JHARKHAND
Rai University
UGC RECOGNISED UNIVERSITY
ACCREDITED BY NAAC

Bachelor of Science (Honours) in Medical Radiology & Imaging Technology (BMRIT)

EFFECTIVE FROM

ACADEMIC SESSION: 2025 – 2026 ONWARDS

SYLLABUS

SEMESTER – I

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Program: BRIT
Semester: I
Subject: Human Anatomy
Code: 42BBMRIT001

Course Outcome:
On completion of the Course, the students will be able to:

CO1: Describe the general anatomy of human body
CO2: Explain normal disposition of various structures and organs in the body and its clinical correlation.
CO3: Describe the microscopic structure of various tissues.
CO4: Determine the topography of various structures on the surface of the body.
CO5: Identify and locate structures of the body.
CO6: Identify organs and tissues under microscope.

Course Content: Human Anatomy

Topics and contents	Hours
MODULE – I: Introduction: Human Body as a Whole	**7**
Definition of anatomy and its subdivisions, Terms of location, positions and planes, Cell and its organelles, Epithelium – definition, classification, describe with examples, functions, Glands – classification, describe serous and mucous glands with examples, Basic tissues – classification with examples	
MODULE – II: Locomotion and Support	**8**
Cartilage – types, examples and histology Bone – classification, examples and histology. Parts of long bone, names of all bones, vertebral column and intervertebral disc. Fontanel's of fetal skull. Joints – classification of joints with examples, typical synovial joint (in detail). Muscular system – classification of muscular tissue and histology Important muscles of the body- Sternocleidomastoid, Trapezius, Muscles of tongue, Deltoid, Biceps brachii, Intercostal muscles, Thoracic diaphragm, Rectus abdominis, External oblique, Internal oblique, Transversus abdominis, Pelvic diaphragm, Gluteus maximus, Gluteus medius, Gluteus Minimus, Quadriceps femoris, Soleus.	
MODULE – III: Cardiovascular System	**8**
Heart – size, location, chambers, exterior and interior, Blood supply of heart, Pericardium, Systemic and pulmonary circulation, Branches of aorta - common carotid artery, subclavian artery, Axillary artery, brachial artery, radial artery, superficial palmar arch, femoral artery, popliteal artery, dorsalis pedis artery., Peripheral pulse, Inferior venacava, portal vein, portosystemic anastomosis, Great saphenous vein, median cubital vein, Dural venous sinuses, Lymphatic system – cisterna chyli and thoracic duct, Lymphatic tissues and its histology, Regional lymph nodes – cervical, axillary and inguinal lymph nodes. **Respiratory System** Parts of RS – nose, nasal cavity, paranasal air sinuses, larynx, trachea, lungs, pleura, bronchopulmonary segments, Histology of trachea and lungs.	
MODULE – IV: Gastro-Intestinal System Theory	**7**
Parts of GIT- oral cavity (lip, cheek, tongue, salivary glands, palate, dentition) pharynx (Waldeyer's ring) esophagus, stomach, small and large intestine and appendix, Liver, gall bladder, pancreas and spleen, Histology of esophagus, stomach, small and large intestine, liver, gall bladder and pancreas. **Peritoneum** Description of reflection, folds and pouches in brief.	

MODULE – V: Urinary System, Reproductive System and Endocrine Glands	8
Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder. Parts of male reproductive system- testis, vas deferens, epididymis, prostate, Parts of female reproductive system- uterus, fallopian tubes, ovary, mammary gland, Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube and ovary. Names of all endocrine glands, describe in detail on pituitary gland, thyroid gland and parathyroid gland, suprarenal gland, Histology of pituitary, thyroid, parathyroid, suprarenal gland.	
MODULE – VI: Nervous System and Sensory Organs	
Neuron, Classification of nervous system, Cerebrum, cerebellum, brain stem, spinal cord & spinal nerve, Meninges, ventricles and cerebrospinal fluid, Blood supply of the brain, Cranial nerves (in brief), Nerve plexus (Brachial & lumbar) Skin and its appendages, Eye – parts of eye ball and lacrimal apparatus, Extra- ocular muscles, Histology of cornea and retina, Ear – parts of ear- external, middle and inner ear and contents Embryology Spermatogenesis and oogenesis, Ovulation, fertilization, Placenta	7

REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1	Human Anatomy, Vol.1,2 &3, 5th edition, 2010,	B.D. Chaurasia	CBS publishers & distributors Pvt. Ltd.
2	Text Book of Physiology	A. P. Krishna	Suman Publication
3	Manipal Manual of Anatomy, 2nd edition, 2012	Sampath Madhyastha	CBS publishers & distributors Pvt. Ltd
4	Text Book of General Anatomy, 2nd edition, 2013	Shobha Rawlani and Shivlal Rawlani	Jaypee brothers
5	Text Book of Physiology	A.K. Jain	Avichal Publishing Company;

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Program: BRIT
Semester: I
Subject: Physiology
Code: 42BBMRIT002

Course Outcome:
On completion of the Course, the students will be able to:

CO1: Explain the normal functioning of organs and systems.
CO2: Understand the interrelationships and interactions among various organs and systems for maintaining homeostasis.
CO3: Assess the relative contribution of each organ systems toward the maintenance of constant internal environment.
CO4: Differentiate between normal and abnormal functioning of organs and systems,
CO5: Understand physiological basis of pathogenesis and treatment of diseases and disorders.
CO6: Apply the physiological basis in the field of allied health care

