



Sunrise University

Approved by Govt. of Rajasthan vide Sunrise University Act, 2011
Recognized by UGC Act, 1956 u/s 2 (f)

SYLLABUS

OF

**BACHELOR OF SCIENCE IN RADIOLOGY
&IMAGING TECHNOLOGY (B.Sc. RIT)**

FIRST SEMESTER

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSRIT101	Human Anatomy- Part I	40	60	100
BSRIT102	Human Physiology- Part I	40	60	100
BSRIT103	Biochemistry	40	60	100
BSRIT104	Radiation Physics	40	60	100
BSRIT105	English Communication and Soft Skills-I*	40	60	100
BSRIT106	Preventive Medicine, Healthcare and Radiation Protection	40	60	100
PRACTICAL				
BSRIT107	Practical-Human Anatomy	60	40	100
BSRIT108	Practical-Human Physiology	60	40	100
BSRIT109	Practical-Biochemistry	60	40	100
Total		420	480	900

SECOND SEMESTER

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSRIT201	Human Anatomy- Part II	40	60	100
BSRIT202	Human Physiology- Part II	40	60	100
BSRIT203	Radiographic Positioning-Part I	40	60	100
BSRIT204	Computer Fundamentals*	40	60	100
BSRIT205	Medical Law and Ethics	40	60	100
BSRIT206	English Communication & Soft Skills-II*	40	60	100
PRACTICAL				
BSRIT207	Practical-Human Anatomy	60	40	100
BSRIT208	Practical-Human Physiology	60	40	100

BSRIT209	Practical-Radiographic Positioning-Part I	60	40	100
Total		420	480	900

THIRD SEMESTER

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSRIT301	Radiographic Positioning-Part II	40	60	100
BSRIT302	Conventional Radiographic Techniques- Part I	40	60	100
BSRIT303	Basics of USG and Mammography	40	60	100
BSRIT304	Orientation in Para Clinical Sciences.	40	60	100
BSRIT305	Environmental Sciences*	40	60	100
PRACTICAL				
BSRIT306	Practical- Radiographic Positioning-Part II	60	40	100
Total		260	340	600

FOURTH SEMESTER

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSRIT401	Conventional Radiographic Techniques- Part II	40	60	100
BSRIT402	Special Radiographic Procedure	40	60	100
BSRIT403	Computed Tomography	40	60	100
BSRIT404	Radiation Protection and Quality Assurance.	40	60	100
BSRIT405	Orientation in Clinical Sciences	40	60	100
PRACTICAL				
BSRIT406	Practical- Special Radiographic Procedure	60	40	100
BSRIT407	Practical- Computed Tomography	60	40	100
Total		320	380	700

FIFTH SEMESTER

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSRIT501	Magnetic Resonance Imaging	40	60	100
BSRIT502	Nuclear Medicine Technology	40	60	100
BSRIT503	Patient Care and Management	40	60	100
BSRIT504	Interventional Procedure and Techniques	40	60	100
PRACTICAL				
BSRIT505	Practical- Magnetic Resonance Imaging	60	40	100
BSRIT506	Practical-Nuclear Medicine Technology	60	40	100
Total		280	320	600

SIXTH SEMESTER

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSRIT601	Bio-Statistics and Research Methodology	40	60	100
BSRIT602	Clinical Aspects in Radio-Imaging	40	60	100
BSRIT603	Advance CT, MRI and USG	40	60	100
PRACTICAL				
BSRIT604	Seminars, Journal Clubs and Procedures	60	40	100
BSRIT605	Practical-Clinical Radio-Imaging	60	40	100
Total		240	260	500

B.Sc.RIT–1st Semester (1st Year)

L	T	P	C
3	0	2	4

Course/Paper: Human Anatomy-Part- 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, gallbladder, 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. Chaurasia's Human Anatomy: Lower limb, abdomen & pelvis. CBS Publishers & Distributors; 2004.
3. Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H. Derrickson

Course/Paper: Human Physiology-Part I Course

L	T	P	C
3	0	2	4

Code:BRIT-102

Learning Objective-To enable the students to understand and the normal functioning 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, haemoglobin & anaemia, 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, lung volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways 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, gall bladder & 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. Textbook 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 Code: Biochemistry Paper

L	T	P	C
3	0	2	4

Code:BRIT-103

Learning Objective-To enable the students to understand about .To develop the basic concepts of Lab diagnosis for Radiology.

Unit-I

Introduction to Fundamental and Clinical Biochemistry, First aid in laboratory accidents. Principle, working, care & maintenance of Weighing balance, hotplate, centrifuges, incubator, hot air oven, colorimeter, spectrophotometer, pHmeter.

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

Carbohydrates: 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 for measuring enzyme 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 Minerals and ions: 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, Sreekumari S, Vaidyanathan K. Textbook of biochemistry for medical students. JP Medical Ltd; 2013 Aug 31.
2. Hames BD, Hooper NM, Hames BD. Instant notes in biochemistry. Biochemical education. 1997;25:253-4.
3. Devlin TM, editor. Textbook of biochemistry: with clinical correlations.

