD, Hall JE. Text book of medical physiology. WB Saunders, Philadelphia. 2000:392-401.
3. Tortora GJ, Derrickson BH. Principles of anatomy and physiology. John Wiley & Sons; 2008.

**Course/Paper: Radiographic Positioning- Part**

**IPaperCode: BRIT-203**

**Learning Objective** – The objective is to learn basic and special projections for the better delineation and diagnosis of the disease conditions of different anatomical structures.

**UNIT- I**

**SKULL**

**Cranial bones and facial bones**

- Related radiological anatomy

**Basic & special projections**

- Cranium Base of skull
- Sellaturcica
- Mastoids
- Optic foraminaandOrbits
- Nasal bone
- TM joint
- Facial bone
- Zygomaticarches
- Mandible
- Paranasalsinuses

**UNIT-II**

**NECK**

- Related radiological anatomy
- Positioning- AP,LAT

**UNIT-III**

**THORAX**

- Related radiological anatomy
- Chest X-ray–AP, LAT
- Special projections

## UNITIV

### ABDOMEN

- Related radiological anatomy

#### Basic& special projection

- Basic:
- AP supine(KUB)
- Special:
- PA prone
- Lateraldecubitus
- Erected
- Dorsaldecubitus
- Lateral
- Acute abdomen: three way series

## UNITV

### KUB

- Related radiological anatomy
- Positioning-AP

**Learning outcome-** At the end of the course, student will be expert in practicing various radiographic positioning and procedure in dependently and understanding the radio graphic diagnosis.

#### ***Suggested Readings:***

- Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hadley G. Clark's Positioning in Radiography13E.CRCPress; 2015Jul28.
- Bondage KL, Lampignano J .Text book of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013Aug7.
- Bondage KL, Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK. Elsevier Health Sciences; 2017Feb10.
- Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures-E-Book. El Sevier Health Sciences; 2013Aug13.

**Course/ Paper: Computer**

**Fundamentals Paper Code: BRIT-204**

**Course Code**

**Learning Objective:** To give the basic knowledge of Computer hard ware, Internet and application software with DOS keys to the students.

**Course Contents**

**Unit I:**

**Introduction and Definition of Computer:** Computer Generation, Characteristics of Computer, Advantages and Limitations of a computer, Classification of computers, Functional components of a computer system (Input, CPU, Storage and Output Unit), Types of memory (Primary and Secondary) Memory Hierarchy. Hardware: a) Input Devices- Keyboard, Mouse, Scanner, Bar Code Reader b) Output Devices – Visual Display Unit (VDU), Printers, Plotters etc. Software: Introduction, types of software with examples, Introduction to languages, Compiler, Interpreter and Assembler. Number System: Decimal, Octal, Binary and Hexadecimal Conversions, BCD, ASCII and EBCDIC Codes.

**(Lecture 08)**

**Unit II:**

**MS–**

**DOS:** Getting Started on DOS with Booting the System, Internal Commands: CHDIR(CD), CLS, COPY, DATE, DEL(ERASE), DIR, CHARACTER, EXIT, MKDIR(MD), REM, RENAME(REN), RMDIR(RD), TIME, TYPE, VER, VOL, External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT, HELP, LABEL, MORE, REPLACE, RESTORE, SORT, TREE, UNDELETE, UNFORMAT, XCOPY.

**Introduction of Internet:** History of internet, Web Browsers, Searching and Surfing, Creating an E- Mail account, sending and receiving E-Mails. **(Lecture 08)**

**Unit III:**

**MS Word:** Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge. **(Lecture 08)**

**Unit IV:**

**MS Excel:** Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping , Sorting data, Auto Sum, Use of functions, Cell Referencing form, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets. MS Power Point: Starting MS–Power Point, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience hand outs, printing presentation documents. MS–Access: creating table and database.

**(Lecture 08)**

## **Unit V:**

**MS-POWERPOINT:** Starting MS–Power Point,, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slideshow, preparing note pages, preparing audience and outs ,printing presentation documents.

**(Lecture08)**

### **Learning outcomes:**

After studying this course, you should be able to:

- Understand the fundamental hardware components that makeup a computer' hard ware and the role of each of these components
- Understand the difference between an operating system and an application–program, and what each is used for in a computer
- Describe some examples of computer sand state the effect that the use of computer technology hashed on some common products
- Be familiar with software applications
- Understand file management
- Accomplish creating basic documents, work sheets, presentations with their properties.
- Experience working with email and recognized ail netiquette.

### **Text Books:**

1. Sinhala P.K., Computer Fundamentals, BPB Publishing.
2. Bill Bruck. , The Essentials Office 2000 Book, BPB Publishing.
3. LeonA. &LeonM, Introductions to Computers, Vikas Publications.

### **Reference Books:**

1. Peter Norton's, Introduction sto Computers, Tata Mc Graw Hill.
2. Price Michael, Office in Easy Steps, TMH Publication.

## **Course/Paper: Medical Law and**

### **Ethics Paper Code: BRIT-205**

**Learning Objective-** Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human right sand changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

#### **Unit-I**

Medical ethics - Definition - Goal –  
Scope Introduction to Code of conduct  
Basic principles of medical ethics – Confidentiality  
Malpractice and negligence- Rational and irrational drug therapy

#### **Unit-II**

Autonomy and informed consent- Right of patients Care of the terminally ill-  
Euthanasia Organ transplantation, ethics and law

#### **Unit-III**

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.

#### **Unit-IV**

Professional Indemnity insurance policy  
Development of standardized protocol to avoid near miss or sentinel events  
obtaining an informed consent.

#### **Unit-V**

Basics of emergency care and life support skills  
Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR, Using an AED (Auto mated external defibrillator), Managing an emergency including moving a patient.

**Learning outcome** - Student will abide by the rule and regulation of the medicine and have abundant knowledge on professional attitude and communication among the colleague, patients and co-parties.

Suggested Readings:

1. Kennedy I, Grubb A. Medical law. London: Butter worths; 2000.
2. Jackson E. Medical law: text, cases, and materials. Ox ford University Press.
3. Recent Trends in Medical Imaging (CT, MRI and USG)
4. Bontrager KL,  
Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques - E-BOOK. Elsevier Health Sciences; 2017 Feb 10.
5. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning

## **Course/Paper: English Communication & Soft Skills-II**

**Course Code: BRIT-299**

### **Module-1: Basic Communication & Soft Skills**

**(6Lectures)**

- a) Reading comprehension
- b) Building *conversational* skills
- c) Verbal & Non-verbal communication

*[Note: As part of classroom activity, review and recap the last semester and carry out (oral and written) practice tests up to date the progress card of each student, refer to the Work book]*

### **Module-2: Vocabulary: Building Blocks**

**(10Lectures)**

- a) Word Formation: Prefix, suffix, conversion and compounding
- b) Homophones and one-word substitution
- c) Word often confused and misused
- d) Idiomatic phrase, Antonyms and Synonyms

*[Note: As part of classroom activity, organize and learning language games, initiate the learning of 5 new words per class]*

### **Module-3: English Communication: World around Me**

**(12Lectures)**

- a) Market place, Bus stop, Bank, Post Office
- b) Village, Town and City
- c) Eating out: Stall, Dhaba and Restaurant

*[Note: As part of class room activity, refer Work book for class room and home assignments, carry out practice tests (written and oral)]*

### **Module-4: Personality Development-II**

**(12Lectures)**

- a) Etiquettes: Telephone, e-mail and at a wedding or social gathering
- b) Public dealing: Making enquiries and requesting for help, handling difference of opinion, giving directions, instructions and getting assistance
- c) Expressions: Giving compliments, making complaints, Feeling sorry and saying thank you
- d) Entertainment: Radio, music, television, and computers

*[Note: As part of class room activity, refer Work book for class room and home assignments, carry out practice tests (written and oral)]*

### **Reference Books:**

1. ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation
2. English Grammar Composition & Usage by J.C. Newfield, Macmillan Publishers
3. The Business letters by Madan Sood, Good will Publishing House, New Delhi
4. Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press
5. Newspapers

## Practical Syllabus

### Course/Paper: Human Anatomy-II (Practical)

PaperCode: BRIT-111

#### Course Contents:

##### Demonstration of:

1. Nervous system from models.
2. Structure of eye and ear
3. Structural differences between skeletal, smooth and cardiac muscles.
4. Various bones
5. Various joints
6. Various parts of male & female reproductive system from models

### Course/Paper: Human Physiology-II (Practical)

Paper Code: BRIT-252

#### Course Contents:

1. To perform total platelet count.
2. To perform bleeding time.
3. To perform clotting time.
4. To study about CSF examination.
5. To study about intrauterine contraceptive devices.
6. To demonstrate microscopic structure of bones with permanent slides.
7. To demonstrate microscopic structure of muscles with permanent slides.

### Course/Paper: Radiographic Positioning-Part111 (Practical)

Paper Code: BRIT-253

#### Skull

Cranial bones and facial bones  
Basic & special projections  
Related radiological Pathology