Course Content: Physiology

Topics and contents	Hours
MODULE – I: General physiology, Muscle nerve physiology and Blood	**8**
Introduction to Physiology, Concept of Homeostasis, cell – Morphology – Functions of organelles and Cell membrane, Transport mechanisms, Body fluid compartments. Neurons: Morphology, Action Potential, Neuroglia: Types & functions, Muscles: Types, structure of sarcomere. Neuromuscular junction, sliding filament mechanism of contraction. Composition, properties, functions. Plasma proteins: Concentrations and functions, RBC: Morphology, functions, count, physiological variations and life span Erythropoiesis – stages, essential factors, regulation of Erythropoiesis, Hemoglobin: Functions, concentration, physiological variations. Fate of Hemoglobin – Jaundice, types, Color index, MCH, MCV, MCHC, PCV – normal values, WBC: Morphology, functions of all types including T & B lymphocytes, total and differential counts, physiological variations, Platelets: Morphology, count, functions, thrombocytopenia & bleeding time, Blood groups: Basis of blood grouping. Landsteiner's laws, ABO system, determination of blood groups, blood transfusion, complications of incompatible blood transfusion, Rh group, erythroblastosis foetalis, prevention and treatment, Blood bank. Haemostasis: Mechanisms. Clotting mechanism: factors, intrinsic and extrinsic pathways. Disorders of clotting – hemophilia, vitamin K deficiency. Anticoagulants – mechanism of action and their uses, Anemia: Classification – Morphological and Etiological, Blood volume: normal values.	
MODULE – II: Cardiovascular system	**6**
Organization of cardiovascular system, greater and lesser circulation, Physiological anatomy of the heart, nerve supply, Junctional tissues of heart (pacemaker), Cardiac cycle: Mechanical events, Heart sounds, causes, characteristics and significance, Normal ECG, clinical significance of ECG, Heart rate – Physiological variations, Cardiac output: Definitions, normal values, physiological variations, Arterial blood pressure: Definitions, normal values, physiological variations, factors maintaining blood pressure. Role of baroreceptors in regulation of blood pressure.	
MODULE – III: Respiratory system	**8**
Respiratory and non-respiratory function of respiratory system. Physiological anatomy of respiratory system Functions of respiratory tract. Respiratory membrane. Respiratory muscles. Surfactant: functions, respiratory distress syndrome. Definitions of terms used in respiratory physiology: Eupnea, Hyperpnoea, Tachypnea, Apnea, Dyspnea.	

Mechanics of breathing – intrapulmonary and Intrapleural pressure changes during a respiratory cycle. Spirometry – Lung volumes and capacities. Vital capacity. Oxygen transport: Role of hemoglobin, factors affecting, oxygen carrying capacity. Carbon dioxide transport: forms, chloride shift. Respiratory centers. Role of chemo receptors in regulation of respiration. Pulmonary ventilation and alveolar ventilation. Partial pressure of gases, Calculation of partial pressure of gasses in mixture. Arterial and venous blood gas concentrations and contents. Hypoxia: Types and effects Cyanosis, Asphyxia, Periodic Breathing, Acclimatization.	
MODULE – IV: Excretory system	**5**
Functions of kidneys. Nephrons – Juxta glomerular apparatus – functions, Steps in Urine formation – Ultrafiltration, Tubular Reabsorption, Tubular Secretion, GFR. Definition, normal values, factors affecting GFR, measurement of GFR, Renal threshold for glucose, tubular load for glucose, Role of aldosterone and ADH in urine formation, Micturition, Innervation of bladder. Diuresis, Renal functions tests – Based on analysis of urine and analysis of blood, Skin: Functions of skin. Sweat glands.	
MODULE – V: Digestive system	**5**
Introduction, structure of alimentary canal, Saliva: Composition, functions, Stomach: Functions. Gastric Juice: composition, functions, Pancreatic Juice: Composition and functions, Liver: Functions, Bile: composition, functions, Gall bladder: functions, Succusentericus: Composition, functions. Functions of large intestine, Movements of small intestines, Deglutition.	
MODULE – VI: Endocrine system and Nervous system	
Major endocrine glands- Hormone: Definition, Anterior pituitary: hormones and their functions, disorders – Giganitism, acromegaly, dwarfism, Posterior pituitary: Hormones – diabetes insipidus, Thyroid: Hormones, normal values, functions, role of TSH. Disorders: simple goitre, myxoedema cretinism, Grave's disease, Adrenal cortex: hormones, functions of cortisol and aldosterone. Addison's disease, Cushing's syndrome, Adrenal medulla: actions of adrenaline and noradrenaline, Endocrine pancreas: Insulin & glucagon, functions, Regulation of blood glucose level, diabetes mellitus, Parathyroid: Functions of PTH. Synapse (Nervous system): Types, Transmission, Sensory receptors: Definition, Classification Organization of spinal cord, Functions of Dorsal column and Spinothalamic tract, Functions of Corticospinal tract, Reflex Action: Definition, reflex arc, Functions of Cerebellum, Basal ganglia, Thalamus, Hypothalamus, Cerebral cortex: Lobes & functions. EEG – Definition and uses, Autonomic nervous system: Organization & functions, Cerebrospinal fluid: Composition and function.	**7**
MODULE – VI: Special senses and Reproductive system	
Vision: Physiological anatomy of eye ball, rods & cones, Refractive errors: Myopia, hypermetropia, presbyopia & astigmatism, Audition: Functions of outer, middle & inner ear, cochlea, Deafness – types, Taste: Taste buds, primary taste sensation, Smell: Receptors, modalities of smell Male reproductive system: functions of testes, puberty, spermatogenesis functions of testosterone, semen, Female reproductive system: Ovarian hormones functions – Menstrual cycle, Hormonal basis of changes in menstrual cycle, Family Planning.	**6**

REFERENCE BOOKS:

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

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Program: BRIT
Semester: I
Subject: Basics of Radiation Physics
Code: 42BBMRIT003

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Understand the fundamental principles of general physics as they relate to medical imaging, including concept of radiation.

