Undergraduate Qualifications
B.Voc in Radiology and Imaging Technology

As per guidelines of the National Higher Education Qualification Framework (NHEQF)

Year	Qualification Title	NCrF Level
Year-1	Undergraduate Certificate in Radiology and Imaging Technology	Level 4.5
Year-2	Undergraduate Diploma in Radiology and Imaging Technology	Level 5
Year-3	Bachelor of Vocation in Radiology and Imaging Technology	Level 5.5

School of Health Science and Technology

(Academic Year: 2025- 2026)

Program Overview

The B.Voc in Radiology and Imaging Technology is a specialized undergraduate program designed to train students in the use of imaging techniques for accurate diagnosis and treatment planning in healthcare. This three-year program integrates theoretical knowledge with hands-on training, ensuring that students develop expertise in operating advanced imaging equipment and understanding radiographic procedures. The curriculum covers essential areas such as X-ray imaging, ultrasound, CT scans, MRI, and nuclear medicine, equipping students with the necessary skills to work in diagnostic centers, hospitals, and research institutions. In addition to technical proficiency, students are also trained in patient care, radiation safety, medical ethics, and quality control to ensure professional and ethical conduct in medical imaging.

The program includes industrial training and internships that provide practical exposure to real-world medical imaging environments. Through hands-on experience, students gain a deep understanding of imaging techniques, image interpretation, and the role of radiology in disease diagnosis and treatment monitoring. The course structure is designed to meet industry demands, ensuring that graduates are job-ready and capable of handling the latest imaging technologies used in modern healthcare facilities.

Scope

1. **Employment in Healthcare Facilities** – Graduates can work in hospitals, diagnostic imaging centers, radiology departments, and specialty clinics, assisting in accurate disease diagnosis.
2. **Research and Development** – Opportunities exist in medical research institutions and imaging technology firms, where professionals contribute to advancements in imaging techniques and equipment development.
3. **Public Health and Emergency Services** – Graduates can work with emergency and trauma centers, aiding in rapid imaging and diagnosis for critical patient care.
4. **Quality Control and Radiation Safety** – Careers in regulatory bodies and healthcare organizations involve ensuring safety standards, compliance with radiation protection guidelines, and maintaining imaging quality.
5. **Higher Education and Specialization** – Those interested in academic growth can pursue postgraduate studies, specialized certifications in advanced imaging techniques, or research in medical imaging sciences.

Career Path

Entry-Level

1. X-ray Technician
2. Radiology Technician
3. CT Scan Technician
4. MRI Technician
5. Diagnostic Imaging Assistant

Mid-Level

1. Senior Radiology Technician
2. Ultrasound Technician / Sonographer
3. Mammography Technician
4. Interventional Radiology Technologist
5. PACS Administrator

Senior-Level

1. Chief Radiology Technologist
2. Radiology Department Manager
3. Radiology Trainer / Faculty
4. Diagnostic Imaging Consultant
5. Regulatory Compliance Officer (Radiology)

Program Learning Outcomes

Program Specific Outcomes	
	A Graduate of B.Voc Radiology and Imaging Technology in should be able to:
PSO1	Demonstrate the acquisition of comprehensive knowledge and coherent understanding of radiology in a broad multidisciplinary context, their different learning areas, their linkages with related fields of study, and current and emerging developments associated with the industry.
PSO2	Demonstrate the acquisition of practical, professional, and procedural knowledge required for carrying out professional or highly skilled work/tasks related to healthcare sector including knowledge required for undertaking self-employment initiatives, and knowledge and mind-set required for entrepreneurship involving enterprise creation, improved product development, or a new mode of organization.
PSO3	Demonstrate the acquisition of skills in areas related to specialization in radiology and imaging in a broad multidisciplinary context, including wide-ranging practical skills, involving variable routine and non-routine contexts relating to the radiology and medical imaging technology field.
PSO4	Demonstrate the acquisition of the capacity to extrapolate from what has been learned, translate concepts to real-life situations and apply acquired competencies in new/unfamiliar contexts, rather than merely replicate curriculum content knowledge, to generate solutions to specific problems.