Course/Paper: Radiation Physics

L	T	P	C
4	2	0	5

PaperCode: BRIT-104

LearningObjective-To enable the students 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

TheAtom-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 claws.

Electromagnetism-Electromagnetic Effect, Faraday's & Lenz's law of Electromagnetic 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

ImageQuality-Exposure, attenuation, absorption, contrast, resolution, sharpness, noise, various factors determining image quality.

Unit-V

Ray Circuit 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 therapy.

Suggested Readings:

1. CurryTS, DowdeyJE, MurryRC.Christensen's physics of diagnostic radiology.Lippincott Williams &Wilkins;1990.
2. HolmbergO,Malone J,RehaniM, McLeanD, CzarwinskiR. Current issues and actions in radiation protection of patients.
3. Dendy PP, Heat on B. Physics for diagnostic radiology.CRCpress;2011Aug4.

Course/Paper: English Communication & Soft Skills – I

Paper Code:BRIT-199

Learning Objective: To comprehend and communicate in simple English.

L	T	P	C
3	0	2	4

Course Content:

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

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

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

- Pronunciation and daily usage correction (speak with differences between p/b, s/sh, f/ph, t/d, v/w sounds)
- Parts of speech, articles, tenses, verbs and modals
- Practice of daily use words, numerals and tongue twisters
- 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 newspapers for oral drills in the classroom and practice tests(written and oral)]

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

- Let's talk, making conversation, meeting and greeting
- Introducing myself, my family and my friends
- My opinions, my likes and dislikes
- Life at college, hostel and workplace
- *[Note: As part of classroom activity, use the Workbook for reference for classroom and home assignments, carryout practice tests(written and oral)]

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

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

Learning Outcome-

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 LSRW
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. Nesfield, Macmillan Publishers
3. The Business letters by Madan Sood, Good will Publishing House, NewDelhi
4. Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press

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

PaperCode: BRIT-106

L	T	P	C
3	0	0	3

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 problems of 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, diarrhoea, 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

1. General Principles and Materials.
2. Departmental protection.
3. Protection instruments and personal monitoring.
4. 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 textbook of preventive and social medicine.
2. Leavell HR, Clark EG. Preventive Medicine for the Doctor in his Community. An Epidemiologic Approach.
3. Durrani SA, Ilic R, editors. Radon measurements by etched track detectors: applications in radiation protection, earth sciences and the environment. World Scientific; 1997 Jun 9.
4. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences; 2014 Mar 12.

Practical Syllabus

Course/Paper: Human Anatomy (Practical) – Paper Code (BRIT-111)

Course Contents: Demonstration of Major organs through models and permanent slides. Parts of circulatory system from models. Parts of respiratory system from models. Digestive system from models. 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 oesophagus
7. Calculation and evaluation of daily energy and nutrient intake.
8. Measurement of basal metabolic rate
9. Demonstration of ECG
10. Bile juices secretion and excretion
11. Urine formation and excretion

Course/Paper: Biochemistry (Practical) Paper Code: 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 Creatinine values

B.Sc. RIT Year 1 (Semester-II)

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

L	T	P	C
3	0	2	4

Learning Objective-To develop and to ensure proper knowledge on description, orientation and positions of organs and their relations to other organs.

Unit-I

Cardio vascular 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, meninges 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, 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. Chaurasia's Human Anatomy: Lower limb, abdomen & pelvis. CBS Publishers & Distributors; 2004.
3. Garg K. BD Chaurasia's Human Anatomy-Regional and Applied Dissection and Clinical: Volume 1 Upper Limb and Thorax.
4. Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H. Derrickson

L	T	P	C
3	0	2	4

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

Unit-II

Muscle nerve physiology,typesof 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 endocrinological disorder such as diabetes mellitus,hyper &hypothyroidism,dwarfism,gigantism,tetany.

Unit-V

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

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

Suggested Readings:

1. Sembulingam K, Sembulingam P. Essentials of medical physiology. JP MedicalLtd; 2012.
2. ArthurC, Guyton MD, HallJE. Textbookofmedicalphysiology.WBSaunders,Philadelphia.2000:392-401.
3. TortoraGJ, Derrickson BH. Principles of anatomy and physiology.JohnWiley&Sons;2008.

Course/Paper: Radiographic Positioning- Part I PaperCode:BRIT-203

L	T	P	C
3	2	4	6

Learning Objective-The objectives to learn basic and and delineation diagnosis of the disease conditions of different anatomical structure.

UNIT- I

SKULL

Cranial bones and facial bones:

- Related radiological anatomy

Basic & special projections:

- Cranium Base of skull
- Sellaturcica
- Mastoids
- Optic foramina and Orbits
- Nasal bone
- TM joint
- Facial bone
- Zygomatic arches
- Mandible
- Paranasal sinuses

UNIT-II

NECK

- Related radiological anatomy
- Positioning-AP,LAT

UNIT-III

THORAX

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

UNIT-IV

ABDOMEN

- Related radiological anatomy

Basic & special projection

Basic:

- APsupine (KUB)
- Special:
- PAprone
- Lateral decubitus
- Erect AP
- Dorsaldecubitus
- Lateral
- Acute abdomen: three way series

UNIT-V

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 independently and understanding the radiographic diagnosis.