#### Neck, Thorax & Abdomen

Basic & special projection

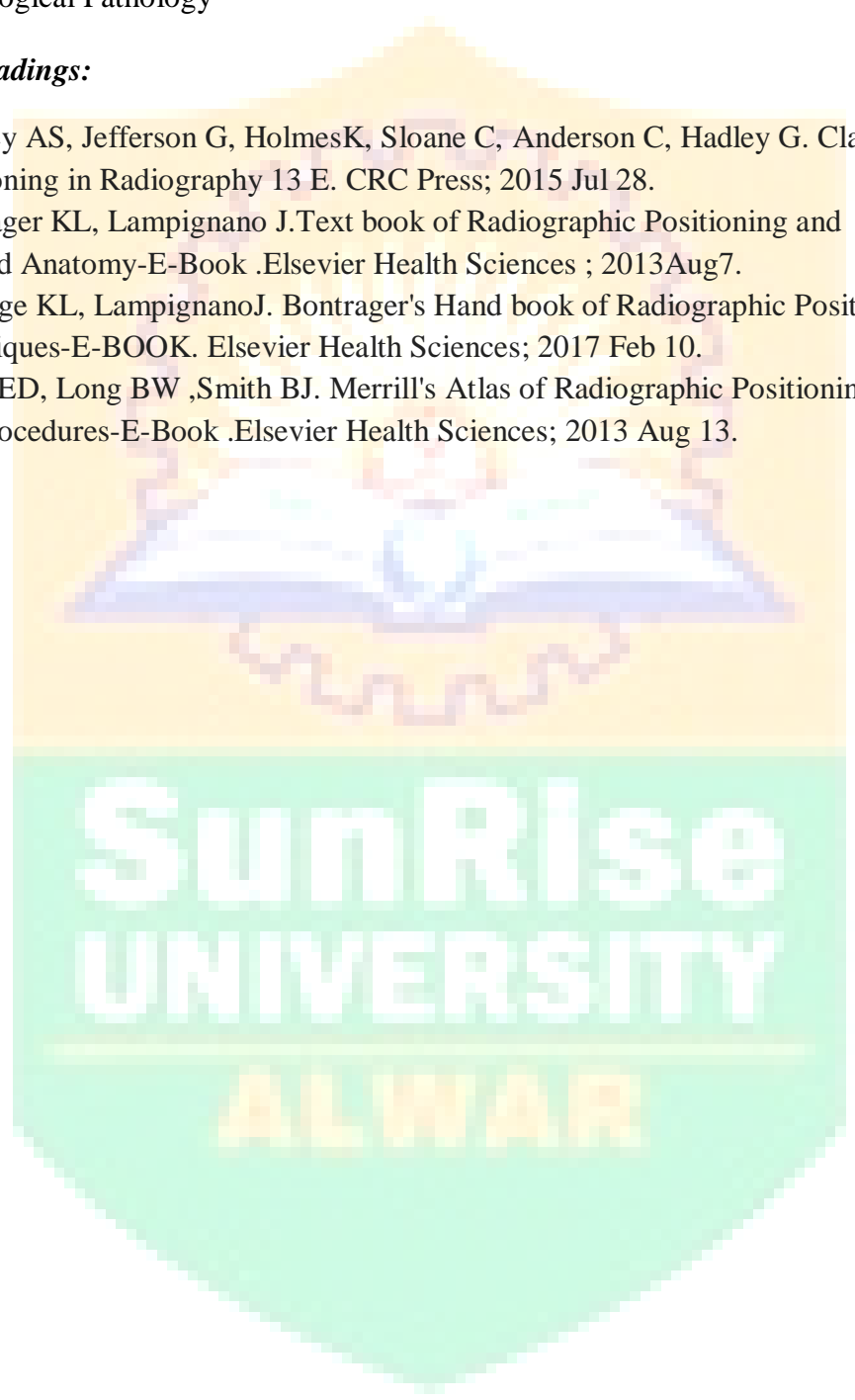
Related radiological Pathology

## **KUB**

Basic & special projection  
Related radiological Pathology

### ***Suggested Readings:***

1. Whitley AS, Jefferson G, HolmesK, Sloane C, Anderson C, Hadley G. Clark's Positioning in Radiography 13 E. CRC Press; 2015 Jul 28.
2. Bontrager KL, Lampignano J. Text book of Radiographic Positioning and Related Anatomy-E-Book .Elsevier Health Sciences ; 2013 Aug 7.
3. Bondage KL, Lampignano J. Bontrager's Hand book of Radiographic Positioning and Techniques-E-BOOK. Elsevier Health Sciences; 2017 Feb 10.
4. Frank ED, Long BW ,Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures-E-Book .Elsevier Health Sciences; 2013 Aug 13.



## **Course/Paper: Computer Fundamentals (Practical)**

**PaperCode: BRIT 254**

### **Unit I**

#### **Conception Computer:**

Definition of Computer, History of Computer , Generations, Characteristic and Application of Computers, Classification of Computers, Computer Hardware, CPU, Various Types of I/O devices, Peripherals Devices, Storage Devices. Management Introductory concepts in operating system, textual V's GUI Interface, Introduction to DOS

### **Unit II**

Starting MS WORD, Creating and formatting a document, Changing fonts and point size ,Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.

### **Unit III**

Starting Excel, Worksheet, cell inserting Data into Rows/Columns, Alignment, Text wrapping , Sorting data, Auto Sum, Use of functions, referencing formula cell in other formulae , Naming cells, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page setup, Print Preview, Printing Worksheets.

### **Unit IV**

Starting MS–PowerPoint, , Creating presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing notes pages, preparing audience handouts, printing presentation documents, MS- Access, Creating tables and data base, Internet, Use of Internet (Mailing, Browsing, Surfing).



## **B.Sc.RITYear2 (Semester–III)**

**Course/Paper: Radiographic Positioning- Part**

**IIPaperCode: BRIT-301**

**Learning Objective-** The objective is to learn basic and special projections for the better delineation diagnosis of the disease conditions of different anatomical structure (UPPER AND LOWER EXTRIMITIES, SHOULDER JOINT, PELVIS GRIDDLE, and WHOLE SPINE).

### **UNIT-I**

#### **UPPER&LOWEREXTRIMITIES**

- Related radiological anatomy

#### **Basic and special projection**

- Finger-PA,LAT,OBLIQUE
- Hand-PA,LAT,
- Wrist joint-PA,LAT
- Forearm-AP,LAT
- Elbow joint-AP,LAT
- Hummers-AP,LAT
- Femur-AP,LAT
- Knee joint-AP,LAT
- Patella-SKYLINEVIEW
- Tibia-AP,LAT
- Ankle joint-AP,LAT,MORTISVIEW
- Foot–AP,LAT

### **UNIT-II**

#### **SHOULDERJOINTS**

- Related radiological anatomy

#### **Basic and special projections**

- Shoulder-AP,AXIAL
- Clavical-AP,APAXIAL
- Scapula-AP,OBLIQUE,YVIEW

### **UNITIII**

#### **Pelvic Girdle and Proximal Femur**

- Related radiological anatomy

#### **Basic & special projections**

- Pelvic girdle
- AP pelvis
- Frog lateral(modified cleaves method)

- A Paxil for pelvic outlet (tailor method)
- A Paxil for pelvic inlet(modified linen field method)
- Post erioroblique -acetabulum(judder method)
- Hip and proximal femur
- AP until apteral hip
- Axiolateral ,infer superior (dandelions–mille method)
- Unilateral frog leg (modified cleaves method)
- Modified axiolateral(Clements- nakayama method)
- Sacroiliac joints: AP, post eriorobliques

#### **UNIT-IV**

#### **WHOLESPINEPOSITIONING**

##### **Cervical spine**

- Related radiological anatomy
- Basic views
- AP open mouth(C1 and C2)
- AP axial
- Oblique
- Lateral
- Erect
- Trauma lateral (horizontal beam)
- Cervicothoracic junction(swimmers view)
- Special views
- Lateral- hyper flexion and hyperextension
- AP (Fuchs method)or PA(judd method)
- AP wagging jaw(ottonello method)
- AP axial(pillars)

##### **Thoracic spine**

- Related radiographic anatomy
- Projections
- AP
- Lateral
- Oblique

##### **Lumbar spine, sacrum and coccyx**

- Related radiographic anatomy
- Lumbar spine
- AP
- Oblique
- Lateral
- Lateral(L5–S1)
- APaxial (L5– S1)
- Scoliosis series
- APorPA
- Erect lateral
- AP (fergusonmethod)

- AP – Rand Blending
- Spinal fusion series
- APorPA– Rand Blending
- Lateral–hyper extension and hyper flexion
- Sacrum and Coccyx
- AP axial sacrum
- AP axial coccyx
- Lateral sacrum
- Lateral coccyx

## **UNIT-V**

### **Pediatric Radiography**

- Positioning, care and radiation protection while handling babies.

**Learning outcome** – At the end of the course, students will be experts in practicing various radiographic positioning and procedures independently and understanding the radiographic diagnosis.

### **References:**

1. Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioning in Radiography 13E. CRC Press; 2015 Jul 28.
2. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy – E-Book. Elsevier Health Sciences; 2013 Aug 7.
3. Bontrager KL, Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques – E-Book. Elsevier Health Sciences; 2017 Feb 10.
4. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures – E-Book. Elsevier Health Sciences; 2013 Aug 13.

## **Course/Paper: Conventional Radiographic Techniques- Part**

**IPaperCode: BRIT-302**

**Learning Objective**-the main objective is to aware the student about the conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) along with the image formation, developing and reading.

### **Unit-I**

**Introduction to Radiologic Imaging**-Radiation, Sources of radiation, Radioactivity, Half-life, Ionizing & Non-ionizing Radiation, History of x-ray production, Development of modern Radiology

**X-Ray Tube**- External components- X-ray tube support, Protective housing, Glass or metal Enclosure, Internal components- cathode, anode, focusing cup, focal spot, Line focus principle, Heel effect, X-ray tube failure, Rating charts

### **Unit-II**

**X-Ray production-Characteristic Radiation, Bremsstrahlung Radiation, X-ray Emission Spectrum, Properties of X-ray, X-ray quality, X-ray quantity, Half value layer.**

**Interaction of x-ray with matter**- Coherent scattering, Compton effect, Photoelectric effect, Pair Production, Photodisintegration, Differential absorption.

### **Unit-III**

**The Recording System**- X-ray film construction, Emulsion, Formation of latent image, Types of film, Handling and storage of film, Construction of Intensifying screen, Luminescence, screen characteristics, Cassette construction and types, silver recovery, Film artifacts,

### **Unit-IV**

**Processing of Latent image**-Manual Processing, Automatic processing, Processing sequence, wetting, developing, fixing, washing, Drying, Processing area (Dark room)

**Characteristic curve, Optical density, Geometry of Radiographic image**- magnification, distortion, focal spot blur, Subject factors.

### **Unit-V**

**Fluoroscopy**- Introduction to fluoroscopy, Techniques of fluoroscopy, Image Intensifier, Flux gain, Brightness gain, Magnification gain, multifold image intensifier, Cathode-ray tube.

**Learning outcome-** At the end of the course, the students will have knowledge on:

- Generation of x-ray tube and its components.
- Generation of an x-ray and its character.
- Image recording system.
- Fluoroscopy and its component.

***Suggested Readings:***

1. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20.
2. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.
3. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences.
4. D Nand MO Chesney-X ray equipments for student radiographers-Third edition
5. Burgener FA, Korman M. Differential diagnosis in conventional radiology.



**Course/Paper:**

**Basics of Ultrasonography and Mammography Paper Code:**

**BRIT-303**

**Learning Objective-** The objective is to learn basic knowledge on ultrasound and Doppler equipments for various imaging and equipments used for breast imaging and mammography techniques.

### **Unit-1**

#### **Introduction to Ultra sound Imaging**

Sound, Ultra sound, Attenuation, Echoes, Basic principle of Ultra sound imaging, Advantages and disadvantages

### **Unit-II**

#### **Instrumentation of Ultra sonography**

Controls of Ultrasound Equipment, USG probes, Coupling agent, Cathode ray tube, Image display, USG contrast agent. **Piezoelectric Effect**-Definition, Types of element, Properties. Transducers: Construction and operation, Types of transducers

### **Unit-III**

**USG Display modes:** A mode, B mode, M mode, T M mode.

**Gray scale imaging** Beam focusing, Resolution

### **Unit-IV**

#### **Doppler USG**

Principle, Doppler effect, Color Doppler, Continuous wave Doppler, Pulsed wave Doppler. USG Bio effects, safety.