Generic Program Outcomes	
	A graduate of B.Voc in Radiology and Imaging Technology should be able to:
PO5	Demonstrate the capability for complex problem-solving
PO6	Demonstrate the capability for critical thinking
PO7	Demonstrate the ability for creativity
PO8	Demonstrate the skills that enable them to communicate effectively
PO9	Demonstrate the capability for analytical reasoning/thinking
PO10	Demonstrate the ability for coordinating and collaborating with others
PO11	Demonstrate the capability for leadership readiness
PO12	Demonstrate 'learning how to learn" skills
PO13	Demonstrate the capability for digital and technological skills
PO14	Demonstrate multicultural competence and inclusive spirit
PO15	Demonstrate the acquisition of knowledge and attitude that are required for value inculcation
PO16	Demonstrate the ability for autonomy, responsibility, and accountability
PO17	Demonstrate the acquisition of and ability to apply the knowledge, skills, attitudes, and values required to take appropriate actions for environmental awareness and action
PO18	Demonstrate the capability to participate in community-engaged services/ activities for promoting the wellbeing of society.
PO19	Demonstrate the ability to identify with or understand the perspective, experiences, or points of view of another individual or group, and to identify and understand other people's emotions

Abbreviation And Definition

Abbreviation	Definition
MDP	Multidisciplinary
AEC	Ability Enhancement Courses
VAC	Value Added Courses
SEC	Skill Enhancement Courses
MC	Major (Core)
MD	Major (Discipline)
MIP	Major (Industry Practice)
VETI	Vet (Industry Immersion)
MI	Minor (Electives)

Semester Wise Structure and Curriculum

UG Certificate in Radiology and Imaging Technology | NCrF – 4.5

Semester-1							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Human Anatomy and Physiology	MC-1	0	3	0	3	
	Basics of Physics	MC-2	0	3	0	3	
	Concepts of health and hospital services	MDP-1	3	0	0	3	
	Professional Skills (Team Skills)	SEC-1	3	0	0	3	
	On the Job Training- 1	MIP	0	0	8	8	
	Total		**6**	**6**	**8**	**20**	

Semester-2							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Radiation Physics and Radiographic Photography	MC-3	0	2	0	2	
	Positioning Techniques and Radiographic Clinical Procedures	MC-4	0	2	0	2	
	Orientation in Clinical Sciences.	MC-5	0	2	0	2	
	Fundamentals of Business	MDP-2	3	0	0	3	
	Employability Skills (Basics)	SEC-2	3	0	0	3	
	On the Job Training- 2	MIP	0	0	8	8	
	Total		**6**	**6**	**8**	**20**	

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Semester-3							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Instrumentation of Specialized Radiology Equipment	MC-6	0	3	0	3	
	Radiation safety and quality control	MC-7	0	3	0	3	
	Environmental Sciences	MDP-3	3	0	0	3	
	Communication Skills (English)	AEC-1	0	4	0	4	
	On the Job Training – 3	MIP	0	0	8	8	
	Total		**3**	**10**	**8**	**21**	

Semester-4							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Physics and hardware of MRI	MC-8	0	3	0	3	
	Computed Tomography	MC-9	0	3	0	3	
	Basics of Ultrasonography	MC-10	0	3	0	3	
	Cultural Diversity in the Indian Society	VAC-1	2	0	0	2	
	Professional Skills (Career Skills)	SEC-3	3	0	0	3	
	On the Job Training – 4	MIP	0	0	8	8	
	Total		**5**	**9**	**8**	**22**	

UG degree in Radiology and Imaging Technology | NCrF – 5.5

Semester-5							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Interventional Radiology	MC-11	0	3	0	3	
	Recent Advances and Guided Radiological Procedures	MC-12	3	0	0	3	
	Hospital Administration	MC 13	3	0	0	3	
	Research Methodology and Biostatistics	MC 14	3	0	0	3	
	Business Communication	AEC -2	0	4	0	4	
	On the Job Training –5	MIP	0	0	8	8	
	Total		**9**	**7**	**8**	**24**	

Semester-6							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Biomedical Waste Management	MC 15	3	0	0	3	
	Lab Operation and Safety Process	MC 16	3	0	0	3	
	Universal Human Values	VAC-2	3	0	0	3	
	On the Job Training –6	MIP	0	0	12	12	
	Total		**9**	**0**	**12**	**21**	

Curriculum (Course-wise)

Semester I

Course Code	MC-1	Course Name	Human Anatomy and Physiology	Course Category	Skill	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall the basic structures and functions of major organs and systems in the human body.	1
CLO2	Explain the relationship between the structure and function of organ systems.	2
CLO3	Apply knowledge of anatomy and physiology to describe physiological processes.	3
CLO4	Analyze the interrelationships between organ systems in maintaining health.	4
CLO5	Evaluate the impact of anatomical or physiological dysfunctions on health.	5

Module 1: Human anatomy and physiology

Introduction to anatomy and physiology - Definition, difference between structures and functions. Different terms used in anatomy. Levels of body organization

Characteristics of the living human organism – Eleven systems of the human body and its associated organs. Scopes of human anatomy and physiology-Scopes and career prospects, branches and divisions.