CO2: Differentiate the various forms of general radiation by examining their nature, sources, energy levels, and interactions with matter.

CO3: Identify the fundamental components and construction of radiology equipments.

CO4: Interpret quality control of radiology equipment's.

CO5: Differentiate between x-ray equipment's and other radiology related equipment's.

CO6: Describe the production of x-rays.

CO7: Describe circuit system of radiology equipment's.

Course Content: Basics of Radiation Physics

Topics and contents	Hours
MODULE – I: Basic concept of general physics related to imagingthe	**5**
Units and measurements-Force, work, power and energy- Temperature and heat-SI units of above parameters. Atomic structure-atom model-Nucleus-electronic configuration-periodic table-Isotopes-Ionization- excitation-Binding energy-electron volt-Electromagnetic radiation-Quantum nature of radiation-mass energy equivalence-Fluorescence-electromagnetic spectrum.	
MODULE – II: Electricity, magnetism and electromagnetic waves	**9**
Electric charges, Coulomb's Law- Unit of charge- Electric potential, unit of potential-Electric induction, capacitance and Capacitors, series and parallel connection-electric current, unit, resistance, ohm's law, electric power, Joule's law. Varying currents-Growth and decay of current in LR circuit time constant, charge and discharge of a Capacitor through a resistance and inductance. Oscillations in an LC circuit. DC circuit, Ohm's law, resistivity, series and parallel combination, EMF, Kirchhoff's law, heating effect of current. **Electricity, magnetism and electromagnetic waves by IKS.** Introduction to electromagnetic waves, Maxwell's equation, electromagnetic waves, energy density and intensity, momentum, electromagnetic spectrum and radiation in Atmosphere.	
MODULE – III: Electronics	**9**
Semiconductors; Conduction in crystals, Energy bands. Intrinsic and Extrinsic semiconductors n-type and p-type semiconductors, majority and minority carriers. Semiconductor diodes: p-n junction-properties forward and reverse bias, characteristics of p-n junction Rectifiers-Half-wave and full wave, ripple factor, Efficiency of HW and FW rectifiers. Filter circuits; Zener diode, regulated power supply. Transistors-Symbols, Transistor connections and characteristics, Transistor as an amplifier, load line analysis, operating point, types of amplifiers-voltage and power amplifiers. Feedback-negative feedback in amplifiers.	
MODULE – IV: Discovery of x-rays-X-ray production and properties	**5**
Bremsstrahlung radiations-Characteristics X-Rays, factors affecting X-ray emission spectra, X-ray quality and quantity, HVL measurements, heel effect, soft and hard X-Rays, added and inherent filtration, reflection and transmission targets.	
MODULE – V: Concept of Heat	**4**
Definition of heat, temperature, Heat capacity, specific heat capacity, Heat transfer-conduction, convection, radiation, thermal conductivity, equation for thermal conductivity (k), the value of k of various material of interest in radiology, thermal expansion, Newton's law of cooling, Heat radiation, perfect black body, Stefan law, application in Diagnostic Radiology (Heat dissipation in both stationary and rotating X-ray tubes).	

MODULE – VI: Interaction of ionizing radiation with matter Types of interactions of X-and gamma radiation, Photoelectric & Compton, Pair production, annihilation radiation. Interaction of X and gamma rays: Transmission through matter, law of exponential attenuation, half value layer, and linear attenuation coefficient-coherent scattering- photonuclear disintegration-Particle interactions. Interactions of X rays and Gamma rays in the body; fat-soft tissue-bone-contrast media-total attenuation coefficient-relative clinical importance.	**7**
MODULE – VII: Exponential attenuation Half Value Thickness (HVT), Tenth Value Thickness (TVT), dependence on energy and atomic number. Radiation intensity and exposure, photon flux and energy flux density. LET, range of energy relationship for alpha, beta particles with X-Rays. **Physical quantity, its unit and measurement**: Fundamental and derived quantity, SI unit, various physical/radiation quantity used in Diagnostic Radiology and its unit (for example, KVp, mA, mAS, Heat unit.	**6**

REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1	Basic radiological physics	K. Thayalan	Jaypee Brothers Medical Publishers (P) Limited, 2003
2	Christensen's physics of diagnostic radiology	Curry and Dowdey	Wolters Kluwer
3	X-Ray Equipment for Student	D.N. And M.O. Chesney	Blackwell Science Ltd
4	A Textbook of Radiation Physics for Radiologic Technology	Surendra Maharjan, Suraj Sah	Samiksha Publications
5	A Concise Guide on Basic Radiographic Physics Darkroom Procedures, Radiographic Positioning & Techniques	Lalit Agarwal	JBD Publications

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Program: BRIT
Semester: I
Subject: Basics of Radiation Physics Lab.
Code: 42BBMRIT004

Course Outcome:

On completion of the Course, the students will be able to:

CO1: Explain the fundamental principles of general physics as applied to medical imaging.

CO2: Differentiate between various types of radiation relevant to diagnostic imaging.

CO3: Identify and describe the components and construction of radiological equipment.

CO4: Interpret quality control parameters of radiology equipment.

CO5: Compare and contrast X-ray equipment with other imaging modalities.

CO6: Describe the process of X-ray production.

CO7: Illustrate and explain the circuitry of radiology equipment.

Course Content: Basics of Radiation Physics Lab.