**Mammography:** Mammography Equipments and Basic view sin Mammography.

### **Unit V**

#### **Clinical Practice**

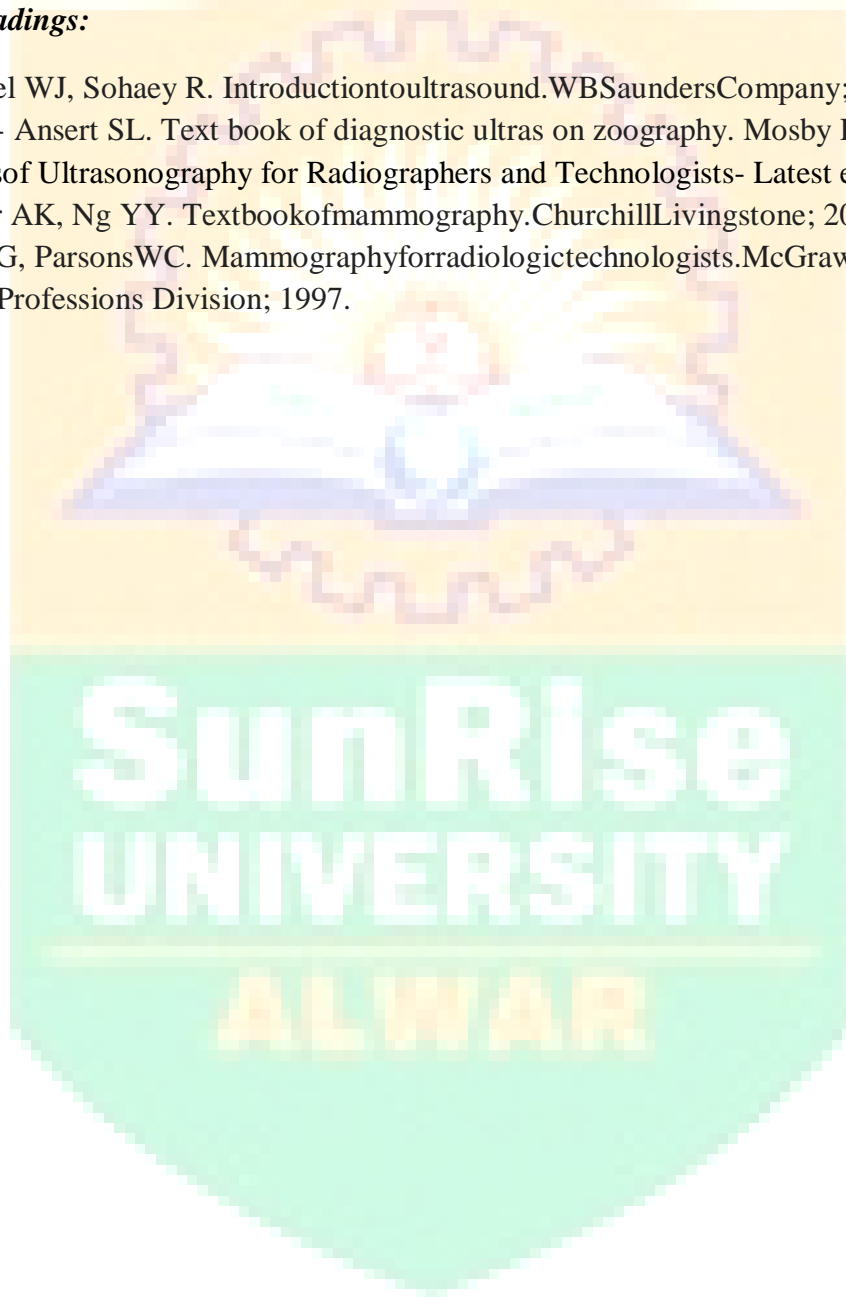
Scanning protocol, Indication, Patient preparation, image quality and artifacts in Ultrasound and Mammography,

**Learning outcome-** At the end of the course, student will be able to assist the radiologist and sonologist:

- Transducer selection
- Patient selection and preparation
- Managing image quality and art effects in USG and mammography
- Sufficient knowledge about contrast media selection and its adverse effect.

***Suggested Readings:***

1. Zwiebel WJ, Sohaey R. Introduction to ultrasound. WBSaunders Company; 1998.
2. Hagen- Ansert SL. Text book of diagnostic ultrasound on zoography. Mosby Elsevier; 2006.
3. Basic of Ultrasonography for Radiographers and Technologists- Latest edition
4. Tucker AK, Ng YY. Textbook of mammography. Churchill Livingstone; 2001.
5. Wentz G, Parsons WC. Mammography for radiologic technologists. McGraw-Hill, Health Professions Division; 1997.



**Course/Paper:**

**Orientation in Para Clinical Sciences Paper Code:**

**BRIT-304**

**Learning Objective**-The objective is to learn basic pathological condition related to cardiology, surgery, nephrology, orthopedic, gastrology, neurology and general medicine for diagnosis.

**Unit-I**

- Pericarditis
- Valvular diseases
- Rheumatic Heart Disease
- Heart failure
- Bronchitis
- Emphysema
- Bronchitis
- Pneumonia
- Tuberculosis
- Pleura effusion
- Pneumothorax

**Unit-II**

- Aclasiacardia
- Peptic ulcer
- Intestinal obstruction
- Crohn's disease
- Ulcerative colitis
- Pancreatitis
- Portal Hypertension
- Ascitis
- Cirrhosis
- Cholecystitis
- Melena
- Appendicitis

**Unit-III**

- Hematuria
- UTI
- Hydronephrosis
- Horseshoe Kidney
- Hydrocele
- Glomerulonephritis
- Nephrotic Syndrome
- Urinary calculi
- Polycystic Kidney disease
- Renal failure

#### Unit-IV

- Fracture
- Type Mechanism, Healing ,Delayed Union, Non-complication
- Injuries of the shoulder girdle, Dislocation of shoulder
- Injuries of the carpal
- Dislocation of Hip
- Femur ,Tibia, Ankle, calcaneum
- Acute& chronic osteoarthritis
- Rheumatoidarthritis
- Paget's Disease
- Ankylosings pondylitis
- Clubfoot
- Bone Tumor –Benign Malignant
- Perthes diseases

#### Unit-V

- Cholelithiasis
- Peritonitis
- Suprarenal Abscess
- Appendicitis
- Benign Hypertrophy prostate

**Learning Outcome** – At the end of the course, students will be expert in handling patients with different disease conditions referred to the radiology department. They will have the knowledge to allocate patients to various modalities according to their pathological condition.

#### Suggested Readings:

1. Kumar V, Abbas AK, Fausto N, Aster JC. *Robbins and Cotran Pathologic Basis of Disease, Professional Edition – E-Book*. Elsevier Health Sciences; 2014 Aug 27.
2. Mohan H. *Textbook of Pathology*. New Delhi: Jaypee Brothers Medical Publishers.
3. Boyd W. *A Textbook of Pathology: An Introduction to Medicine*. Academic Medicine.
4. David Sohn I, Henry JB, Todd JC. *Todd-Sanford Clinical Diagnosis by Laboratory Methods*.

**Course/Paper: Environmental**

**StudiesPaperCode: BRIT-305**

**Learning Objective-** To create ware ness among students about environment protection.

**Unit I (Lectures08)**

Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustain able development.

**EcologyandEnvironment:** ConceptofanEcosystem-itsstructureandfunctions, EnergyFlowin an Ecosystem, Food Chain, Food Web, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.

**Unit II (Lectures08)**

**Natural Resources:** Renewable & Non-Renew able resources; Land resources and land use change; Land degradation, Soil erosion & desertification. **Deforestation:** Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources:** Renew able & Non-Renewable resources, Energy scenario& use of alternate energy sources, Case studies.

**Biodiversity:** Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogas graphical Classification of India

**Unit III (Lectures08)**

**EnvironmentalPollutions:**Types,Causes,Effects&control;Air,Water,soil&noisepollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies

**Unit IV (Lectures08)**

**Environmental policies & practices: Climatechange & Global Warming** (Green house Effect), Ozone Layer-Its Depletion and Control Measures, Photochemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature serves, tribal population & Rights & human wildlife conflictsin Indian context

**Human Communities & Environment:**

Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case studies.

**Field Work:**

1. Visit to an area to document environmental assets; river/forest/flora-fauna etc.
2. Visit to a local polluted site: urban/rural/industrial/agricultural.
3. Study of common plants, insects, birds & basic principles of identification.
4. Study of simple ecosystem; Pond River etc.

**Learning Outcomes** – Based on this course, the forensic graduate will understand / evaluate / develop technologies on the basis of ecological principles and environmental regulations, which in turn helps in sustainable development. development

**Text Books:**

1. "Environmental Chemistry", De, A.K., New Age Publishers Pvt. Ltd.
2. "Introduction to Environmental Engineering and Science", Masters, G. M., Prentice Hall India Pvt. Ltd.
3. "Fundamentals of Ecology", Odum, E. P., W. B. Saunders Co.

**Reference Books:**

1. "Bio diversity and Conservation", Bryant, P.J., Hyper text Book
2. "Textbook of Environment Studies", Tewari, Khulbe & Tewari, I.K. Publication

**Course/Paper:** English Communication & Soft Skills-III

**Paper Code:** BRIT-399

**Module-1 Functional Grammar-II**

**(8 Lectures)**

- a) Sentence construction : Simple, Complex and Compound
- b) Application writing
- c) Paragraph writing, essay writing and précis writing
- d) Pre-testing of oral and writing skills

*[Note: As part of class room activity, Review and recap of last's master and update progress of each student refer Module 3 of Workbook]*

**Module-2 Professional Skills**

**(14 Lectures)**

- a) Bio data, CV and resume writing
- b) Joining Letter, Cover Letter & Resignation letter
- c) Inter-Office Memo, Formal Business Letter, Informal Notes
- d) Minutes of the Meeting, Reporting Events, Summary Writing

*[Note: As part of class room activity, use of standard templates and scenario buildings, practice session in class room and home work assignments, refer to Workbook]*

**Module-3 Presentation Skills**

**(10 Lectures)**

- a) Power-point presentations & presentation techniques
- b) Body language
- c) Describing people, places and events
- d) Extempore speech and Just- a minute sessions

*[Note: As part of classroom activity, practice sessions carried out in class on different topics of the domain expertise, refer to Work book]*

**Module-4 Interview Skills**

**(8 Lectures)**

- a) Developing skill to (a) Debate (b) Discussion, Basics of GD & styles of GD
- b) Discussion in groups and group discussion on current issues
- c) Steps to prepare for an interview and mock interviews

*[Note: As part of class room activity, language games, extensive coverage of contemporary issues for GDs, facing mock interview sessions with faculty, respective TPOs and Director CRC]*

**Reference Books\*:**

- ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation
- Communication Skills for Engineers and Scientists by Sangeeta Sharma & Binod Mishra, PHI Learning Private Limited, New Delhi
- Professional Communication by Malti Agarwal, Krishna Prakashan Media (P) Ltd., Meerut
- Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press
- The Business Letters by Madan Sood, Goodwill Publishing House, New Delhi



**Course/Paper: Radiographic Positioning-PartII (Practical)**  
**PaperCode: BRIT-351**

**Contents:**

Upper & Lower Extremities

Hand  
Fore  
armArm  
Thigh  
Leg  
Foot

Shoulder Joints

Basic & special projection  
Related radiological Pathology  
Basic & special positioning

Pelvis Griddle

Basic & special projection  
Related radiological Pathology  
Basic & special positioning

Whole Spine Positioning

Cervical spine  
Thoracic spine  
Lumbar spine, sacrum and coccyx

Paediatric Radiography

Special Positioning Views for all the X-Rays.

**References:**

- Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioning in Radiography 13E. CRC Press; 2015 Jul 28.
- Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy – E-Book. Elsevier Health Sciences; 2013 Aug 7.
- Bontrager KL, Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques – E-Book. Elsevier Health Sciences; 2017 Feb 10.
- Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures – E-Book. Elsevier Health Sciences; 2013 Aug 13.