Module 2: Cell, tissue, bones and skeletal muscular system

Organization of the human body- Cell, cellular organelles, structures and functions, Cell division processes. Types of tissues, their structure and functions.

Skeletal system- structure and function of different bones and joints, skeletal system of humans, position of bones and skeletons.

Muscular system- Structure, composition, and functions of different muscles and their positions.

Module 3: Blood, Lymph, Circulatory and Cardiovascular system

Blood- Structure, composition, functions, synthesis processes, mechanism, and normal ranges of blood and blood components.

Lymphatic system- composition and circulation process of lymph, structure and functions of different associated organs of the lymphatic system.

Cardiovascular system- Structure, position, and functions of the heart, veins, and arterial supplies, different blood circulation systems, cardiac output, and cardiac cycle.

Module 4: Respiratory, Urinary and Digestion system

Respiratory System- identifying different organs, their structure, position, and functions involved in the respiratory system, respiratory mechanism, lungs capacity.

Urinary System- structure and function of organs of the urinary system, urine composition, mechanism of urination, filtration, and storage process.

Digestion System- structure and functions of organs involved in the digestion process, their metabolic activity, associated organs of digestion and their structure and functions.

Module 5: Endocrine, Nervous system and Reproductive system

Endocrine Glands- definition of endocrine glands, their classification, structural, functional descriptions of each gland, and their hormones.

Nervous System – Description of the brain, spinal cord, and a complex network of nerves, understanding of the central nervous system and peripheral nervous system. Sensory Nervous System- Understanding the sensory system, organs of the sensory system, their structure and function.

Reproductive system- Understanding the both male and female reproductive organs, their structures, secretions, and functions.

Suggested Readings

1. "Human Anatomy and Physiology" by Elaine N. Marieb and Katja Hoehn
2. "Anatomy and Physiology: The Unity of Form and Function" by Kenneth S. Saladin
3. "Essentials of Human Anatomy and Physiology" by Elaine N. Marieb
4. "Human Anatomy and Physiology" by Stuart Fox
5. "Anatomy and Physiology for Health Professionals" by J. L. H. Asimov

Course Code	MC-2	Course Name	Basics of Physics	Course Category	Skill	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall that physics is the study of matter, energy, and the fundamental forces of nature, such as gravity, electromagnetism, and nuclear forces.	1
CLO2	Explain how the laws of motion, like Newton's laws, describe the relationship between the forces acting on an object and its motion.	2
CLO3	Apply the concept of energy conservation by demonstrating how potential energy converts to kinetic energy in a falling object.	3
CLO4	Analyze how the principles of physics, such as force and motion, work together to explain everyday phenomena like driving a car or riding a bike.	4
CLO5	Evaluate how understanding physics is essential for advancing technology and solving real-world problems, such as in medicine or engineering.	5

Module 1: Mechanics

Newton's Laws of Motion: The fundamental principles governing the motion of objects, including force, mass, and acceleration, work,

Energy, and Power: Kinetic energy, potential energy, conservation of energy, and power,

Gravitation: Newton's law of gravitation, gravitational potential energy, and orbits of planets and satellites,

Circular Motion: Centripetal force, angular velocity, and acceleration,

Rigid Body Dynamics: Concepts of torque, rotational motion, moment of inertia, and angular momentum.

Module 2: Electromagnetism

Electrostatics: Coulomb's law, electric field, and potential due to point charges, Gauss's law, and capacitance,

Magnetic Effects of Current: Magnetic field due to a current-carrying wire, Biot-Savart law, Ampere's law, and magnetic force on moving charges,

Electromagnetic Induction: Faraday's law of induction, Lenz's law, and self and mutual inductance,

Alternating Current (AC): AC circuits, impedance, resonance, and power factor,

Electromagnetic Waves: Properties of electromagnetic waves, spectrum, and the speed of light.