Suggested Readings:

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.

L	T	P	C
3	0	2	4

Course/Paper: Computer Fundamentals PaperCode:BRIT-204

Learning Objective: To give the basic knowledge of Computer hardware, 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.
(Lecture08)

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, ExternalCommands: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.

Unit-III

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

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 handouts, printing presentationdocuments.MS-Access: creating table and database.

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 handouts, printing presentation documents.

Learning outcomes:

After studying this course, you should be able to:

1. Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components
2. Understand the difference between an operating system and an application program, and what each is used for in a computer
3. Describe some examples of computers and state the effect that the use of computer technology has had on some common products
4. Be familiar with software applications
5. Understand file management
6. Accomplish creating basic documents, worksheets, presentations with their properties.
7. Experience working with email and recognize email netiquette.

Text Books:

1. Sinha P.K., Computer Fundamentals, BPB Publishing.
2. Bill Bruck., The Essentials Office 2000 Book, BPB Publishing.
3. Leon A. & Leon M., Introductions to Computers, Vikas Publications.

Reference Books:

1. Peter Norton_s, Introductions to Computers, Tata McGraw Hill.
2. Price Michael, Office in Easy Steps, TMH Publication.

L	T	P	C
2	0	0	2

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 rights and 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-rescuerCPR,UsinganAED(Automatedexternaldefibrillator),Managinganemergencyincludingmovingapatient.

Learning outcome- Student will abide by the rule and regulation of the medicineandhaveabundantknowledgeonprofessionalattitudeandcommunicationamongthe colleague, patients and co-parties.

Suggested Readings:

1. KennedyI, GrubbA. Medical law. London: Butterworths;2000.
2. JacksonE.Medical law: text, cases, and materials.Oxford University Press.
3. Recent Trends in Medical Imaging (CT,MRIandUSG)
4. Bontrager KL, Lampignano J.Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK.ElsevierHealthSciences;2017Feb10.
5. FrankED,LongBW,SmithBJ.Merrill's Atlas of Radiographic Positioning and Procedures-E-Book.Elsevier Health Sciences;2013Aug13.

L	T	P	C
3	0	2	4

Module-1: Basic Communication & Soft Skills (6 Lectures)

1. Reading comprehension
2. Building *conversational* skills
3. Verbal & Non-verbal communication

*[Note: As part of classroom activity, review and recap the last semester and carry out (oral and written) practice test to update the progress card of each student, refer to the Workbook]

Module-2: Vocabulary: Building Blocks (10 Lectures)

1. Word Formation: Prefix, suffix, conversion and compounding
2. Homophones and one-word substitution
3. Words often confused and misused
4. 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 (12 Lectures)

1. Market place, Bus stop, Bank, Post Office
2. Village, Town and City
3. Eating out: Stall, Dhaba and Restaurant

*[Note: As part of classroom activity, refer Workbook for classroom and home assignments, carry out practice tests (written and oral)]

Module-4: Personality Development-II (12 Lectures)

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

*[Note: As part of classroom activity, refer Workbook for classroom 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. Nesfield, 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:HumanPhysiology-II(Practical)PaperCode: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:RadiographicPositioning-PartII(Practical)PaperCode:BRIT-253

Skull

1. Cranial bones and facial bones Basic & special projections Related radiological Pathology
2. Neck, Thorax &Abdomen
3. Basic & special projection

Related radiological Pathology

KUB

Basic & special projection Related radiological Pathology

Suggested Readings:

1. WhitleyAS,JeffersonG,HolmesK,SloaneC,AndersonC,HoadleyG.Clark'sPositioninginRadiography13E.CRCPress;2015Jul28.
2. BontragerKL,LampignanoJ.TextbookofRadiographicPositioningandRelatedAnatomy-E-Book.ElsevierHealthSciences;2013Aug7.
3. BontragerKL, LampignanoJ.Bontrager'sHandbookofRadiographicPositioningandTechniques-E-BOOK.ElsevierHealthSciences;2017Feb10.
4. FrankED,LongBW,SmithBJ.Merrill's AtlasofRadiographicPositioningandProcedures-E-Book.ElsevierHealthSciences;2013Aug13.

Unit-I

Concept in 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 Vs 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 cells in other formulae , Naming cells, Generating graphs, Worksheet data and charts with WORD, CreatingHyperlinktoaWORDdocument,Pagesetup,PrintPreview,PrintingWorksheets.

Unit-IV

Starting MS–PowerPoint, 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, Wordart gallery, Adding Transition and Animation effects, setting timings for slide show, preparingnotepages,preparingaudiencehandouts,printingpresentationdocuments,MS-Access,Creating tables and database, Internet, Use of Internet(Mailing, Browsing, Surfing).