## **B.Sc.MRITYear2 (Semester –IV)**

**Course/Paper: Conventional Radiographic Techniques-Part II**

**Paper Code: BRIT-401**

**Learning Objective**-the main objective is too aware the student about the convention al technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) a long with the image formation, developing and reading.

### **Unit-I**

#### **Portable & Mobile equipments**

Portable X-Ray Equipments

Mains requirements

Cable connections to wall plugs

Mobile X-Ray Equipments

X-Ray Equipments for the Operating Theatre

### **Unit-II**

#### **Fluoros copy Equipments**

Construction & Working principles of Image Intensifier

Direct Fluoroscopy

Viewing the Intensified image

recording the intensified Image

Digital fluoroscopy

### **Unit-III**

#### **Fluoroscopic/Radio graphic Tables**

General features of fluoroscopic/radio graphic able

the serial changer

Remote control tables

the spot film devices.

### **Unit-IV**

#### **Topographic Equipment**

Principles of tomography

Various types of tomographic movement

Equipment for tomography

### **Unit-V**

#### **Equipment for Crania land Dental radiography**

The skulltable

General Dental X-ray equipment

Pan Tomography equipment

Equipment for Cranial & skeletal radiography

## Direct and Indirect Radiography

**Learning out come-**At the end of the course, the students will have knowledge on:

- Mobile x-ray equipments and its application.
- Tomography equipments and its principles.
- Dental radiographic equipments and its applications.

### ***Suggested Readings:***

1. Curry TS, Dowdy JE, and Murry RC .Christensen's physics of diagnostic radiology. Lippincott Williams &Wilkins; 1990.
2. Brant WE, Helms CA, editors. Fundamental soft diagnostician biology. Lippincott Williams & Wilkins; 2012Mar20.
3. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.
4. Adam A, Dixon AK, Gillard JH,Schaefer-ProkopC,GraingerRG,AllisonDJ.Grainger&Allison'sDiagnostic Radiology-Book .El Sevier Health Sciences.
5. DN and MO Chesney-X ray equipments for student radiographers-Third edition
6. Burgener FA, Korman M. Differential diagnosisin convention al radiology.



The logo of Sunrise University is a shield-shaped emblem. The top half is yellow with a sunburst design. The bottom half is green with the text 'SunRise UNIVERSITY' in white and 'ALWAR' in yellow below it.

SunRise  
UNIVERSITY  
ALWAR

**Course/Paper: Special Radiographic Procedure**

**Paper Code: BRIT-402**

**Learning Objective-** The objective is to learn contrast imaging techniques under the guidance of flour copy, administration of contrast media and its safety aspect.

**Unit-I**

**Introduction to Radiographic Special Procedures**

**Contrast Media-** Application, types, safety aspects & administration, Reaction to contrast media and management of contrast reactions.

**Unit-II**

- Bariums  
wallow, Barium  
meal
- Bariummeal follow through(BMFT)
- Barium enema

**Unit-III**

- Intravenousurogram(IVU),
- Micturating Cystoure trigram(MCU),
- Ascending Urethrogram(ASU)/RGU
- Hysterosalpin geography(HSG)

**Unit-IV**

- Xylography
- ERCP/PTBD,PTC,T-tubecholan giography

**Unit-V**

- Sialography,
- Dacrocystography,
- Sinogram,
- Fistulogram,
- FNAC
- Biopsy

**Indications, contraindication sprocedure and technique of all procedures**

**Learning outcomes-**At the end of the course, student will have knowledge on:

- Barium enhanced Gastrointestinal tract studies
- Iodinated contrast media enhanced urinary tract and female reproductive system studies
- Interventional procedures of different ducts, fluid aspiration & tissue extraction.

***Suggested Readings:***

- Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. *Clark's Positioning in Radiography*, 13th Edition. CRC Press; 2015 Jul 28.
- Bontrager KL, Lampignano J. *Textbook of Radiographic Positioning and Related Anatomy – E-Book*. Elsevier Health Sciences; 2013 Aug 7.
- Bontrager KL, Lampignano J. *Bontrager's Handbook of Radiographic Positioning and Techniques – E-Book*. Elsevier Health Sciences; 2017 Feb 10.
- Frank ED, Long BW, Smith BJ. *Merrill's Atlas of Radiographic Positioning and Procedures – E-Book*. Elsevier Health Sciences; 2013 Aug 13.



**Course/Paper:** Computed Tomography  
**Paper Code:** BRIT-403

**Learning Objective:**

The objective is to introduce cross-sectional imaging of different anatomical areas along with their associated pathologies.

---

***Unit-I***

**Introduction to Computed Tomography and Principles of CT**

- History of CT
- Advantages and disadvantages of CT
- Basic principles of CT

**Generations of Computed Tomography**

- 1st Generation
- 2nd Generation
- 3rd Generation (Slipping technology)
- 4th Generation
- Electron Beam CT
- Dual Source CT
- Flat Panel Detector CT
- Single and Multi-line Technology

---

***Unit-II***

**Instrumentation**

- CT scanner gantry
- Detectors & Data Acquisition System
- Generator
- Computer and image processing system
- Image display system, storage, recording, and communication system
- CT console: options and accessories for CT systems

---

***Unit-III***

**Image Reconstruction**

- Basic principles
- Reconstruction grids
- Image reconstruction from projections
- Types of data reconstruction

## **Image Display and Image Quality**

- Image formation and representation
- Image processing
- Pixel and voxel
- CT number, window level, and window width
- Image quality: resolution, contrast, sharpness, noise properties

---

### ***Unit-IV***

#### **CT Artifacts**

- Classification
- Types
- Causes
- Remedies

---

### ***Unit-V***

#### **Diagnostic Aspects of CT and Post-Processing Techniques**

- High-Resolution CT (HRCT)
- Isotropic imaging
- Patient management: preparation and positioning
- Technologist roles
- Protocols for whole-body imaging
- Clinical applications: 2D & 3D imaging, MPR, SSD, Volume Rendering, Bone Mineral Density (BMD)

---

### ***Learning Outcomes***

At the end of the course, students will have knowledge of:

- Working principles, construction, and clinical applications of Computed Tomography
- CT instrumentation: gantry system, console system, recording, and display system
- Image reconstruction techniques: pre- and post-processing techniques

### ***Suggested Readings:***

1. Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical Applications, and Quality Control. Elsevier HealthSciences; 2015 Sep 2.
2. Seeram E. Computed tomography: physical principle and recent technical advances. Journal of Medical Imaging and Radiation Sciences. 2010.
3. Kak AC, Slaney M. Principles of computerized tomographic imaging. Society for Industrial and Applied Mathematics; 2001 Jan 1

## Course/Paper: Radiation Protection and Quality Assurance

### Paper Code: BRIT-404

**Learning Objective-** The objective is to learn aim, objective, philosophy and principle of radiation protection to protect oneself from biological effect of radiation and monitoring of radiation exposure.

#### Unit-1

- **Introduction to Radiation Protection, Units & Quantities-** Primary, secondary radiation, need for radiation protection, Exposure, Absorbed dose, absorbed dose equivalent, Effective dose, air KERMA, Radiation weighting factor, Tissue weighting factor, MPD
- **Aim & Principle of Radiation Protection-** Concept of ALARA, Cardinal Principle, ICRP Regulation, Radiation Protection in: Radiography, CT, Fluoroscopy, Mammography, Ward radiography, radiation shielding.

#### Unit-II

- **Radiation monitoring:** Personnel – Film badge, TLD, OSLD, pocket dosimeter, Area monitoring Devices.
- **Radiobiology:** Radiolysis of water, Direct & Indirect effects of radiation, Stochastic, Deterministic effects, Somatic, Genetic effects, dose relationship, Antenna exposure. 10 day rule, 14 day rule, 28 day rule, structural shielding, work load, use factor, occupancy factor.

#### Unit III

- **Quality Control and Assessment in Radiology:** Quality Assurance and quality control of Modern Radiological and Imaging Equipment which includes Digital Radiography, Computed Radiography, CT scan, MRI Scan, Ultrasonography and Teleradiology and PACS related.

#### Unit IV

- **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.

#### Unit-V

- **Role of Radiographer in Planning, QA & Radiation Protection:** Role of technologist in radiology department- Personnel and area monitoring. ICRP, NRPB, NCRP and WHO guidelines for radiation protection, pregnancy and radiation protection. NABH guidelines, AERB guidelines, PNDTA standards and guidelines.

## Learning Outcomes

At the end of the course, students will have knowledge of:

- Radiobiology and its energy determinants
- Quality control and assessment of equipment installed in the radiology department
- Layout planning of radiology departments according to ICRP and AERB recommendations

---

## Suggested Readings

1. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. *Radiation Protection in Medical Radiography - E-Book*. Elsevier Health Sciences; 2014 Mar 12.
2. Brandon AN, Hill DR. *Selected List of Books and Journals in Allied Health*. Bulletin of the Medical Library Association; 1996.
3. Long BW, Frank ED, Ehrlich RA. *Radiography Essentials for Limited Practice - E-Book*. Elsevier Health Sciences; 2016 Sep 6.
4. Duran SA, Iliac, editors. *Radon Measurements by Etched Track Detectors: Applications in Radiation Protection, Earth Sciences and the Environment*. World Scientific.
5. Turner JE. *Atoms, Radiation, and Radiation Protection*. John Wiley & Sons; 2008 Jan 8.
6. [www.AERB.com](http://www.AERB.com) (Guidelines and Details of Quality Control in Radiology).