Module 3: Optics

Reflection and Refraction: Laws of reflection, Snell's law, refractive index, total internal reflection,

Lenses and Mirrors: Image formation, magnification, and focal length,

Optical Instruments: Simple microscope, compound microscope, and telescope,

Wave Nature of Light: Interference, diffraction, and polarization,

Modern Optics: Introduction to lasers and fiber optics.

Module 4: Modern Physics

Photoelectric Effect: Einstein's explanation, photons, and quantum nature of light,

Atomic Models: Rutherford, Bohr model of the atom, and energy levels,

Radioactivity: Types of radiation (alpha, beta, gamma), half-life, and decay processes,

Dual Nature of Matter: Matter waves, de Broglie wavelength, and wave-particle duality,

Nuclear Physics: Fission and fusion reactions, nuclear energy.

Module 5: Physics of Radiology and Medical Imaging

Basic Concepts of Radiology

Ionizing Radiation: Types of radiation (alpha, beta, gamma, X-rays), interaction of radiation with matter, and their biological effects,

X-rays and Their Production: How X-rays are generated, X-ray tubes, and the role of high voltage,

Radiation Safety: Understanding dose, shielding, and safety measures in radiology to minimize exposure to patients and medical staff ,

X-ray Imaging Principles: Absorption of X-rays by tissues, contrast, and the formation of images based on differential attenuation,

Radiographic Techniques: How X-ray images (radiographs) are produced, importance of exposure time, intensity, and contrast in diagnostic images, Basics of CT scans, Magnetic Resonance Imaging (MRI), Ultrasound Imaging.

Suggested Readings

1. Physics: Principles with Applications by Douglas C. Giancoli
2. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
3. Concepts of Physics by H.C. Verma
4. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
5. Introduction to Physics by John D. Cutnell and Kenneth W. Johnson.

Course Code		**Course Name**	Concept of Health and Hospital Services	**Course Category**	MDP		L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Define key concepts related to health, well-being, and hospital services.	1
CLO2	Explain the structure and functions of health care delivery systems in India and globally.	2
CLO3	Analyze real-life scenarios to identify the roles and responsibilities of various hospital departments.	3
CLO4	Compare and contrast different types of health care services (public vs. private) and their impacts on patient care.	4
CLO5	Develop a health promotion program or intervention plan for a specific community based on health needs assessment.	5

Module 1: Concept of Health and Well-being

Definition and Dimensions of Health (Physical, Mental, Social, Spiritual, Emotional), Determinants of Health: Biological, Environmental, Behavioral, Social, Economic, Concepts of Disease and Illness Acute vs. Chronic, Infectious vs. Non-infectious, Indicators of Health – Mortality rate, Morbidity rate, Life expectancy, DALY, Concepts of Well-being and Quality of Life, Changing concepts of health Biomedical, Ecological, Psychosocial, Holistic, Role of lifestyle and behavior in health maintenance

Module 2: Health Care Delivery System in India

Overview of Health Care System in India, Levels of Health Care: Primary, Secondary, Tertiary, Functions and Services at Each Level, Role of Government in Health Care – MOHFW, NRHM/NHM, Public Health Infrastructure: Sub-centers, PHCs, CHCs, District Hospitals, Role of Private Sector, Voluntary Organizations, and NGOs, Indigenous Systems of Medicine (AYUSH), Recent Initiatives: Ayushman Bharat, Digital Health Mission

Module 3: Hospital Services and Administration

Definition, Aims, and Classification of Hospitals, Functions of Hospitals – Curative, Preventive, Educational, Research, Types of Hospitals – General, Specialty, Teaching, Rural, Urban, Hospital Departments OPD, IPD, ICU, Emergency, Operation Theatre, Pharmacy, Radiology, Laboratory, Hospital Administration – Organizational Structure, Duties of Hospital Administrator, Human Resource Management in Hospitals, Equipment and Material Management, Legal Aspects: Medical Ethics, Consumer Protection Act, Medical Negligence

Module 4: Community Health and Preventive Services

Definition and Importance of Community Health, Principles and Levels of Prevention: Primary, Secondary, Tertiary, Role of Community Health Workers – ASHA, ANM, MPW, Immunization Programs and National Health Campaigns, Water Supply, Sanitation, Waste Disposal in Health,

Nutrition and Health – Community Nutrition Programs, Health Education and IEC (Information, Education, Communication), Maternal and Child Health (MCH) and Reproductive Health Services