B.Sc.RIT Year-2 (Semester-III)

Course/Paper: Radiographic Positioning- Part II Paper Code:BRIT-301

L	T	P	C
4	0	4	6

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

UNIT-I

UPPER&LOWER EXTRIMITIES

Related radiological anatomy

Basic and Special Projection

- Finger-PA,LAT,OBLIQUE
- Hand-PA,LAT,
- Wrist joint-PA,LAT
- Fore arm-AP,LAT
- Elbow joint-AP,LAT
- Humerus-AP,LAT
- Femur-AP,LAT
- Knee joint-AP,LAT
- Patella-SKYLINEVIEW
- Tibia-AP,LAT
- Ankle joint-AP,LAT,MORTISVIEW
- Foot-AP,LAT

UNIT-II

SHOULDER JOINTS

Related radiological anatomy

Basic and Special Projections

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

UNIT-III

Pelvic Girdle and Proximal Femur

Related radiological anatomy

Basic & Special Projections

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

- AP axial for pelvic outlet(taylor method)
- AP axial for pelvic inlet(modified linien field method)
- Posterior oblique-acetabulum (judet method)
- Hip and proximal femur
- AP unilateral hip
- Axial lateral, inferosuperior(danielius–miller method)
- Unilateral frog leg(modified cleaves method)
- Modified axial lateral(clements-nakayama method)
- Sacroiliac joints:AP,posterior obliques

UNIT-IV

WHOLE SPINE POSITIONING

Cervical spine

- Related radiological anatomy
- Basic views
- AP open mouth(C1 and C2)
- AP axial
- Oblique
- Lateral
- Erect
- Traumatolateral(horizontal beam)
- Cervico thoracic junction(swimmers view)
- Special views
- Lateral- hyperflexion and hyperextension
- AP (fuchs method)orPA(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)
- Scoliosisseries
- AP or PA
- Erect lateral
- AP (ferguson method)

- AP – Rand L bending
- Spinal fusion series
- AP or PA– Rand L bending
- Lateral–hyper extension and hyperflexion
- Sacrum and Coccyx
- AP axial sacrum
- AP axial coccyx
- Lateral sacrum
- Lateral coccyx

UNIT-V

Paediatric Radiography

Positioning, care and radiation protection while handling babies

Learning outcome- At the end of the course, student will be expert in practicing various radiographic positioning and procedure 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 I Paper Code: BRIT-302

L	T	P	C
3	0	0	3

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, Photo disintegration, 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 artefacts,

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, Minification gain, Multifield 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. DN and MO Chesney-X ray equipments for student radiographers-Third edition
5. Burgener FA, Korman M. Differential diagnosis in conventional radiology.

L	T	P	C
4	0	0	4

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-I

Introduction to Ultrasound Imaging

Sound,Ultrasound,Attenuation,Echoes,Basic principle of Ultrasound imaging,Advantages and disadvantages

Unit-II

Instrumentation of Ultrasonography

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, TM mode.

Gray scale imagingBeam focusing, Resolution

Unit-IV

Doppler USG:Principle,Doppler effect,Color Doppler,Continuous wave Doppler,Pulsed wave Doppler.USG Bioeffects, safety.

Mamography:Mammography Equipments and Basic views in Mammography.

UnitV

Clinical PracticeScanning protocol,Indication,Patient preparation,image quality and artefacts in Ultrasound and Mammography,

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

Transducer selection

Patient selection and preparation

Managing image quality and artefacts inUS Gand mammography

Sufficient knowledge about contrast medias election and its advers effect.

SuggestedReadings:

1. ZwiebelWJ, SohaeyR. Introduction to ultrasound.WBSaundersCompany;1998.
2. Hagen-AnsertSL.Textbook of diagnostic ultrasonography.Mos by Elsevier;2006.
3. Basics of Ultrasonography for Radiographers and Technologists- Latest edition
4. TuckerAK, NgYY. Textbookofmammography.ChurchillLivingstone;2001.
5. WentzG,ParsonsWC.Mammography for radiologic technologists. McGraw-Hill, Health Professions Division;1997.

L	T	P	C
3	0	0	3

Course/Paper: Orientations in Para Clinical Sciences Paper Code: BRIT-304

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

Unit-I

- Pericarditis
- Valvular diseases
- Rheumatic Heart Disease
- Heart failure
- Bronchitis
- Emphysema
- Bronchitis
- Pneumonia
- Tuberculosis
- Pleuraeffusion
- Phenumothorax

Unit-II

- Aclasiacardia
- Pepticulcer
- 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
- Rheumatoid arthritis
- Paget's Disease
- Ankylosing spondylitis
- Clubfoot
- Bone Tumour- Benign Malignant
- Perthes diseases

Unit-V

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

Learning Outcome- At the end of the course, student will be expert handling patients with different disease condition referred to radiology department. Knowledge to allocate the 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
2. E-Book. Elsevier Health Sciences; 2014 Aug 27.
3. Mohan H. Textbook of pathology. New Delhi: Jaypee brothers medical publishers
4. Boyd W. A Textbook of Pathology: An Introduction to Medicine. Academic Medicine.
5. Davidson I, Henry JB, Todd JC. Todd-Sanford clinical diagnosis by laboratory methods.