Topics and contents	Hours
MODULE – I: Basic concept of general physics related to imaging	**9**
Units and measurements-Force, work, power and energy Temperature and heat-SI units of the relevant parameters. Atomic structure-atom model-Nucleus-electronic configuration Binding energy-electron volt-Electromagnetic radiation Quantum nature of radiation, Fluorescence-electromagnetic spectrum.	
MODULE – II: Electricity, magnetism and electromagnetic waves	**9**
Electric charges, Coulomb's Law, Unit of charge, Electric potential, unit of potential, Electric induction Varying currents-Growth and decay of current in LR circuit time constant Charge and discharge of a Capacitor through a resistance and inductance. LC circuit, DC circuit, resistivity, series and parallel combination	
MODULE – III: Electronics	**9**
Semiconductors- Intrinsic and Extrinsic semiconductors n-type and p-type semiconductors. Semiconductor diodes: p-n junction, Efficiency of HW and FW rectifiers. Filter circuits; Zener diode. Transistors- Transistor connections, Transistor as an amplifier, load line analysis, operating point, types of amplifiers-voltage and power amplifiers.	
MODULE – IV: Discovery of x-rays-X-ray production and properties	**9**
X-Rays, factors affecting X-ray emission spectra, X-ray quality and quantity, HVL measurements, heel effect, soft and hard X-Rays, added and inherent filtration, reflection and transmission targets.	
MODULE – V: Concept of Heat	**9**
Temperature, Heat capacity, specific heat capacity, Heat transfer-conduction. Radiation, thermal conductivity, equation for thermal conductivity (k), the value of k of various material of interest in radiology, thermal expansion. Newton's law of cooling, Heat radiation, perfect black body. Application in Diagnostic Radiology.	
MODULE – VI: Interaction of ionizing radiation with matter	**7**
Photoelectric & Compton. Interaction of X and gamma rays, Interactions of X rays and Gamma rays in the body, fat-soft tissue-bone-contrast media-total attenuation coefficient, relative clinical importance.	
MODULE – VII: Exponential attenuation	**8**
Half Value Thickness (HVT), Tenth Value Thickness (TVT). Radiation intensity and exposure, photon flux and energy flux density. LET, range of energy relationship for alpha, beta particles with X-Rays. Diagnostic Radiology and its unit (for example, KVp, mA, mAS, Heat unit.	

REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1	Basic radiological physics	K. Thayalan	Jaypee Brothers Medical Publishers (P) Limited, 2003
2	A Textbook of Radiation Physics for Radiologic Technology	Surendra Maharjan, Suraj Sah	Samiksha Publications

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Program: BRIT
Semester: I
Subject: Introduction to Healthcare
Code: 42BBMRIT005

Course Outcome:
On completion of the Course, the students will be able to:

CO 1: Demonstrate a foundational understanding of the concept of health.
CO 2: Explore the objectives, components, and implementation strategies of various National Health Programs.
CO 3: Understand and apply the basic principles of nursing care.
CO 4: Gain comprehensive insight into public health systems.

Course Content: Introduction to Healthcare

Topics and contents	Hours
MODULE – I: Introduction to Health	**3**
Definition of Health, Determinants of Health Health indicators of India Health team concept **Health Team Concept in the Bhartiya Knowledge System (IKS)**	
MODULE – II: National Health Programs	**3**
National Health Policy National Health Programs (Brief objectives and scope) Family welfare programs in India	
MODULE – III: Nursing principles and Interpersonal relationship	**6**
Nursing and Nursing principles, Interpersonal relationships, Bandaging basic turns, Bandaging extremities, Triangular bandages and their applications Nursing position, bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's position, comfort measures, Aids, rest and sleep Lifting and transporting patients, transferring patients to wheel chair, transferring from bed to stretcher Bedside Management: Proper usage of bed pan, Observation of stools, urine, sputum. Understand the use and care of catheters. Enema procedures	
MODULE – IV: Public health, healthcare delivery, and basic medical terminology	**3**
Method of giving nourishment: Feeding, tube feeding, drips, transfusion Monitoring and recording of vitals Simple aseptic techniques, sterilization and disinfection Observation of surgical dressings, Concepts of First Aid	

REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1	A Textbook of Radiation Physics for Radiologic Technology	Surendra Maharjan, Suraj Sah	Samiksha Publications
2	X-Ray Equipment for Student	D.N. And M.O. Chesney	Blackwell Science Ltd

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Program: BRIT
Semester: I
Subject: Medical Terminology and Record Keeping
Code: 42BBMRIT006

Course Outcome:
On completion of the Course, the students will be able to:

CO 1: Understand and Apply Medical Terminology.

CO 2: Enhance Communication in Healthcare Settings.

CO 3: Develop Proficiency in Medical Record Keeping.

CO 4: Ensure Accuracy and Confidentiality in Records Management.

CO 5: Familiarize with Health Information Systems.

Course Content: Medical Terminology and Record Keeping

Topics and contents	Hours
MODULE – I: Introduction to Medical Terminology	**3**
Definition and Scope of Medical Terminology Origins and Evolution of Medical Terms Rules for Interpreting Medical Terms Importance of Precision in Medical Terminology	
MODULE – II: Communication in Healthcare Settings	**3**
Importance of Communication in Healthcare Components of a Medical Record Principles of Effective Healthcare Communication Communication in Challenging Situations Barriers to Effective Communication	
MODULE – III: Proficiency in Medical Record Keeping	**3**
Introduction to Medical Records Documentation Standards and Guidelines, Formats of Medical Records Legal and Ethical Aspects of Record Keeping Data Accuracy and Quality Control	
MODULE – IV: Accuracy and Confidentiality in Records Management	**3**
Introduction to Records Management Accuracy in Health Records Confidentiality in Health Records, Roles and Responsibilities Data Retention and Disposal Policies	
MODULE – V: Health Information Systems	**3**
Introduction to Health Information Systems (HIS) Components of Health Information Systems Functions and Applications, Security, Privacy, and Legal Issues Evaluation and Quality Assurance	