**Course/Paper: Orientation in Clinical Sciences**

**Paper Code: BRIT-405**

**Learning Objective-**The objective is to learn basic medical pathologies for the image in perpetration and diagnosis.

**Unit-I**

- Meningitis
- CerebralVascular Disorders
- Encephalitis
- Sinusitis
- Polyps
- DNS
- OtitisMedia
- Tonsillitis
- CSFRhinorea

**Unit-II**

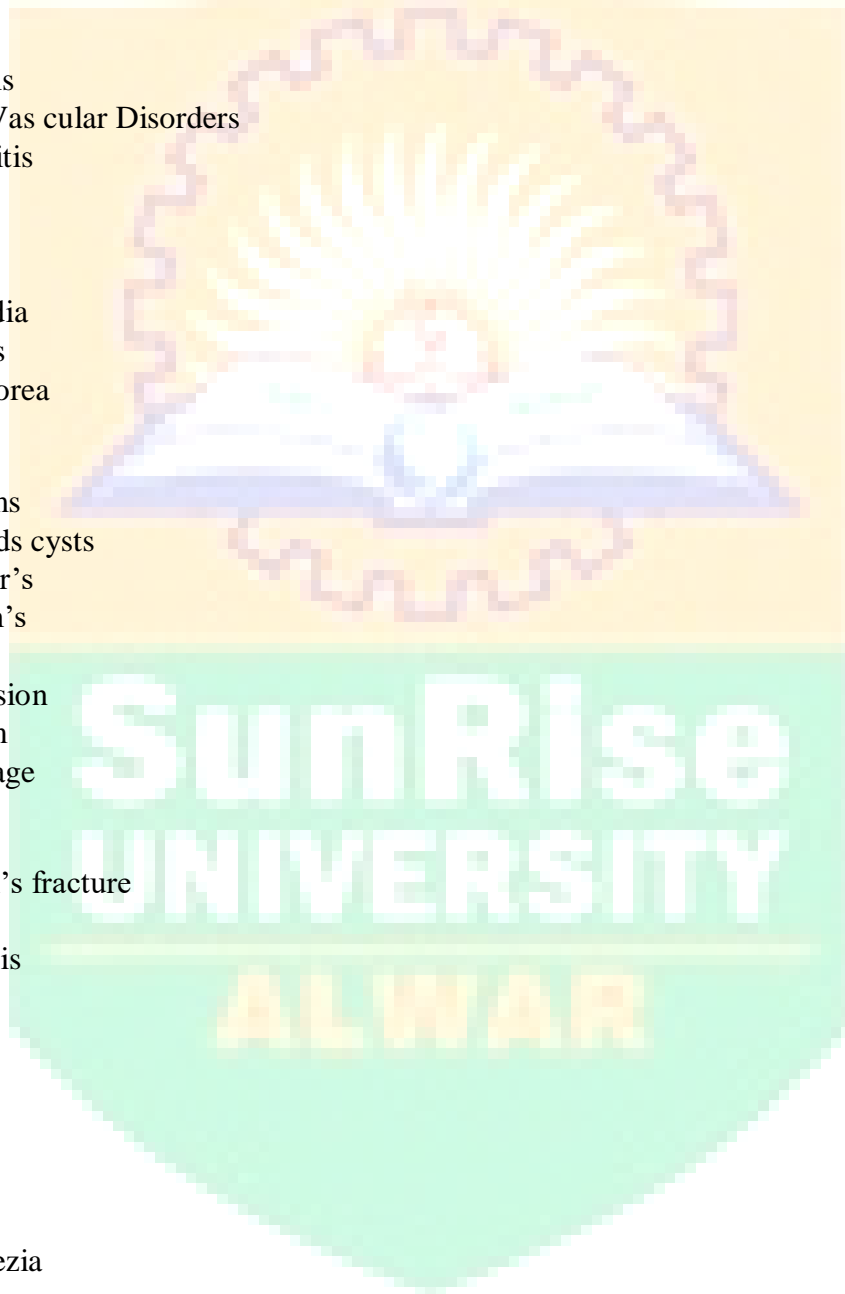
- Aneurysms
- Arachnoids cysts
- Alzheimer's
- Parkinson's
- Shock
- Hypertension
- Embolism
- Hemorrhage

**Unit-III**

- Hangman's fracture
- Dashikis
- Spondylitis
- IVDP
- Scoliosis
- Pott's
- TBSpine
- Hypnosis

**Unit-IV**

- Hematocezia
- Anemia
- Leukemia
- Epilepsy
- COPD



- Asthma
- Emphysema
- Hepatitis
- Diabetes Mellitus
- Varicose Vein
- DVT

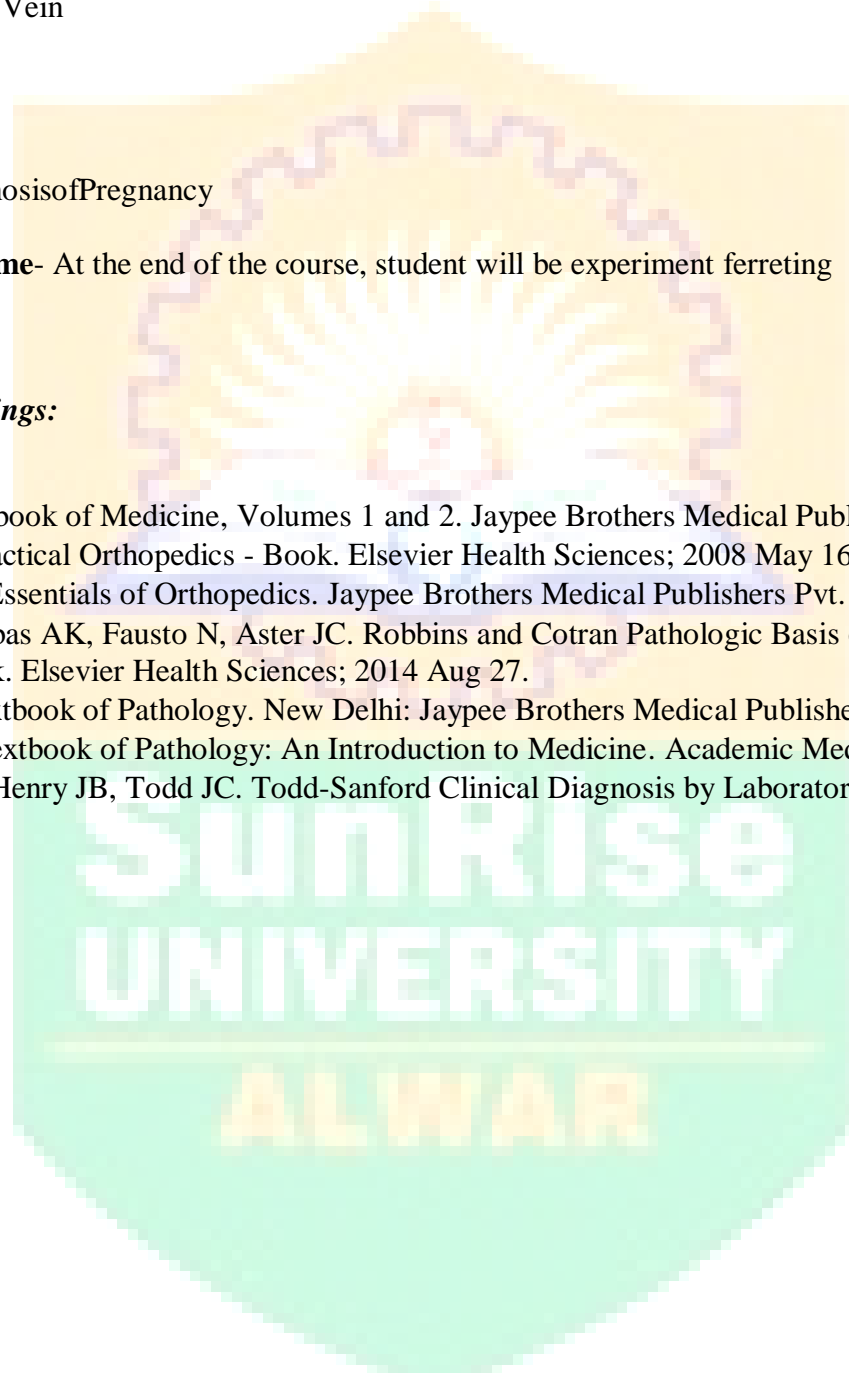
### **Unit-V**

Obstetrics-Diagnosis of Pregnancy

**Learning outcome-** At the end of the course, student will be experiment ferreting pathologies.

#### ***Suggested Readings:***

- Das KK. Textbook of Medicine, Volumes 1 and 2. Jaypee Brothers Medical Publishers (P) Ltd; 2002.
- Mercier L. Practical Orthopedics - Book. Elsevier Health Sciences; 2008 May 16.
- Shenoy RM. Essentials of Orthopedics. Jaypee Brothers Medical Publishers Pvt. Limited; 2015.
- Kumar V, Abbas AK, Fausto N, Aster JC. Robbins and Cotran Pathologic Basis of Disease, Professional Edition - E-Book. Elsevier Health Sciences; 2014 Aug 27.
- Mohan H. Textbook of Pathology. New Delhi: Jaypee Brothers Medical Publishers.
- Boyd W. A Textbook of Pathology: An Introduction to Medicine. Academic Medicine.
- Davidsohn I, Henry JB, Todd JC. Todd-Sanford Clinical Diagnosis by Laboratory Methods



**Course/Paper: English Communications & Soft Skills -IV**

**Paper Code: BRIT- 499**

**Module-1 Fundamentals of Time Management & Managing Change (12 Lectures)**

- a) Time Management
- b) Managing People and managing change
- c) Team building, Leadership and taking decisions
- d) Stress Management

*[Note: As part of class room activity, refer to the Work book, guest lecture by management faculty]*

**Module-2 Public Speaking (8 Lectures)**

- a) Art of public speaking
- b) Welcome speech
- c) Farewell Speech
- d) Vote of thanks

*[Note: As part of class room activity, extensive practice sessions in class and home assignments]*

**Module-3 Personality Development-III (8 Lectures)**

- a) Rude vs Polite Behaviour
- b) Ethics and human values
- c) Concern for environment
- d) Crisis Management

*[Note: As part of classroom activity, refer to the Workbook, guest lecture by management faculty and industry representative]*

**Module-4 Oral Practice (12 Lectures)**

- a) Debate
- b) Just-a-minute
- c) Group Discussions
- d) Mock Interviews

*[Note: As part of class room activity, extensively test the oral skills and update the progress card of each student]*

**Reference Books \*:**

1. ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation
2. Communication Skills for Engineers and Scientists by Sanpete Sharma & Bind Mishra, PHIL earning Private Limited, New Delhi.
3. Professional Communication by Malti Agarwal, Krishna Prakashan Media (P) Ltd., Meerut.
4. Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press
5. The Business letters by Madam Sood, Good will Publishing House, New Delhi