Module 5: Health Planning, Policies, and Global Health

Health Planning in India – Five Year Plans and Health Goals, National Health Policy – Evolution and Objectives, Health Committees: Bhore, Mudaliar, Shrivastava, Role of International Health Agencies WHO, UNICEF, Red Cross, UNDP, World Bank, Global Health Issues – Pandemics, Malnutrition, Access to Care, Sustainable Development Goals (SDGs) and Health, Health Economics Cost of Health Care, Financing, Insurance, Role of Health Information Systems and Surveillance

Suggested Readings

1. Principles of Hospital Administration and Planning – Dr. B.M. Sakharkar
2. Hospital Administration – C.M. Francis & Mario C. deSouza
3. Essentials of Hospital Management & Administration – Yashpal Bhatia
4. Textbook of Hospital Administration – D. C. Joshi & Mamta Joshi
5. Hospital and Health Services Administration – S.L. Goel
6. Hospital Management – G.D. Kunders

Course Code	SEC-1	Course Name	Professional Skills (Team Skills)	Course Category	General	SEC	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Explain the importance of team skills and list the key team skills	2
CLO2	Apply cognitive skills such as critical thinking, problem-solving and the ability to learn, for smooth and efficient functioning in the workplace	3
CLO3	Apply non-cognitive skills such as empathy, creativity, teamwork, collaboration, interpersonal skills, and resilience for smooth and efficient functioning in the workplace	3
CLO4	Use trust and collaboration while working in a team	3
CLO5	Display effective communication as team leaders and members for the proper functioning of the team	3

Module 1: **Communication Basics**
Communication: Basics and Importance, Speaking: Greetings and Introductions, Writing: Understand Personal Experiences and Thoughts, Non-verbal Communication, Active Listening, Negotiation, Self-Presentation, Self-Presentation: Excelling at Interviews, Self-Presentation: Rocking the Group Discussion, Selling

Module 2: **Communication Workplace**
Speaking: On the Telephone, Speaking: Making Requests,

Writing: Write Effective Notes, Writing: Write Effective Emails, Negotiation: Negotiation in Action Getting to YES

Module 3: **Teamwork**
Work Effectively in a Team, Collaborate to Achieve Team Goals, Build Effective Relationships with Stakeholders, Conflict Management,

Module 4: **Customer Centricity**
Types of Customers, Responding Effectively to Customers,

Module 5: **Attitudes and Behavioural Skills**
Time and task management, Quality consciousness, Result Orientation,

Self-Development - Positive Attitude, Self-Awareness: Know Yourself, Responding to Change, Personal Health, Hygiene, and Grooming, Adopting safety practices, Gain Financial Literacy

Module 6: **Problem Solving**:
Introduction to Critical Thinking,

Problem Solving: Introduction to Creative Thinking,

Problem-Solving: Introduction to Decision Making, Decision Making: Respond Effectively to a Situation,

Module 7: **Workplace Awareness**
Cultural Fitment and Gender Diversity, Identify and Align with High-growth Sectors, Organisational Structure and Values, Searching and Applying for Relevant Job,

Module 8: **Success in Job Interviews**
How to Prepare for a Job Interview, How to Prepare for Job Interview - Getting Ready, How to Conduct Yourself at the Venue, How to Answer Questions During the Interview, How to Effectively Conclude the Interview, How to follow up after the Interview, Ace your Job Interview.

Suggested Readings

1. "The Five Dysfunctions of a Team" by Patrick Lencioni
2. "Team of Teams" by General Stanley McChrystal
3. "The Five Behaviors of a Cohesive Team" by Patrick Lencioni
4. "The New Science of Building Great Teams" by Michael A. West
5. "First, Break All the Rules" by Marcus Buckingham and Curt Coffman.

Semester 2

Course Code	**MC-3**	**Course Name**	Radiation Physics and Radiographic Photography	**Course Category**	Skill	Major	L	P	Pr	C
							0	2	0	2
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Recall that radiation physics deals with the study of ionizing radiation, its properties, and its application in medical imaging like X-rays.	1
CLO2	Explain how X-rays interact with different tissues in the body, creating varying levels of contrast on radiographic images.	2
CLO3	Apply radiation physics by showing how adjusting exposure time and intensity impacts the clarity and quality of radiographic images.	3
CLO4	Analyze how radiation protection techniques, such as shielding and dosage control, ensure minimal risk to both patients and radiologists.	4
CLO5	Evaluate how improper use of radiation in radiographic photography can lead to potential health risks, such as tissue damage or increased cancer risk.	5

Module 1: Introduction to Radiation Physics

Basic principles of radiation, types of radiation (ionizing and non-ionizing), properties of X-rays and their interaction with matter, the electromagnetic spectrum, radiation energy, atomic structure, and the production of X-rays.