REFERENCE BOOKS:

S. No.	Title	Author	Publisher
1	Medical Terminology, Documentation, and Coding	Anne P. Stich	Routledge Publisher
2	Medical Terminology for Health Professions	Ann Ehrlich, Carol L. Schroeder	Cengage Learning
3	Medical Terminology	M. Mastenbjörk M.D. S. Meloni M.D. Medical Creation David Andersson	Medical Creations
4	Medical Records: Organization and Management	GD Mogli (Author)	Jaypee Brothers Medical Publishers

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Program: BRIT
Semester: I
Subject: Professionalism and Values
Code: 42BBMRIT007

Course Outcome:
On completion of the Course, the students will be able to:

CO 1: Understand the Professional, ethical and moral values.

CO 2: Illustrate the Code of conduct, team efforts and healthcare environment.

Course Content: Professionalism and Values

T Topics and contents	Hours
MODULE – I: Professional, ethical and moral values	**5**
Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality Personal values- ethical or moral values	
MODULE – II: Code of conduct, team efforts and healthcare environment	**10**
Attitude and behavior- professional behavior, treating people equally Code of conduct, professional accountability and responsibility, misconduct Differences between professions and importance of team efforts Cultural issues in the healthcare environment	

REFERENCE BOOKS:

S. No.	Title	Author	Publisher
1	Textbook of Medical Ethics	Erich H Loewy	Springer
2	Professionalism, Professional Values and Ethics in Nursing	Suresh K Sharma, Asha P Shetty	Jaypee Brothers Medical Publishers

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Program: BRIT
Semester: I
Subject: English & Communication Skills
Code: 42BBMRIT008

Course Outcome:
On completion of the Course, the students will be able to:

CO1: Develop a foundational understanding of language structures.

CO2: Read, interpret, and comprehend a variety of texts, including prescribed course books and health-related materials.
CO3: Draft and manage health-related documents and correspondence.

CO4: Participate effectively in oral communication activities, such as seminars, telephonic conversations, and situational dialogues.
CO5: Students should be familiar with listening to comprehension media, audio, video, speeches and identify the key points.

Course Content: English & Communication Skills

Topics and contents	Hours
MODULE – I: Knowledge of Language	**3**
Review of grammar, Remedial study of grammar, building vocabulary Introduction to Parts of speech Exercise on use of grammar Tense, Number, Gender	
MODULE – II: Read and comprehend prescribed course books	**3**
Read and comprehend prescribed course books Reading Summarizing, Comprehension	
MODULE – III: Reports on health problem, outgoing correspondence, replying incoming correspondence	**3**
Various Forms of Composition, Letter writing, Note taking Precise writings Diary writing, Reports on health problem etc. Official correspondence: Outgoing correspondence, replying incoming correspondence, writing circulars, notices, charge memos, note taking, writing summaries, observation reports. Teaching learning activities: Exercise on writing: Letter writing, resume/CV Essay writing.	
MODULE – IV: Seminar, Telephonic conversion, conversation in different situations	**3**
Participating in seminar, Telephonic conversion, conversation in different situations, practice in public speaking. Spoken mode, Debates, Telephonic conversion, formal & informal conversation: Agreeing emphasizing, interrupting, politely, opinions, interviews, visual presentation.	
MODULE – V: Comprehension media, audio, video, speeches	**3**
Listening to comprehension media, audio, video, speeches, definition of listening, types of listening, purposes of listening, obstacles for listening, contexts of listening, to be a good listener, listening to a lecture etc. Teaching learning activities: Listening to audio, video tapes and identify the key points.	

REFERENCE BOOKS:

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

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Program: BRIT
Semester: I
Subject: Basic Computers and Information Science
Code: 42BBMRIT009

Course Outcome:
On completion of the Course, the students will be able to:

CO 1: Understand the Fundamentals of Computer Systems.

CO 2: Demonstrate Proficiency in Common Operating Systems and Software.

CO 3: Use the Internet and Online Resources Effectively.

CO 4: Understand Windows and Microsoft Office.

CO 5: Utilize Computers for Health Record Management.

Course Content: Basic Computers and Information Science

Topics and contents	Hours
MODULE – I: Fundamentals of Computer Systems	**3**
Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages. Input output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems). Processor and memory: The Central Processing Unit (CPU), main memory.	
MODULE – II: Proficiency in Common Operating Systems and Software	**3**
Introduction of Operating System: introduction, operating system concepts, types of operating system. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.	
MODULE – III: Internet and Online Resources Effectively	**3**
Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.	
MODULE – IV: Windows and Microsoft Office	**4**
Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.	
MODULE – V: Computers for Health Record Management	**2**
Application of Computers in clinical settings.	

REFERENCE BOOKS:

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

SEMESTER – II

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Program: BRIT
Semester: II
Subject: Basics of Microbiology
Code: 42BBMRIT010

Course Outcome:
On completion of the Course, the students will be able to:

CO001: Describe the structure, classification, morphology and growth of bacteria.

CO002: Describe the methods sterilization, disinfection, its applications and the management of biomedical waste.

CO003: Explain the concepts of immunity, hypersensitivity and immunization.

CO004: Describe Nosocomial infections and methods for prevention of Hospital acquired infections.

CO005: Describe the list of common fungi and viruses and explain their importance.