## Practical syllabus

### **Course/Paper: Special Procedures in Radiography (Practical)**

**Paper Code: BRIT-451**

#### **Course Content:**

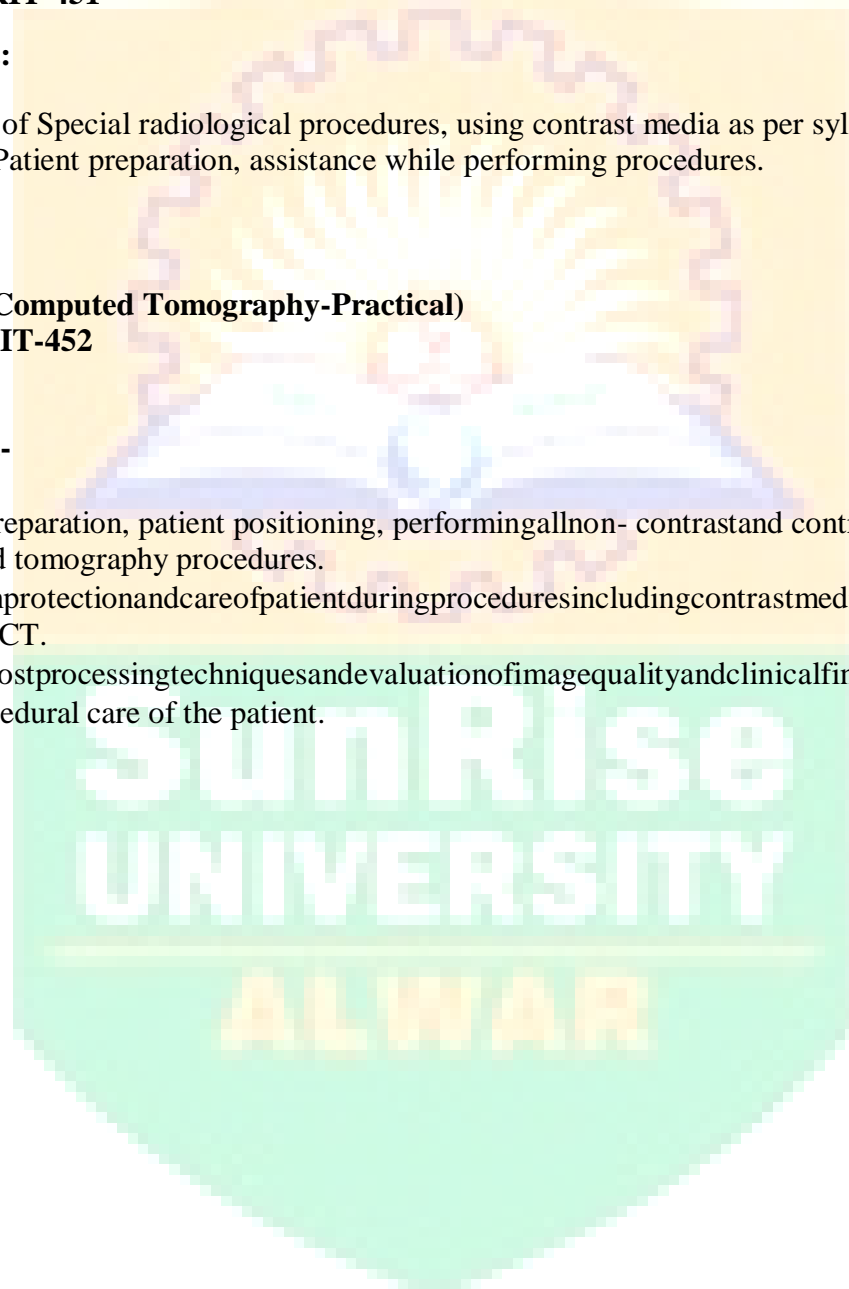
1. Radiography of Special radiological procedures, using contrast media as per syllabus.
2. Positioning, Patient preparation, assistance while performing procedures.

### **Course/Paper: Computed Tomography-Practical)**

**PaperCode: BRIT-452**

#### **Course Content-**

- Patient preparation, patient positioning, performing all non-contrast and contrast computed tomography procedures.
- Radiation protection and care of patient during procedures including contrast media Management in CT.
- Various post processing techniques and evaluation of image quality and clinical findings.
- Post procedural care of the patient.



## B.Sc.RIT Year3 (Semester-V)

**Course/Paper: Magnetic Resonance**

**ImagingPaperCode: BRIT-501**

**Learning Objective-**The objective is to induce an on cross sectional imaging of different and at comical area along with the different pathologies related to musculoskeletal, soft tissue imaging.

### **Unit-1**

#### **Introduction and Basic Principle of Magnetic Resonance Imaging**

History of MRI, Electricity & Magnetism, Laws of magnetism, Atomic structure, Motion within the atom, The Hydrogen nucleus,

Precession, Larmor equation, Resonance, MR signal, free induction decay signal, Relaxation, T1 recovery, T2 decay, Pulse timing & parameters.

### **Unit-II**

#### **MRI Hardware**

Introduction, Permanent magnets, Electromagnets, Superconducting magnets, Fringe fields, Shimcoils, Gradient coils, Radio-frequency coils, the pulse control units, Patient transportation system, Operator interface

#### **Encoding, Data collection & Image formation**

Introduction, Gradients, Slice selection, Frequency encoding, Phase encoding, Scan timing, Sampling,  $k$ -space,  $k$ -space filling and fast Fourier transformation.

### **Unit-III**

#### **Pulse sequences**

Introduction To basic pulse sequences.

Spin echo sequences,

Conventional spin echo, Fast spin echo

Inversion recovery,

STIR, FLAIR

Proton Density Imaging,

Gradient echo pulse sequences

Conventional gradient echo, The steady state, SSFP, Coherent residual transverse magnetization,

Incoherent residual transfer saturation, Ultra-fast imaging, Advanced imaging techniques,

EPI

#### **MRI parameters & Tradeoffs**

Introduction, Signal to Noise Ratio (SNR) & How to increase SNR, Contrast to Noise Ratio (CNR), Spatial resolution & how to increase the spatial resolution, Scan time & how to reduce time, Tradeoffs, Decision making, Volume imaging.

## **Unit-IV**

### **MRI Artifacts**

Introduction, Phase mis-mapping, Aliasing or wrap around, Chemical shift artefact, Chemical misregistration, Truncation artefact/Gibbs phenomenon, Motion of the patient

Magnetic susceptibility artefact, Magic angle artefact, Zipper artefact, shading artefact Cross excitation and cross talk

### **MRI contrast agents**

## **Unit-V**

### **Flow Phenomena & MRI angiography**

Introduction, The mechanism of flow, Time of flight phenomenon, Entry slice phenomenon, Intravoxel Rephasing. **Flow phenomena compensation**-Gradient moment rephrasing, Presaturation, Echo rephrasing, MR Angiography.

### **Clinical Applications, Scanning Protocols and Safety aspects**

Protocols for whole body imaging, The minimum notified, Gradient magnetic field, Radiofrequency fields, Projectiles, Implants and prostheses, Pace makers, Medical emergencies, Patient monitoring, Monitors and devices in MRI Claustrophobia, Quenching, Safety tips, Layout planning.

**Learning outcome**- At the end of the course, student will have an abundant knowledge on.

- Principle, instrumentation, and application of MRI
- MRI hardware and software
- Imaging sequences (pulse sequences, gradient sequences, angiography)
- Quality assurance and controls.

### **Suggested Readings:**

1. McRobbie DW, Moore EA, Graves MJ. *MRI from Picture to Proton*. Cambridge University Press; 2017 Apr 13.
2. Huettel SA, Song AW, McCarthy G. *Functional magnetic resonance imaging*. Sunderland: Sinecure Associates; 2004 Apr 1.
3. Westbrook, Catherine, and Carolyn Kaut Roth. *MRI in Practice*. John Wiley & Sons.
4. Westbrook, Catherine. *Hand book of MR I technique*. John Wiley & Sons, 2014.
5. Miller, Torsten B., and Emil Reif. *MRI parameters and positioning*. Thieme, 2010.
6. Dale BM, Brown MA, Semelka RC. *MRI: basic principles and applications*. John Wiley & Sons; 2015 Aug 6.

**Course/Paper:NuclearMedicineTechnology)P  
aperCode:BRIT-502**

**Learning Objective**-The objective is to learn basic about the radio activity and radioactive nuclides.

**Unit-1**

**Introduction to NMT and Radio active Transformation**

Basic atomic and nuclear physics, History of radioactivity, Units & quantities, Isotopes, Isobars, Isomers, Radioactivity and half life, Exponential decay ,specific activity, Modes of Radioactivedecay,parentdaughterdecay.

**Unit-II**

**Production of Radionuclides**

Reactor produced radionuclide, Reactor principles; Accelerator produced radionuclide, Radionuclide generators.

**Unit-III**

**Radio pharmacy &  
Handling & Transport of Radio-nuclides**

Cold kits, Radio pharmacy used in Nuclear medicine, Radio pharmaceuticals used in various procedures, Safe handling of radio active materials, Procedures for handling spills

**Unit-IV**

**Equipments of NMT**

Gammacamera,PET,SPECT(working principle)

**Learning out come**-At the end of the course, student will have knowledge on:

- Basic principle, instrumentation and clinical application of nuclear medicine Technology.
- Radio active transformation
- Production, handling & transportation of radio-nuclides.

**Suggested Readings:**

1. Cherris, Sorenson, PhelpsME.Physics inNuclear MedicineE-Book.Elsevier Health Sciences;2012Feb14.
2. Boxford CK,Miller J,Kunkler H ,SherriffIH,Bomford SB,IHK unkler SB.Walter and Miller's text book of radio the rapy: radiation physics, the rapy, and oncology.1993.
3. Sutton,David."A text book of radio logyand imaging."(1987).
4. Waterstram-Rich KM, Gilmore D. Nuclear Medicine and PET/CT-E-Book: TechnologyandTechniques.ElsevierHealthSciences;2016Jul30.
5. BaileyDL,TownsendDW, ValkPE,MaiseyMN. Positronemission tomography.London:Springer;2005

**Course/Paper: Patient Care and**

**Management Paper Code: BRIT-503**

**Learning Objective-**The objective is to learn about the assessment and handling emergencies in the department as well as the infection control amongst self and the patient.

**Unit-1**

**Patient care and Assessment**

Taking history, Assessing current physical status, Skin temperature, colour, consciousness, Breathing, Obtaining Vitals signs, Electronic Patient Monitoring.

**Unit-II**

**Responsibilities of the Imaging Technologist-** Medication administration, routes of administration, List of frequently used medications

**Patient transfer technique & Restraint technique-**Preparation for transfer, wheel chair transfer, street chair transfer, immobilization techniques

**Unit-III**

**Handling the emergencies in Radiology**

Reaction to contrast media, Oxygen administration and suction, Respiratory emergencies, Cardiac emergencies, Trauma, Shock

**Patient care during Investigation-** G.I. Tract, Biliary tract, Respiratory tract, Gynecology, Cardiovascular, Lymphatic system, C.N.S. etc

**Unit-IV**

**Infection Control**

Microorganism- Bacteria, Viruses, Fungi, Prions,

Protozoa Cycle of Infection

Immunity, Infectious disease

Transmission

modes Isolation techniques

Sterilization & sterile techniques

**Unit-V**

**Patient Education & Communication**

patient communication problems Explanation of examinations

Radiation Safety /

Protection Interacting with terminally ill

patient Informed Consent

## ***Learning Outcomes***

At the end of the course, students will have knowledge of:

- Communication with patients, as well as taking patient history and consents
- Handling patients in different conditions
- Sterilization techniques, medication administration, and infection control

---

## ***Suggested Readings***

1. Ehrlich RA, Coakes DM. *Patient Care in Radiography - E-Book: With an Introduction to Medical Imaging*. Elsevier Health Sciences; 2016 Jan 19.
2. Bontrager KL, Lampignano J. *Textbook of Radiographic Positioning and Related Anatomy - E-Book*. Elsevier Health Sciences; 2013 Aug 7.
3. Grol R, Wensing M, Eccles M, Davis D, editors. *Improving Patient Care: The Implementation of Change in Healthcare*. John Wiley & Sons; 2013 Mar 18.
4. Brant WE, Helms CA, editors. *Fundamentals of Diagnostic Radiology*. Lippincott Williams & Wilkins; 2012 Mar 20.



**Course/Paper:** Interventional Procedure and Techniques

**Paper Code:** BRIT-504

**Learning Objective:**

The objective is to learn about special procedures performed using interventional approaches in the radiology department with the help of radiological equipment.