Module 2: Radiation Safety and Protection

The principles of radiation protection (ALARA: As Low As Reasonably Achievable), methods of protection including shielding, distance, and time, personal protective equipment (PPE) for radiation safety, biological effects of ionizing radiation, and radiation dose measurement and monitoring.

Module 3: X-ray Tube and Imaging Equipment

The construction and working principles of the X-ray tube, components of radiographic equipment, the generation of X-rays, control of X-ray exposure, and imaging systems used in radiography.

Module 4: Radiographic Imaging Techniques

The basics of radiographic image production, factors influencing image quality such as exposure time, voltage, current, and the use of contrast agents, addresses image receptor types and film processing techniques, including digital imaging methods.

Module 5: Radiographic Photography and Image Interpretation

Principles of radiographic image capture, the use of photo graphic techniques in radiography, digital image acquisition, image quality parameters, and the basic principles of interpreting radiographic images for diagnostic purposes.

Suggested Readings

1. Radiologic Science for Technologists: Physics, Biology, and Protection by Stewart C. Bushong
2. Radiation Physics for Medical Imaging by Stewart C. Bushong
3. Introduction to Radiologic and Imaging Sciences and Patient Care by Arlene M. Adler and Richard R. Carlton
4. Essentials of Radiographic Physics and Imaging by James Johnston
5. Radiographic Imaging and Exposure by Terri L. Fauber.

							L	P	Pr	C
Course Code	**MC-4**	**Course Name**	Positioning Techniques and Radiographic Clinical Procedures	**Course Category**	Skill	Major	0	2	0	2
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall that positioning techniques in radiography involve placing the patient in specific positions to ensure accurate imaging while minimizing discomfort.	1
CLO2	Explain how proper positioning ensures the area of interest is well-aligned with the X-ray beam to produce clear and diagnostic images.	2
CLO3	Apply positioning techniques by demonstrating how different body positions, such as supine or lateral, are used to capture specific anatomical views.	3
CLO 4	Analyze how radiographic clinical procedures, like contrast media usage or fluoroscopy, enhance the quality and diagnostic value of images in various medical conditions.	4
CLO5	Evaluate how improper positioning or technique can result in poor-quality images, leading to misdiagnosis or the need for repeat imaging, increasing patient exposure to radiation.	5

Module 1: Fundamentals of Radiographic Positioning
Principles of patient positioning for various diagnostic radiographic procedures, proper alignment techniques, and the use of positioning aids. positioning terminology and the importance of positioning to obtain high-quality diagnostic images while minimizing patient discomfort and radiation exposure.

Module 2: Positioning for Skeletal Radiography
The positioning techniques for imaging the skeletal system, including the upper and lower limbs, spine, and pelvis. include routine views, special projections, and methods for optimizing image quality for bone fractures, dislocations, and joint conditions.

Module 3: Positioning for Thoracic and Abdominal Imaging
Proper positioning for chest radiographs, including views for lung and heart evaluations, abdominal imaging techniques, including the use of upright and supine positions for abdominal radiography. the use of contrast agents and guidelines for imaging the thoracic cavity and abdominal organs.

Module 4: Positioning for Specialized Radiographic Procedures

Advanced positioning techniques for imaging areas such as the head, neck, and temporomandibular joints (TMJ), as well as specialized projections for sinus, skull, and facial bone radiography. techniques for imaging the gastrointestinal system using contrast media.

Module 5: Radiographic Clinical Procedures and Patient Care
Process of performing radiographic procedures in clinical settings, including patient preparation, safety protocols, and infection control, the role of radiographers in patient interaction, ensuring patient comfort and safety during the procedure, and post-procedure care and instructions**.**

Suggested Readings

1. Radiographic Positioning and Related Anatomy by Dale A. Stidham
2. Manual of Radiographic Positioning by H. P. Berman and G. K. C. Schmidt
3. Positioning in Radiography by Paul L. G. Moon
4. Radiographic Procedures and Positioning by Carol A. J. and Michael A. Johnston
5. Radiographic Positioning and Procedures by W. H. D. White.