Course Content: Basics of Microbiology

Topics and contents	Hours
MODULE – I: Structure, classification, morphology and growth of bacteria	**6**
Morphology of Bacteria: (Structure, size, shape, arrangement cell wall, flagella, spore, capsule, fimbria) Physiology of Bacteria: (Bacterial growth curve, Temp, O2, Co2, micro and macro nutrient growth requirements), Culture Media, Culture Methods, Antimicrobial sensitivity tests Sterilization and Disinfections: Definition, Dry heat Sterilization, Moist heat Sterilization, Chemical disinfectants, Gaseous disinfection, Test for disinfection/ Sterilization control	
MODULE – II: Sterilization, disinfection and the management of biomedical waste	**6**
Infection: Classification, Sources of infection, Modes of transmission Nosocomial infection including biomedical waste management: Definition, Classification, Significance, Prevention and control Biomedical waste management	
MODULE – III: Concepts of immunity, hypersensitivity and immunization	**6**
Immunology: Immunity, Antigen, Antibody, Hypersensitivity	
MODULE – IV: Nosocomial infections and methods for prevention	**6**
General Properties of fungi. (General characters, classification, Morphology, Reproduction) General Properties of Viruses. (General character, classification based on Genome, Capsid, Envelope & replication and cultivation of virus).	
MODULE – V: Common fungi and viruses; and their importance	**6**
Applied Microbiology: Pyrexia of unknown origin, Meningitis, Zoonotic infections, Hepatitis, HIV infection and AIDS, Food poisoning, Diarrhea, Urinary tract infections, Pulmonary Tuberculosis	

REFERENCE BOOKS:

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

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Program: BRIT
Semester: II
Subject: Basics of Biochemistry
Code: 42BBMRIT011

Course Outcome:
On completion of the Course, the students will be able to:

CO1: Understand the Nutritional importance of carbohydrate, lipids, proteins, vitamins and minerals.

CO2: To study about Acid–Base Balance, Water & Electrolyte balance.

CO3: Understand the fundamental chemistry and the different functional tests like LFT (Liver function test), RFT (Renal function test).

CO4: Understand the applications of radioisotopes.

Course Content: Basics of Biochemistry

Topics and contents	Hours
MODULE – I: Nutrition	**11**
Calorific value Nitrogen Balance Respiratory quotient BMR Nutritional importance of carbohydrate, lipids, proteins, vitamins and minerals Emphasis on parenteral nutrition	
MODULE – II: Acid–Base Balance, Water & Electrolyte balance	**12**
Henderson Hassel Bach equation Buffers of the body fluids Ph regulation, Disturbance in acid base balance Anion gap Basic principles & estimation of blood gases and ph. Over view of water and electrolyte balance Basic principles in estimation of Electrolyte Normal values and interpretation	
MODULE – III: Clinical chemistry, normal values and interpretation of results	**12**
Renal function tests, Liver function tests, Tumor markers Cardiac markers Diagnostic Enzymology Lipid profile Blood sugar and GTT Normal &Abnormal urine analysis	
MODULE – IV: Radioisotopes	**10**
Definition, Application &Hazards Normal and abnormal urine analysis Clinical charts on LFT, RFT, and diagnostic enzymology	

REFERENCE BOOKS:

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

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Program: BRIT
Semester: II
Subject: Conventional Radiography and Equipment
Code: 42BBMRIT012

Course Outcome:
On completion of the Course, the students will be able to:

CO1: Describe the structure and working of x-ray tube, production of x-rays, types of x-ray tube and heat dissipation methods.
CO2: Describe the x-ray generator circuits and different circuit types.
CO3: Explain the list the control of scattered radiation
CO4: Describe the meters and exposure timers
CO5: Describes about the fluoroscopy and explains about the care and maintenance of x-ray equipment's

Course Content: Conventional Radiography and Equipment

Topics and contents	Hours
MODULE – I: X-Ray tube, production of X-Rays, types of X-Ray tube	**9**
Historical aspects, construction of X-ray tubes, requirements for X- ray production (Electron source, target and anode material), tube voltage, current, space charge, early X-ray tubes(Coolidge tubes, tube envelop and housing) cathode assembly, X-ray production efficiency, advances in X-ray tubes, anode angulation and rotating tubes-line focus principle-space charge effect, tube cooling-Modern X-ray tubes-stationary anode, rotating anode, grid controlled X- ray tubes, heel effect, off focus radiation, tube insert and housing-Tube rating-Quality and intensity of x-rays-factors influencing them. X-ray tube, gas filled x-ray tube, construction working and limitations; stationary anode x - ray tube; construction, working, methods of cooling the anode, rating chart and cooling chart. **Heat dissipation methods**, tube rating, heat units, operating conditions and maintenance and Q.A procedures.	
MODULE – II: X-Ray generator circuits and different circuit types	**9**
Filament current and voltage, X-ray circuits (primary circuit, auto transformer), types of exposure switch and timers, principle of automatic exposure control (AEC) and practical operation, filament circuit, high voltage circuits, half wave, full wave rectification, three phase circuits. **X-ray generator circuits:** Vacuum tube diodes-semi-conductor diodes- transistor-Rectification-half and full wave-self rectification-X-ray generator; filament circuit-kilo Voltage circuit-single phase generator-three phase generator- constant potential generator-Fuses H.T. generator for x-ray machines, three phase rectifier circuits, three phase six rectifier circuit, three phase 12 rectifier circuit, high and medium frequency circuits; capacitance filter control and stabilizing equipment, mains voltage compensator, mains resistance compensator, compensation for frequency variation, control of tube voltage, kV compensator; high tension selector switch, filament circuit, control of tube current, space charge compensation. **Interlocking circuits: Relays:** description and working, use of relays in diagnostic machines for over load protection, circuit diagram; simplified circuit and block diagrams illustrating sequence of events from mains supply to controlled emission of x-rays.	
MODULE – III: Control of scattered radiation	**9**
Beam limiting devices: cones, diaphragms, light beam collimator, beam cantering device, methods to verify beam centring and field alignment; Filters- inherent filters, added filters, heavy metal filters, grids; design and control of scattered radiation, grid ratio, grid cut-off, parallel grid, focused grid, crossed grid, grided cassettes, stationary and moving grid potter bucky diaphragms, various types of grid movements; single stroke movement, oscillatory movement and reciprocatory movement.	