Course/Paper: Environmental Studies PaperCode:BRIT-305

L	T	P	C
4	0	0	4

Learning Objective-To create awareness among students about environment protection.

Unit-I (Lectures 08)

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

Ecology and Environment: Concept of an Ecosystem-its structure and functions, Energy Flowing 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 (Lectures 08)

Natural Resources: Renewable & Non-Renewable 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: Renewable & 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, Biogeographical Classification of India

Unit-III (Lectures 08)

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

Unit-IV (Lectures 08)

Environmental policies & practices: Climate Change & 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 reserves, tribal population & Rights & human wildlife conflicts in Indian context.

Unit-V (Lectures 08)

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:

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

Text Books:

- “Environmental Chemistry”,De,A.K.,NewAge Publishers Pvt. Ltd.
- “Introduction to Environmental Engineering and Science”, Masters, G. M., Prentice Hall India Pvt. Ltd.
- “Fundamentals of Ecology”,Odem,E. P.,W. B.Sannders Co.

Reference Books:

- “Biodiversity and Conservation”,Bryant,P.J.,Hypertext Book
- “Textbook of Environment Studies”,Tewari,Khulbe &Tewari,I.K. Publication

L	T	P	C
3	0	2	4

Module-1 Functional Grammar-II (8Lectures)

1. Sentence construction: Simple, Complex and Compound
2. Application writing
3. Paragraph writing, essay writing and precise writing
4. Pre-testing of oral and writing skills

*[Note: As part of classroom activity, Review and recap of last semester and update progress of each student refer Module3ofWorkbook]

Module-2 Professional Skills (14Lectures)

1. Biodata, CV and resume writing
2. Joining Letter,Cover Letter & Resignation letter
3. Inter-Office Memo, Formal Business Letter,Informal Notes
4. Minutes of the Meeting, Reporting Events, SummaryWriting

*[Note:As part of classroom activity,use of standard templates and scenario buildings,practice sessions in classroom and homework assignments, refer to Workbook]

Module-3 Presentation Skills (10Lectures)

1. Power-point presentations & presentation techniques
2. Body language
3. Describing people, places and events
4. Extempore speech and Just-a minute sessions

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

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 classroom activity, language games, extensive coverage of contemporary issues for GDs, facing mock interview sessions with faculty, respective TPOs and Director CRC]

Reference Books:

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

Course/Paper: Radiographic Positioning-Part II (Practical) Paper Code: BRIT-351

Contents:

Upper & Lower Extremities

Hand Fore arm Arm Thig 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

L	T	P	C
3	0	0	3

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

Portable & Mobile equipments Portable X-Ray Equipments Mains requirements
CableconnectionstowallplugsMobile X-RayEquipments
RayEquipmentsfortheOperating Theatre

Unit-II

FluoroscopyEquipments

Construction&WorkingprinciplesofImageIntensifierDirectFluoroscopy
Viewing the Intensified imageRecordingtheintensifiedImageDigitalfluoroscopy

Unit-III

Fluoroscopic/RadiographicTables

General features of fluoroscopic/radiographic table The serial changer
Remote control tableThe spot film devices.

Unit-IV

Tomographic Equipment

Principles of tomography
Various types of tomographic movement Equipment for tomography

Unit-V

Equipment for Cranial and Dental radiography

The skull table
General Dental X-ray equipment Pantomography equipment
Equipment for Cranial & skeletal radiography

Direct and Indirect Radiography

Learning outcome-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. CurryTS,DowdeyJE,MurryRC.Christensen'sphysicsofdiagnosticradiology.LippincottWilliams &Wilkins;1990.
2. Brant
WE,HelmsCA,editors.Fundamentalsofdiagnosticradiology.LippincottWilliams&Wilkins;2012Mar20.
3. CurryTS,DowdeyJE,MurrayRC.Introductiontothephysics of diagnostic radiology.
4. AdamA,DixonAK,GillardJH,Schaefer-ProkopC,GraingerRG,AllisonDJ.Grainger&Allison'sDiagnostic RadiologyE-Book.ElsevierHealthSciences.
5. DN and MOChesney-Xraye quipments for student radiographers-Third edition
6. BurgenerFA,Kormano M.Differential diagnosis in conventional radiology.