Course Code	MC-5	**Course Name**	Orientation in Clinical Sciences.	**Course Category**	Skill	Major	L	P	Pr	C
							0	2	0	2
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Recall that clinical sciences involve the study and application of medical knowledge in diagnosing, treating, and managing patients' health conditions.	1
CLO2	Explain how orientation in clinical sciences provides an understanding of medical terminology, patient care, and the roles of healthcare professionals in a clinical setting.	2
CLO3	Apply clinical science knowledge by demonstrating how medical professionals assess patient symptoms and formulate treatment plans.	3
CLO 4	Analyze how effective communication and teamwork among healthcare professionals improve patient outcomes in a clinical environment.	4
CLO5	Evaluate how a lack of orientation or proper training in clinical sciences can lead to errors in patient care, diagnosis, or treatment.	5

Module 1: Introduction to Clinical Medicine and Patient Care

Role of a Clinician, Clinical vs. Theoretical Knowledge, Patient Interaction, Clinical Communication Skills, Medical Ethics and Professionalism, Patient-Centered Care, Cultural Competence in Healthcare, Importance of Empathy in Patient Care, , The Healthcare Team: Roles and Responsibilities, Health and Disease: Definitions and Concepts, Patient Assessment: A Holistic Approach

Module 2: Clinical Examination and Diagnostic Skills

Clinical History Taking, Physical Examination, Vital Signs, Diagnostic Methods, Clinical Reasoning and Differential Diagnosis, Techniques of Palpation and Auscultation, Understanding Clinical Signs and Symptoms, Interpretation of Diagnostic Imaging (X-rays, CT, MRI),

Blood and Urine Tests: Collection and Interpretation, Physical Examination in Different Age Groups, The Role of Family and Patient History in Diagnosis, Clinical Decision-Making and Judgement

Module 3: Clinical Pathology and Laboratory Medicine

Introduction to Clinical Pathology, Types of Laboratory Tests, Understanding Test Results, Clinical Microbiology, Point-of-Care Testing, Role of Pathologists in Clinical Diagnosis, Blood Bank and Transfusion Medicine, Urinalysis and its Diagnostic Role, Diagnostic Methods for

Infectious Diseases, Biopsy and Histopathology, Molecular Diagnostics and PCR, Understanding Laboratory Error and Quality Control, Genetic Testing and its Implications in Clinical Practice

Module 4: Clinical Pharmacology and Therapeutics
Principles of Pharmacology, Drug Classes and Their Uses, Prescription Writing, Side Effects and Adverse Reactions, Therapeutic Drug Monitoring, Pharmacokinetics (Absorption, Distribution, Metabolism, Excretion), Pharmacodynamics (Drug Mechanism of Action), Drug Interactions, Antimicrobial Stewardship, Role of Clinical Pharmacists in Patient Care, Understanding Dosing Schedules and Routes of Administration, Drug Therapy in Special Populations (Pregnancy, Pediatrics, Geriatrics), Patient Education on Medication Adherence

Module 5: Clinical Ethics, Legal Aspects, and Professionalism
Medical Ethics in Practice, Informed Consent, End-of-Life Care, Confidentiality and Patient Privacy, Legal Responsibilities in Healthcare, Ethical Dilemmas in Medicine, The Role of Ethics Committees in Healthcare, Professionalism in Medicine, Conflict Resolution in Clinical Settings, Medical Malpractice and Liability, The Doctor-Patient Relationship: Boundaries and Trust, Cultural Sensitivity and Ethical Decision Making, Legal Framework of Healthcare (Patient Rights and Healthcare Laws).

Suggested Readings

1. Clinical Anatomy and Physiology for Veterinary Technicians by Thomas P. Colville and Joanna M. Bassert
2. Clinical Medicine and Surgery for Veterinary Technicians by Theresa Welch Fossum
3. Clinical Skills: An Introduction to the Health Professions by Theresa Raphael-Grimm
4. Introduction to Clinical Psychology by Geoffrey P. K.
5. Clinical Examination: A Systematic Guide to Physical Diagnosis by Nicholas J. Talley and Simon O'Connor.

Course Code	MDP-2	**Course Name**	Fundamental of Business	**Course Category**	General	MDP	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Describe various business forms, their advantages, legal requirements, and the registration process for establishing a business	2
CLO2	Describe the nature and significance of business economics and its role in informed decision-making	2
CLO3	Explain the principles and necessity of business ethics and the concept and importance of social responsibility	2
CLO4	Describe the concepts and processes of management, planning, organizing, directing, controlling, and the traits and styles of effective leadership	2
CLO5	Identify various organizational structures and explain their advantages	1

Module 1: Introduction to Business

Different Types of Business Forms, What is Business?, Types of Business, Advantages of different business forms, Legal requirements for establishing different businesses, Registration process of a business, Steps involved, Necessary documents, Importance, Costs associated, Government agencies, Benefits, Common mistakes to avoid.