---

***Unit-I***

**Introduction to Interventional Radiology, Contrast Media & Emergency Drugs**

- Need for interventional procedures
- Informed consent, patient care, patient preparation, and patient monitoring
- Role of technologist in interventional procedures
- Types of contrast media, methods of administration, contraindications, contrast reaction management
- Emergency crash cart

---

***Unit-II***

**Angiographic Equipment, Catheters & Guidewires**

- Basics of angiographic equipment
- Single and biplane angiographic equipment
- Angiographic table, image intensifier, flat panel detector, electromechanical injectors
- Catheters: types of catheters & guidewires
- Seldinger technique

---

***Unit-III***

**Digital Subtraction Angiography (DSA)**

- Types
- Instrumentation

---

***Unit-IV***

**Sterile Techniques & Radiation Protection**

- Laying up a sterile trolley
- Sterile techniques
- Radiation protection for staff and patients
- Protective devices and monitors

---

## *Unit-V*

### **Interventional Procedures**

- Cardiac
- Vascular
- Non-vascular

---

### *Learning Outcomes*

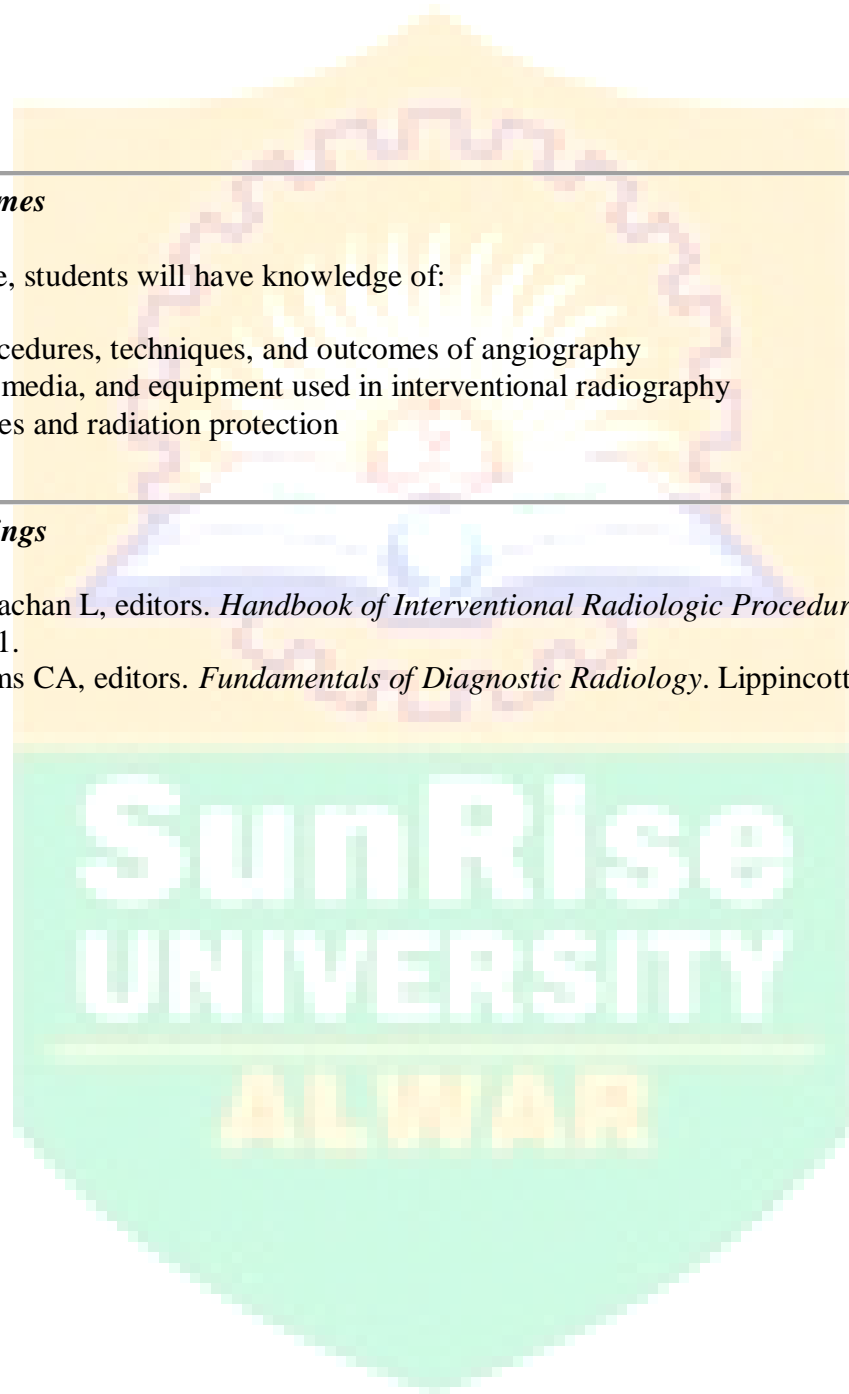
At the end of the course, students will have knowledge of:

- Equipment, procedures, techniques, and outcomes of angiography
- Drugs, contrast media, and equipment used in interventional radiography
- Sterile techniques and radiation protection

---

### *Suggested Readings*

1. Kandarpa K, Machan L, editors. *Handbook of Interventional Radiologic Procedures*. Lippincott Williams & Wilkins; 2011.
2. Brant WE, Helms CA, editors. *Fundamentals of Diagnostic Radiology*. Lippincott Williams & Wilkins; 2012 Mar 20.



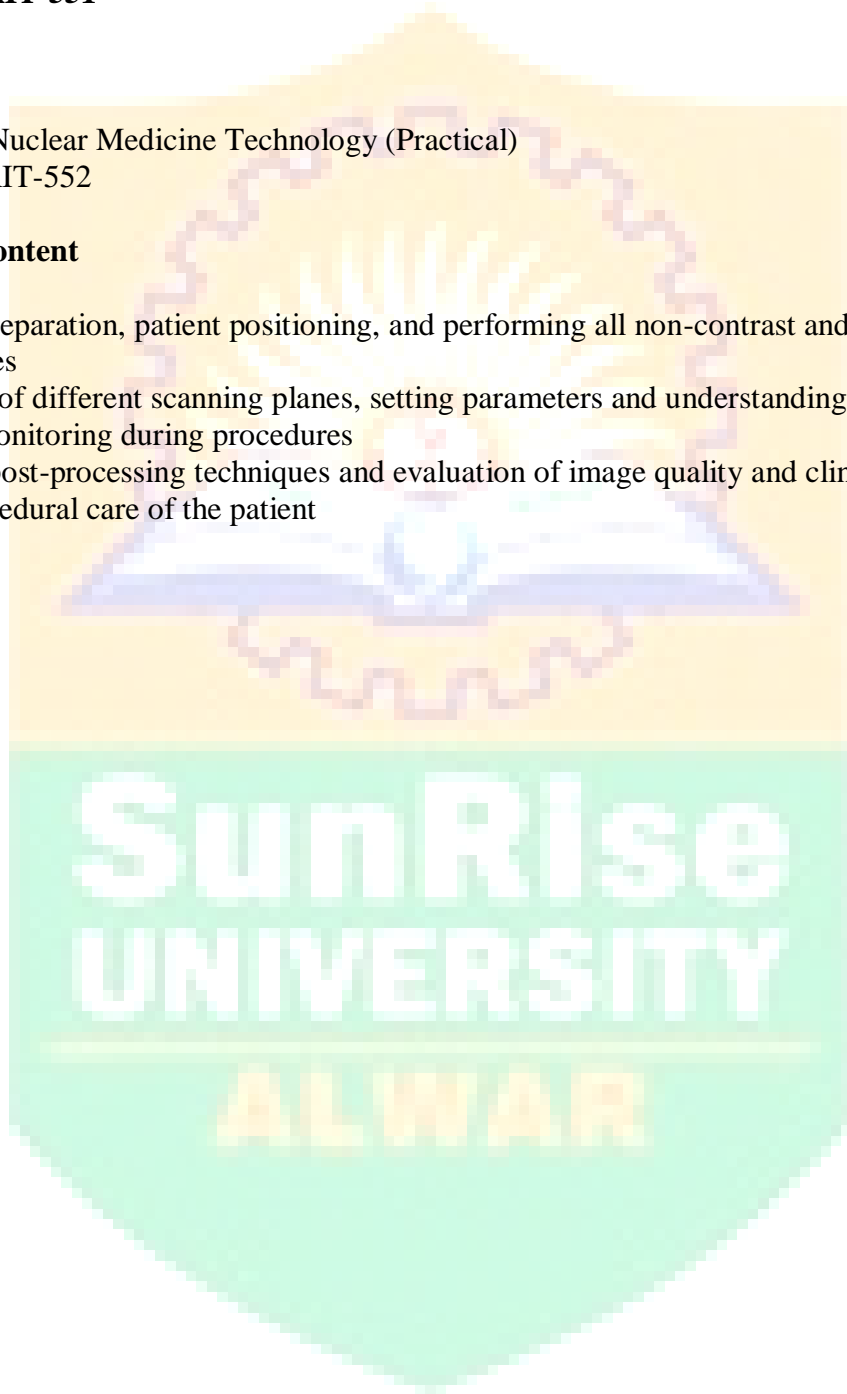
**Course/Paper: Magnetic Resonance Imaging (Practical)**  
**Paper Code: BRIT-551**

**CourseContent:**

**Course/Paper: Nuclear Medicine Technology (Practical)**  
**Paper Code: BRIT-552**

**Course Content**

- Patient preparation, patient positioning, and performing all non-contrast and contrast MRI procedures
- Planning of different scanning planes, setting parameters and understanding their trade-offs, and patient monitoring during procedures
- Various post-processing techniques and evaluation of image quality and clinical findings
- Post-procedural care of the patient



## B.Sc.RITYear3 (Semester–VI)

**Course/Paper:** Biostatistics & Research Methodology

**Paper Code:** BRIT-601

**Learning Objective:**

The objective is to learn about biostatistics, various research methodologies, and methods of research analysis.

---

### *Unit-I*

#### **Introduction I: Biostatistics**

- Definition
- Role of statistics in health science and healthcare delivery systems

#### **Introduction II: Research Methodology**

- Research process
  - Steps involved in the research process
  - Research methods and methodology
- 

### *Unit-II*

#### **Accessing Research Literature**

- Use of databases and other sources
- 

### *Unit-III*

#### **Understanding Research Design**

- Qualitative and quantitative methodologies – differences and potential integration
  - Evaluating research and its potential for informing practice
  - Developing research questions and devising methods for their investigation
  - Ethical issues in research
- 

### *Unit-IV*

#### **Analysis**

- Analysis of qualitative and quantitative data
- Utilization of appropriate software to assist in the retrieval of information and data analysis

---

*Unit-V*

**Clinical Audit**

- Distinctiveness of research and audit processes and their functions

**Research Skills and Management**

- The role of evidence-based practice within health and welfare

---

*Learning Outcomes*

At the end of the course, students will have knowledge of:

- Biostatistics and research methodology
  - Assessment and design of research
  - Clinical audit and data analysis
- 



***Suggested Readings:***

1. Mahajan BK: Method sin Bio statistics for medical student sander search workers,6theditionJaypee,1997
2. KothariCR.ResearchMethodology (Methods&Techniques) WileyEasternLimited.New Delhi.
3. Rao, PSSS under, and J. Richard. *Introduction to bio statistic sander search methods*.PHILearningPvt.Ltd., 2012.
4. PaganoM, GauvreauK, PaganoM.Principlesofbiostatistics.PacificGrove, CA: Duxbury; 2000Mar.
5. Norman, Geoffrey R., and David L. Streiner. *Biostatistics: the bareessentials*.PMPH-USA, 2008.
6. Neuman, W. Lawrence, and Karen Robson .*Basic sofsocialre search*. Pearson Canada.
7. Strauss,A.,andJ.Corbin.*Basicsofqualitativere searchtechniques*.Sagepublications.
8. Corbin, Juliet, Anselm Strauss, and Anselm L. Strauss. *Basics of qualitative search*. Sage, 2014.
9. Mackey, Alison, and Susan M.Gass. Second language search: Methodology and design. Rutledge, 2015.