Course/Paper:Special Radiographic Procedure Paper Code:BRIT-402

L	T	P	C
3	0	4	5

Learning Objective-The objective is to learn contrast imaging techniques under the guidance of fluoroscopy,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

- Barium swallow,Barium meal
- Barium meal follow through(BMFT)
- Bariumenema

Unit-III

- Intravenousurogram(IVU),
- Micturating Cystourethrogram(MCU),
- Ascending Urethrogram(ASU)/RGU
- Hysterosalpingography(HSG)

Unit-IV

- Myelography
- ERCP/PTBD,PTC,T-tubecholangiography

Unit-V

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

Indications,contraindications procedure and technique of all procedures

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

- Bariumenhanced 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:

- Lakhkar BN, BanavaliS, ShettyC.Radiologicalquiz-headandneck.IndianJournalofRadiologyandImaging.
- SnopekAM.FundamentalsofSpecialRadiographicProcedures-E-Book.ElsevierHealthSciences;2013Aug13.
- DaviesSG,ChapmanS.Aidstoradiologicaldifferentialdiagnosis.ElsevierHealthSciences;2013Nov20.
- Krishnamurthy, MedicalRadiographicTechnique&DarkroomPractice.

Course/Paper:ComputedTomography PaperCode:BRIT-403

L	T	P	C
3	0	4	5

Learning Objective-The objective is to induce idea on cross sectional imaging of different anatomical area along with the pathologies.

Unit-I

Introduction to Computed Tomography and Principle of Computed Tomography-

History, Advantage and Disadvantages of CT, Basic principle of CT

Generations of Computed Tomography-1st generation,2nd generation,3rd generation, Slipring technology,4th generation, Electron beamCT,Dual Source CT,FlatPanelDetectorCTSingle and Multislice 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 control console, Options and accessories for CT systems.

Unit-III

Image Reconstruction-Basic principle,Reconstruction algorithms, Imagere construction 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,Qualities,Resolution,Contrast,Sharpness,Noise properties in CT

Unit-IV

CT Artifacts-Classification,Types,Causes,Remedies

Unit-V

Diagnostic aspects of CT and post Processing Techniques HRCT, Isotropic imaging, Patient management, Patient preparation, positioning, Technologist role, Protocols for whole body imaging Clinical applications of CT, 2D&3D imaging, MPR, SSD,Volume Rendering, BMD.

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

- Working principle,construction & clinical application of ComputedTomography
- CT instrumentation–gantry system,console system,recording and display system.
- Image reconstruction technique–pre and post processing technique

Suggested Readings:

- Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical Applications,and Quality Control. Elsevier HealthSciences;2015Sep2.
- SeeramE.Computedtomography:physicalprinciplesandrecenttechnicaladvances.JournalofMedicalImagingandRadiationSciences.2010.
- KakAC,SlaneyM.Principlesofcomputerizedtomographicimaging.SocietyforIndustrialandAppliedMathematics;2001Jan1.
- HsiehJ.Computed tomography: principles,design,artifacts,andrecent advances.SPIEpress;2003. ShawCC, editor.Conebeamcomputedtomography.Taylor&Francis;2014Feb14.

L	T	P	C
3	0	0	3

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-I

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, Antenatal 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, PNDT Act and guidelines.

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

Radiobiology and its energy determinants

Quality control and assessment of equipments installed in radio department.

Layout planning of radiology department according to ICRP, AERB recommendation.

Suggested Readings:

- Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences; 2014 Mar 12.
- Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical Library Association. 1996
- Long BW, Frank ED, Ehrlich RA. Radiography Essentials for Limited Practice-E-Book. Elsevier Health Sciences; 2016 Sep 6.
- Durrani SA, Ilic R, editors. Radon measurements by etched track detectors: applications in radiation protection, earth sciences and the environment. World Scientific.
- Turner JE. Atoms, radiation, and radiation protection. John Wiley & Sons; 2008 Jan 8.
www.AERB.com (Guidelines and Details of Quality Control in Radiology).

L	T	P	C
3	0	0	3

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

Unit-I

- Meningitis
- CerebralVascularDisorders
- Encephalitis
- Sinusitis
- Polyps
- DNS
- OtitisMedia
- Tonsillitis
- CSFRhinorea

Unit-II

- Aneurysms
- Arachnoidscysts
- Alzheimer's
- Parkinson's
- Shock
- Hypertension
- Embolism
- Hemorrhage

Unit-III

- Hangman'sfracture
- Dishitis
- Spondylitis
- IVDP
- Scoliosis
- Pott's
- TBSpine
- Kyphosis

Unit-IV

- Hematocezia
- Anemia
- Leukemia
- Epilepsy
- COPD
- Asthma
- Emphysema
- Hepatitis
- DiabetesMellitus
- VaricoseVein
- DVT

Unit-V

- Obstetrics- Diagnosis of Pregnancy

Learning outcome- At the end of the course, student will be expert in interpreting pathologies.

Suggested Readings:

- DasKK. Textbook of medicine, Volumes 1 and 2. Jaypee Brothers Medical Publishers (P) Ltd; 2002.
- Mercier L. Practical Orthopedics E-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.