MODULE – IV: Meters and exposure timers	**9**
Moving coil galvanometer: construction and working/conversion to millimeter, ammeter and voltmeter, meters commonly used in diagnostic x-ray machines, pre reading kV meter and millimeter, digital panel meters. Clockwork timers, synchronous motor timer, electronic timers, photo metric timers (fluorescent and photoelectric effect as applied in timers), ion chamber-based timers, integrated timer.	
MODULE – V: Fluoroscopy, care and maintenance of x-ray equipment's	**9**
Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, construction of fluoroscopic screen and related accessories, tilting table, dark adaptation. General care; functional tests; testing the performance of exposure timers, assessing the MA settings, testing the available KV, measurement of focal spot of an x-ray tube, testing the light beam diaphragm, practical precautions pertaining to Brakes and locks, H.T. cables, meters and controls, tube stands and tracks as well as accessory equipment.	

REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1	Radiographic Imaging (Cbs)I.C.R.P.	D.N. Chesney & M.O Chesney	CBS Publishers & Distributors
2	The Physics of Radiology and Imaging	K Thayalan	Jaypee

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Program: BRIT
Semester: II
Subject: Clinical Radiography Positioning - I
Code: 42BBMRIT013

Course Outcome:
On completion of the Course, the students will be able to:

CO1: Understand the basic patient positioning during radiographic investigation.
CO2: Apply special positioning skills for different pathological and physical conditions.
CO3: Application of equipments while working in radiology departments.
CO4: Choose proper position during radiography.
CO5: Explain relative positions of x-ray tube and patient relevant exposure factors during radiography.
CO6: Explain the use of accessories.
CO7: Explain the anatomic and physiological basis of the procedure to be undertaken.

Course Content: Clinical Radiography Positioning - I

Topics and contents	Hours
MODULE – I: Principles of Radiography	**7**
Preparation of the Room, Apparatus and Instruments Positions of the Patient: Erect, Sitting, Supine, Prone, Lateral, Oblique, Decubitus Etc. Relative position of X-Ray tube and patient, relevant exposure factors. Use of accessories such as radiographic cones, grid and positioning aids. Anatomic and Physiological basis of the procedure, Association with theory with practical work. Radiographic appearances, both normal and common abnormal conditions where elementary knowledge of the pathology involved will ensure the application of the appropriate radiographic technique. Modifications in technique for various disabilities and types of subjects. Radiation protection, use of gonad shield, practical methods of reducing radiation dose to the patient.	
MODULE – II: Upper limb	**7**
Routine projections for the whole hand, fingers, wrist joint, forearm, elbow joint and humerus. Supplementary projections for Scaphoid, Carpal tunnel, Ball Catchers projections, Head of the Radius, Supracondylar fracture and Olecranon process	
MODULE – III: Lower Limb	**5**
Routine projections for the whole foot, toes, calcaneum, ankle joint, leg, knee- joint, patella and femurs. Supplementary projections for Talo-Calcaneal joint, Forced projections for torn ligaments, Flat Feet, Club Feet, Intercondylar projections for loose bodies in the knee, Axial projection for Patella.	
MODULE – IV: Shoulder Girdle and Thorax	**5**
Routine projections for the shoulder joint, Scapula, Acromio-Clavicular joint, Clavicle, Sternoclavicular joint, Sternum and Ribs. Supplementary projections for the axial projection of Clavicle, Bicipital groove, Coracoid process.	
MODULE – V: Vertebral Column	**7**
Routine projections for Atlanto -Occipital joint, cervical spine, Cervico- thoracic Junction, thoracic Spine, lumbar Spine, Lumbo Sacral Region, Sacrum and Coccyx. Supplementary projections for the intervertebral foramina, posterior arch of Atlas, Flexion and Extension of Cervical Spine, Scoleosis and Kyphosis, Sacro Ileac Joint.	

MODULE – VI: Skull	**7**
Routine projections for cranium and facial bones; Supplementary projections for trauma, Towne's method, Sellaturcica, Optic foramina, Jugular foramina, Temporal bones, Mastoids, Petrous bone, Zygomatic arches, Orbits, Maxillae, Nasal bones, Mandible, Temporomandibular joints. Nasal Sinuses: Techniques for Frontal, Maxillary, Ethmoidal and Sphenoid Sinuses, erect and horizontal projections for fluid levels.	
MODULE – VII: Pelvic girdle and hip region	**7**
Routine projections for the whole pelvis, Sacro-Ileac joints, hip joint and Neck of Femur. Supplementary projections for the greater and lesser trochanters of Femur. Frog leg projection, Ischeum, Symphysis Pubis, Ileum, Acetabulum and Congenital Dislocation of Hip, Arthrodesis. **Skeletal survey:** Skeletal survey for metabolic bone disease, metastases, hormonal disorder, renal disorders.	

REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1	Bontrager's Textbook of Radiographic Positioning and Related Anatomy	John Lampignano and Leslie E Kendrick	Elsevier Science
2	Radiology Of Positioning and Applied Anatomy for Students and Practitioners	Garkal G. S.	Jaypee Brothers Medical Publishers
3	A Guide on Special Radiographic Investigations & Techniques	Lalit Agarwal	JBD Publications

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Program: BRIT
Semester: II
Subject: Clinical Radiography Positioning Lab. - I
Code: 42BBMRIT014

Course Outcome:
On completion of the Course, the students will be able to:

CO1: Understand fundamental patient positioning techniques essential for various radiographic examinations.