**Course/Paper:** Clinical Aspect in Radio Imaging

**Paper Code:** BRIT-602

**Learning Objective:**

The objective is to learn about the clinical aspects in various radio imaging modalities.

---

**Content**

Scanning protocol, indications, patient preparation, and image quality:

- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Nuclear Medicine Technology
- Ultrasonography
- Mammography
- Digital Radiography
- Interventional Radiology

Based on clinical exposure and practices.

---

**Learning Outcome**

At the end of the course, students will have knowledge of:

- Scanning protocols
- Indications for various imaging modalities
- Patient preparation procedures
- Ensuring optimal image quality

---

**Suggested Readings**

1. Standring S, editor. Gray's Anatomy E-Book: The Anatomical Basis of Clinical Practice. Elsevier Health Sciences; 2015 Aug 7.
2. White SC, Pharoah MJ. Oral Radiology - E-Book: Principles and Interpretation. Elsevier Health Sciences; 2014 May 1.
3. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology - E-Book. Elsevier Health Sciences; 2014 Jun 16.
4. Reimer P, Parizel PM, Meaney JF, Stichnoth FA, editors. Clinical MR Imaging. Springer-Verlag Berlin Heidelberg; 2010.
5. Webb WR, Brant WE, Major NM. Fundamentals of Body CT - E-Book. Elsevier Health Sciences; 2014 Sep 5.
6. RSNA (Journals from Radiological Society of North America)

**Course/Paper: Advance CT MRI and USG**  
**Paper Code: BRIT-603**

**Learning Objective - The objective is to learn about the recent advancements & new imaging modalities.**

**Outline of advanced CT/MRI/USG & Doppler**

---

***Unit I***

Helical CT scan: Slip ring technology, advantages, multidetector array helical CT, cone-beam geometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy, HRCT, post processing techniques: MPR, MIP, MinIP, 3D rendering: SSD and VR, CT dose.

---

***Unit II***

MRI imaging methods – Head and Neck, Thorax, Abdomen, Musculoskeletal System imaging, clinical indications and contraindications, types of common sequences on imaging.

Protocols for various studies – slice section – patient preparation – positioning of the patient.

Plain studies – contrast studies – special procedures – reconstructions – 3D images – MRS blood flow imaging, diffusion/perfusion scans, strength and limitations of MRI, role of radiographer.

---

***Unit III***

Techniques of sonography – selection – preparations – instructions and positioning of patient for TAS, TVS, TRUS, neck USG and extremities – biopsy procedures, assurance to patients.

---

***Unit V***

CT of head and neck – thorax – abdomen – pelvis – musculoskeletal system – spine – PNS.

Anatomy – clinical indications and contraindications – patient preparation – technique – contrast media – types, dose, injection technique; timing, sequence – image display – patient care – utilization of available techniques & image processing facilities to guide the clinician – CT anatomy and pathology of different organ systems.

---

***Learning Outcome - At the end of the course, student will have knowledge on:***

- Latest upgraded hardware & software of different imaging modalities.
- New techniques used to achieve images for special conditions.

***Suggested Readings:***

- Faro SH, Mohamed FB, editors. Functional MRI: basic principles and clinical applications. Springer Science & Business Media; 2006 Nov 22.
- Baert AL. Parallel imaging in clinical MR applications. Springer Science & Business Media; 2007 Jan 11.
- Johansen-Berg H, Behrens TE, editors. Diffusion MRI: from quantitative measurement to in vivo neuroanatomy. Academic Press; 2013 Nov 4.
- Bernstein MA, King KF, Zhou XJ. Handbook of MRI pulse sequences. Elsevier.
- Wakefield RJ, D'Agostino MA. Essential Applications of Musculoskeletal Ultrasound in Rheumatology E-Book: Expert Consult Premium Edition. Elsevier Health Sciences.
- Bowra J, McLaughlin RE. Emergency Ultrasound Made Easy E-Book. Elsevier Health Sciences; 2011 Oct 24.
- Buzug TM. Computed tomography: from photon statistics to modern cone-beam CT. Springer Science & Business Media; 2008 May 20.
- Recent Trends in Medical Imaging (CT, MRI and USG).
- RSNA (Journals from Radiological Society of North America).



**Course/Paper: Seminars, Journal Clubs and Procedures**

**Paper Code: BRIT-604**

**Learning Objective - The objective is to expertise the student in presenting seminars for improvement of self confidence.**

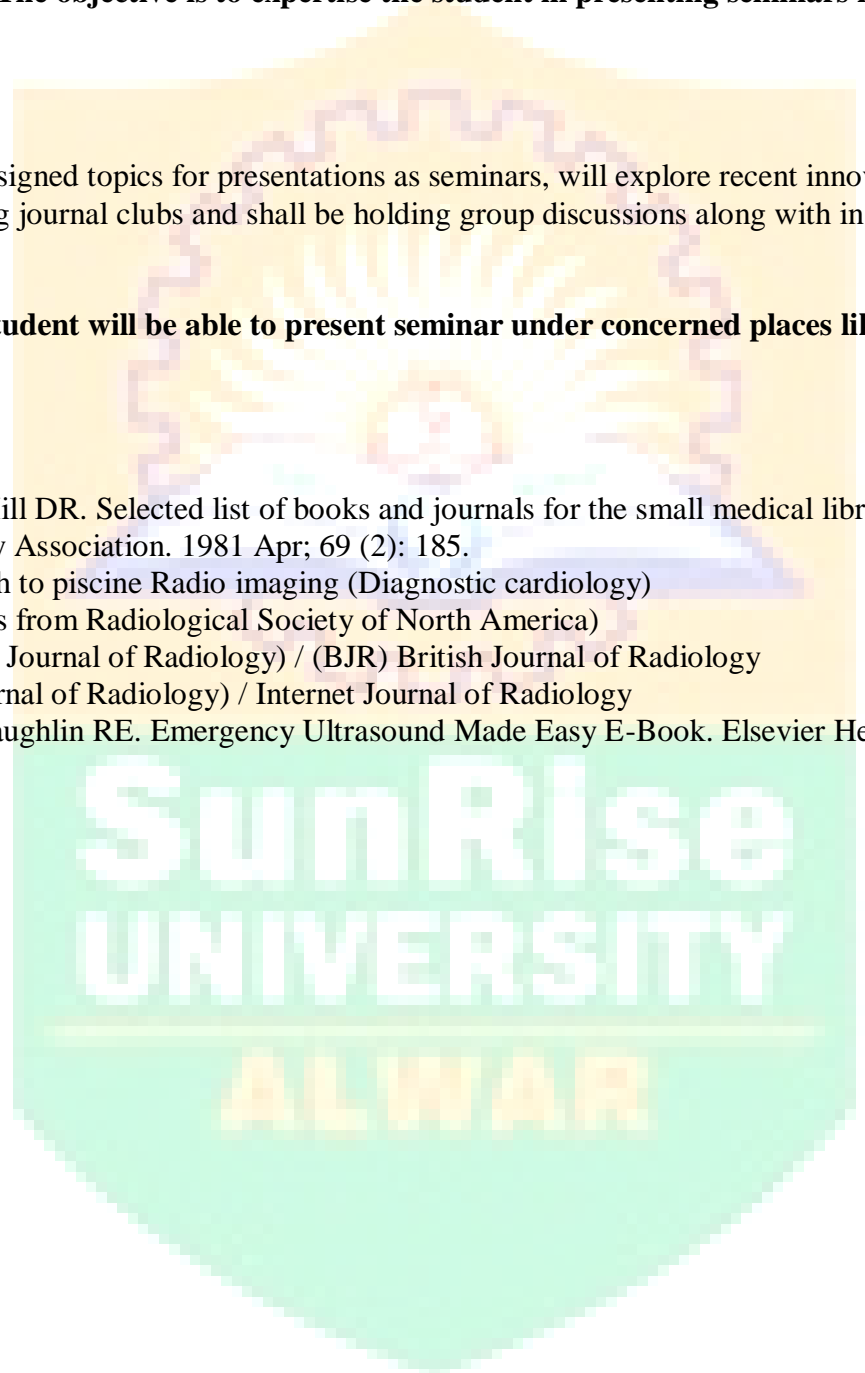
**Contents:**

Each student will be assigned topics for presentations as seminars, will explore recent innovations in MRIT for presenting topics during journal clubs and shall be holding group discussions along with in the presence of faculty.

**Learning outcome - student will be able to present seminar under concerned places like conferences, workshops, meets etc.**

**Suggested Readings:**

1. Brandon AN, Hill DR. Selected list of books and journals for the small medical library. Bulletin of the Medical Library Association. 1981 Apr; 69 (2): 185.
2. Recent Research to piscine Radio imaging (Diagnostic cardiology)
3. RSNA (Journals from Radiological Society of North America)
4. AJR (American Journal of Radiology) / (BJR) British Journal of Radiology
5. IJR (Indian Journal of Radiology) / Internet Journal of Radiology
6. Bowra J, Mc Laughlin RE. Emergency Ultrasound Made Easy E-Book. Elsevier Health Sciences.



**Course/Paper: Clinical as pectin Radio Imaging-Practical**

**Paper Code: BRIT-651**

**Content:**

Scanning protocol, Indication, Patient preparation, image quality:

- Computed Tomography
- Magnetic Resonance Imaging
- Nuclear Medicine Technology
- Ultra sonography
- Mammography
- Digital Radiography
- Interventional Radiology.

Based on Clinical Exposure and Practices.

***Suggested Readings:***

1. Standing S, editor .Gray's Anatomy E-Book: The Anatomical Basis of Clinical Practice.ElsevierHealthSciences; 2015Aug7.
2. White SC, Pharoah MJ. Oral Radiology-E-Book: Principles and Interpretation.ElsevierHealthSciences; 2014May1.
3. AdamA, DixonAK, GillardJH, Schaefer-ProkopC, GraingerRG, AllisonDJ.Grainger&Allison'sDiagnostic RadiologyE-Book.ElsevierHealthSciences; 2014Jun16.
4. ReimerP, ParizelPM, MeaneyJF, StichnothFA, editors.ClinicalMRImaging.Springer-VerlagBerlinHeidelberg; 2010.
5. WebbWR, BrantWE, MajorNM.FundamentalsofBodyCTE-Book.ElsevierHealthSciences; 2014Sep5.
6. RSNA(Journals from Radio logical Society of North America)