L	T	P	C
3	0	2	4

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

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

[Note: As part of classroom activity, refer to the Workbook, 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 classroom 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 classroom 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 Sangeeta Sharma & Binod Mishra, PHI Learning 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 Madan Sood, Goodwill 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) Paper Code: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 Imaging Paper Code: BRIT-501

L	T	P	C
4	0	4	6

Learning Objective-The objective is to induce idea on cross sectional imaging of different anatomical 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, Super conducting magnets, Fringe fields, Shim coils, 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, data space, 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 transverse magnetization, Ultra-fast imaging, Advanced imaging techniques, EPI

MRI parameters & Trade offs

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, Trade offs, Decision making, Volume imaging.

Unit-IV

MRI Artefacts

Introduction, Phase misregistration, 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 crosstalk

MRI contrast agents

Unit-V

Flow Phenomena & MRI angiography

Introduction, The mechanisms of flow, Time off light phenomenon, Entry slice phenomenon, Intravoxel Dephasing.

Flow phenomena compensation- Gradient moment rephrasing, Presaturation, Evenecho rephrasing, MR Angiography.

Clinical Applications, Scanning Protocols and Safety aspects

Protocols for whole body imaging, The main magnetic field, Gradient magnetic field, Radio frequency 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 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: Sinauer Associates; 2004 Apr 1.
3. Westbrook, Catherine, and Carolyn Kaut Roth. MRI in Practice. John Wiley & Sons.
4. Westbrook, Catherine. Handbook of MRI technique. John Wiley & Sons, 2014.
5. Möller, 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) PaperCode:BRIT-502

Learning Objective-The objectives to learn basics about the radioactivity and radioactive nuclides.

L	T	P	C
4	0	4	6

Unit-I

Introduction to NMT and Radioactive Transformation

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

Unit-II

Production of Radio nuclides

Reactor produced radio nuclide, Reactor principles; Accelerator produced radio nuclide, Radionuclide generators.

Unit-III

Radio pharmacy & Handling & Transport of Radio-nuclides Coldkits, Radio pharmacy used in Nuclear medicine, Radio pharmaceuticals used in various procedures, Safe handling of radioactive materials, Procedures for handling spills

Unit-IV

Equipments of NMT Gamma camera, PET, SPECT (working principle)

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

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

Suggested Readings:

1. Cherry SR, Sorenson JA, Phelps ME. Physics in Nuclear Medicine E-Book. Elsevier Health Sciences; 2012 Feb 14.
2. Bomford CK, Miller J, Kunkler H, Sherriff IH, Bomford SB, IH Kunkler SB. Walter and Miller's textbook of radiotherapy: radiation physics, therapy, and oncology. 1993.
3. Sutton, David. "A textbook of radiology and imaging." (1987).
4. Waterstram-Rich KM, Gilmore D. Nuclear Medicine and PET/CT-E-Book: Technology and Techniques. Elsevier Health Sciences; 2016 Jul 30.
5. Bailey DL, Townsend DW, Valk PE, Maisey MN. Positron emission tomography. London: Springer; 2005

L	T	P	C
4	0	0	4

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

Unit-I

Patient care and Assessment

Taking history, Assessing current physical status, Skin temperature, colour, consciousness, Breathing, Obtaining Vital 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, stretcher 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 outcome-At the end of the course, student Will have knowledge on:

- Communication with patients as well as taking patient history & consents
- Handling patients in different conditions
- Sterilization techniques, medication administrations and infection controls.

Suggested Readings:

- Ehrlich RA, Coakes DM. Patient Care in Radiography-E-Book: With an Introduction to Medical Imaging. Elsevier Health Sciences; 2016 Jan 19.
- Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013 Aug 7.
- Groh R, Wensing M, Eccles M, Davis D, editors. Improving patient care: the implementation of change in healthcare. John Wiley & Sons; 2013 Mar 18.
- Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20.

Course/Paper: Interventional Procedure and Techniques PaperCode:BRIT-504

L	T	P	C
4	0	0	4

Learning Objective- The objective is to learn about the special procedures done with the interventional approaches in radiology department with the help of radiological equipments.

Unit-I

Introduction to Interventional Radiology, Contrast media & Emergency Drugs

Need for interventional procedures, Informed consent, patient care, patient preparation, Patient monitoring, role of technologist in interventional procedure Types of contrast media, method of administration, contra indication, contrast reaction management, emergency crash cart.

Unit-II

Angiographic Equipments, Catheters & guidewires

Basics of Angiographic equipments, 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

Types, Instrumentation

Unit-IV

Sterile Techniques & Radiation Protection

Laying up sterile trolley, sterile techniques, radiation protection for staff and patient, protective devices, monitors.

Unit-V

Interventional Procedures

Cardiac, Vascular, Nonvascular.

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

- Equipments, procedure, technique and outcome of angiography
- Drugs, contrast media & equipments of interventional radiography
- Sterilized techniques and radiation protections.

Suggested Readings:

- Kandarpa K, Machan L, editors. Handbook of interventional radiologic procedures. Lippincott Williams & Wilkins; 2011.
- Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20.

- Valji K. The Practice of Interventional Radiology, with Online Cases and Video E-Book: Expert Consult Premium Edition - Enhanced Online Features. Elsevier Health Sciences.
- 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.
- Kessel D, Robertson I. Interventional Radiology: A Survival Guide E-Book. Elsevier Health Sciences; 2016 Oct 22.