CO2: Demonstrate specialized positioning skills tailored to accommodate diverse pathological and physical conditions.

CO3: Apply appropriate use of radiological equipment in clinical settings for accurate imaging outcomes.

CO4: Ensure correct patient alignment and positioning to optimize image quality and minimize repeat exposures.

CO5: Analyze the spatial relationship between the X-ray tube and the patient, and determine suitable exposure parameters.

CO6: Identify and utilize positioning accessories effectively to support accurate and safe radiographic procedures.

CO7: Explain the anatomical and physiological rationale underlying the radiographic procedures being performed.

Course Content: Clinical Radiography Positioning Lab. – I

Topics and contents	Hours
MODULE – I: Principles of Radiography	**10**
Preparation of the Room, Apparatus and Instruments Positions of the Patient: Erect, Sitting, Supine, Prone, Lateral, Oblique, Decubitus. Use of accessories such as radiographic cones, grid and positioning aids. Modifications in technique for various disabilities and types of subjects. Radiation protection, use of gonad shield, practical methods of reducing radiation dose to the patient.	
MODULE – II: Upper limb	**8**
Routine projections for the whole hand, fingers, wrist joint, forearm, elbow joint and humerus. Supplementary projections for Scaphoid, Carpal tunnel, Ball Catchers projections, Head of the Radius, Supracondylar fracture and Olecranon process	
MODULE – III: Lower Limb	**10**
Routine projections for the whole foot, toes, calcaneum, ankle joint, leg, knee- joint, patella and femurs. Supplementary projections for Talo-Calcaneal joint, Forced projections for torn ligaments, Flat Feet, Club Feet, Intercondylar projections for loose bodies in the knee, Axial projection for Patella.	
MODULE – IV: Shoulder Girdle and Thorax	**8**
Routine projections for the shoulder joint, Scapula, Acromio-Clavicular joint, Clavicle, Sternoclavicular joint, Sternum and Ribs. Supplementary projections for the axial projection of Clavicle, Bicipital groove, Coracoid process.	

MODULE – V: Vertebral Column	**8**
Projections for Atlanto -Occipital joint, cervical spine, Cervico- thoracic Junction Thoracic Spine, lumbar Spine, Lumbo Sacral Region, Sacrum and Coccyx. Supplementary projections for the intervertebral foramina, posterior arch of Atlas Flexion and Extension of Cervical Spine, Scoleosis and Kyphosis, Sacro Ileac Joint.	
MODULE – VI: Skull	**8**
Routine projections for cranium and facial bones; Supplementary projections for trauma, Temporal bones, Mastoids, Petrous bone, Zygomatic arches, Orbits, Maxillae, Nasal bones, Mandible, Temporomandibular joints. Nasal Sinuses: Techniques for Frontal, Maxillary, Ethmoidal and Sphenoid Sinuses, erect and horizontal projections for fluid levels.	
MODULE – VII: Pelvic girdle and hip region	**8**
Routine projections for the whole pelvis, Sacro-Ileac joints, hip joint and Neck of Femur. Supplementary projections for the greater and lesser trochanters of Femur. Frog leg projection, Ischeum, Symphysis Pubis, Ileum, Acetabulum and Congenital Dislocation of Hip, Arthrodesis.	

REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1	Bontrager's Textbook of Radiographic Positioning and Related Anatomy	John Lampignano and Leslie E Kendrick	Elsevier Science
2	Radiology Of Positioning and Applied Anatomy for Students and Practitioners	Garkal G. S.	Jaypee Brothers Medical Publishers
3	A Guide on Special Radiographic Investigations & Techniques	Lalit Agarwal	JBD Publications

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Program: BRIT
Semester: II
Subject: Medical Law and Ethics
Code: 42BBMRIT015

Course Outcome:
On completion of the Course, the students will be able to:

CO 1: Understand the Fundamentals of Medical Law and Ethics

Course Content: Medical Law and Ethics

Topics and contents	Hours
MODULE – I: Fundamentals of Medical Law and Ethics	**15**
Medical ethics - Definition - Goal - Scope Introduction to Code of conduct Basic principles of medical ethics – Confidentiality Malpractice and negligence - Rational and irrational drug therapy Autonomy and informed consent - Right of patients Care of the terminally ill- Euthanasia Organ transplantation 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. Professional Indemnity insurance policy Development of standardized protocol to avoid near miss or sentinel events Obtaining an informed consent.	

REFERENCE BOOKS:

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

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Program: BRIT
Semester: II
Subject: Principal of Management
Code: 42BBMRIT016

Course Outcome:
On completion of the Course, the students will be able to:

CO1: Acquainted with the management system of the concerned branch.

Course Content: Principal of Management

Topics and contents	Hours
MODULE – I: Principal of Management	**15**
Introduction to management Strategic Management Foundations of Planning Planning Tools and Techniques Decision Making, conflict and stress management Managing Change and Innovation Understanding Groups and Teams Leadership Time Management Cost and efficiency	

REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1	Essentials of Professionalism, Professional Values & Ethics for BSc Nursing Students	Varinder Kaur	CBS Publishers and Distributors Pvt. Ltd
2	Professionalism Professional Values and Ethics in Nursing	Suresh K Sharma	Jaypee Brothers
3	Professionalism, Professional Values & Ethics	Shama Lohumi and Rakesh Lohumi	CBS publishers and Distributers PVT Ltd