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

Course Content:

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

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

Course Content:

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

B.Sc.RIT Year 3 (Semester–VI)

Course/Paper:Biostatistics&ResearchMethodologyPaperCode:BRIT-601

L	T	P	C
4	0	0	4

Learning Objective-The objective is to learn about the Biostatistics, various methodology & analysis of the research.

Unit-I

- **Introduction-I:**Biostatistics–Definition,Role of statistics in health science and healthcare delivery system.
- **Introduction II:** Research Methodology - Research process, Steps involved in 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 – their 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-V

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

Unit-VI

- **Clinical audit:**Distinctiveness of research and audit processes and their function
- **Research Skills and Management:**The role of evidence based practice within health and welfare.

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

- Biostatistics & methodology of research.
- Assessments and designs of research.
- Clinical audit and analysis.

Suggested Readings:

1. Mahajan BK: Methods in Biostatistics for medical students and research workers, 6th edition Jaypee, 1997
2. Kothari CR. Research Methodology (Methods & Techniques) Wiley Eastern Limited. New Delhi.
3. Rao, PSS Sundar, and J. Richard.
Introduction to biostatistics and research methods. PHI Learning Pvt. Ltd., 2012.
4. Pagano M, Gauvreau K, Pagano M. Principles of biostatistics. Pacific Grove, CA: Duxbury; 2000 Mar.
5. Norman, Geoffrey R., and David L. Streiner. *Biostatistics: the bare essentials.* PMPH-USA, 2008.
6. Neuman, W. Lawrence, and Karen Robson. *Basics of social research.* Pearson Canada.
7. Strauss, A., and J. Corbin. *Basics of qualitative research techniques.* Sage publications.
8. Corbin, Juliet, Anselm Strauss, and Anselm L. Strauss. *Basics of qualitative research.* Sage, 2014.
9. Mackey, Alison, and Susan M. Gass. *Second language research: Methodology and design.* Routledge, 2015.

Course/Paper: Clinical Aspect in Radio Imaging Paper Code: BRIT-602

L	T	P	C
4	0	4	6

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

Content:

Scanning protocol, Indication, Patient preparation, image quality:

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

Based on Clinical Exposure and Practices.

Learning outcome- At the end of the course, student will have knowledge on scanning protocol, indications, patient preparation & 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)

L	T	P	C
4	0	0	4

LearningObjective-The objective is to learn about the recent advancements & new imaging modalities.

Outline of advanced CT/MRI/ USG & Doppler

Unit-I

Helical CT scan:Slipping technology,advantages,multi detector array helical CT,cone-beam geometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy,HRCT,post processing techniques:MPR, MIP, MinIP, 3Drendering:SSDandVR, CT Dose.

Unit-II

MRI imaging methods-Head and Neck,Thorax,Abdomen,Musculo skeletal 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 – musculo skeletal system – spine – PNS.Anatomy– clinicalindicationsandcontraindications–patientpreparation–technique–contrastmedia-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.
- Various post processing techniques.

Suggested Readings:

1. FaroSH, MohamedFB, editors. FunctionalMRI: basic principles and clinical applications. Springer Science & Business Media; 2006 Nov 22.
2. BaertAL. Parallel imaging in clinical MR applications. Springer Science & Business Media; 2007 Jan 11.
3. Johansen-Berg H, Behrens TE, editors. Diffusion MRI: from quantitative measurement to in vivo neuro anatomy. Academic Press; 2013 Nov 4
4. BernsteinMA, KingKF, ZhouXJ. Handbook of MRI pulse sequences. Elsevier.
5. Wakefield RJ, D'Agostino MA. Essential Applications of Musculoskeletal Ultrasound in Rheumatology E-Book: Expert Consult Premium Edition. Elsevier Health Sciences.
6. BowraJ, McLaughlinRE. Emergency Ultrasound Made Easy E-Book. Elsevier Health Sciences; 2011 Oct 24.
7. Buzug TM. Computed tomography: from photon statistics to modern cone-beam CT. Springer Science & Business Media; 2008 May 20.
8. Recent Trends in medical imaging (CT, MRI and USG)
9. RSNA (Journals from Radiological Society of North America)

Course/Paper: Seminars, Journal Clubs and Procedures Paper Code: BRIT-604

L	T	P	C
6	0	0	6

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 within the presence of faculty.

Learning outcome- student will be able to present seminar under concern topic in places like conferences, workshops, meets etc.

Suggested Readings:

1. BrandonAN, HillDR. 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 topics in Radio imaging (Diagnostic radiology)
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. BowraJ, McLaughlinRE. Emergency Ultrasound Made Easy E-Book. Elsevier Health Sciences.

Course/Paper: Clinical Aspect in Radio Imaging- Practical Paper Code: BRIT-651

Content:

Scanning protocol, Indication, Patient preparation, image quality:

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

Based on Clinical Exposure and Practices.

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, Stichtnoth 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)