Module 2: Economics and Business

Nature and Significance, Meaning of business economics, Nature, Role of business economics in decision-making, Fundamentals, Cost-benefit analysis, Demand and supply analysis, Pricing strategies, Economic forecasting, External factors affecting business decisions.

Module 3: Ethics and Social Responsibility

Need of Business Ethics, Meaning, Principles, Need, Concept of Social Responsibility Need, Meaning, Need.

Module 4: Management and Leadership

Concept of management, Process, Nature, Importance, Scope, Planning, Importance, Characteristics, Process, Types of Plans, Organising, Concept, Steps, Principles, Importance, Directing and Controlling, Concept, Principles, Elements and Importance, Controlling and its Features, Importance and Process of Controlling, Leadership, Concept, Meaning, Effective Leadership Traits, Leadership Styles.

Module 5: **Organizational Structure**

Types and advantages of different types of organizational structure, Organisational Structure, Types, Choosing the right type of organizational structure, Necessity, Right structure and Growth, Stages in Organisational Development, Organisational Developmental Strategy, Organisational Practices in 5 phases of growth, Organisational success.

Suggested Readings

1. "Fundamentals of Business" by Stephen J. Skripak
2. "Principles of Business: A Hands-On Approach" by Harry A. Kahn
3. "Business: A Changing World" by O.C. Ferrell, Geoffrey Hirt, Linda Ferrell
4. "Introduction to Business" by Jeff Madura
5. "Business Essentials" by Ronald J. Ebert and Ricky W. Griffin.

Course Code	SEC-2	**Course Name**	Employability Skills (Basics)	**Course Category**	General	SEC	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Demonstrate proficiency in various forms of communication to achieve desired outcomes in personal and professional interactions	3
CLO2	Demonstrate proficiency in workplace communication skills and negotiation techniques for efficient and productive communication within the workplace	3
CLO3	Describe teamwork dynamics within the team environment	2
CLO4	Identify different types of customers and effectively respond to their needs and inquiries, fostering a customer-centric approach	1
CLO5	Demonstrate personal and professional competencies for personal growth, organizational success, and overall well-being	3
CLO6	Demonstrate critical thinking, creative thinking, and decision-making skills to respond effectively to a variety of situations	3
CLO7	Demonstrate an understanding of cultural and gender diversity in the workplace to foster a culture of inclusivity and collaboration.	3
CLO8	Prepare for job interviews, including readiness, conclusion strategies, and post-interview follow-up, to excel in job interviews.	3

Module 1: Communication Basics

Communication: Basics and Importance, Definition, Importance, Improving communication skills for better personal and professional relationships, Speaking: Greetings and Introductions, Conversations, Types of conversations, WORDS approach, Writing: Understand Personal Experiences and Thoughts, How to write a paragraph, CRAFT approach, Non-verbal Communication, Definition, Importance, Improving non-verbal communication, Active Listening, Definition, RESPECT approach, Negotiation: Understanding Perspectives, Definition, OPEN approach,

Self-Presentation: Making a Great First Impression, APPEAR approach, Self-Presentation: Excelling at Interviews, What do recruiters look for?, PERFECT approach, Self-Presentation: Rocking the Group Discussion, Definition of group discussion, PITCH approach,

Selling: Communicate Effectively to Gain Acceptance, Communication methods to gain acceptance for product, service, idea, ACCEPT approach.

Module 2: Communication at Workplace
Speaking: On the Telephone, Everyday communications, Ways to communicate politely and effectively on the telephone, WORDS approach, Speaking: Making Requests, Ways to request politely, The difference between permission and request, WORDS approach, Writing: Write Effective Notes, Definition of note-taking, Effectively writing notes, Organising notes, PILOT approach, Cornell method of note-taking,

Writing: Write Effective Emails, Importance, The difference between written and verbal communication, PILOT approach, Negotiation: Negotiation in Action Getting to YES, Types of outcomes, GAINS approach.

- **Module** 3: **Teamwork**,
  Work Effectively in a Team, Importance of working in a team, CAUSE model, Collaborate to Achieve Team Goals, Importance, Identifying goals, SUCCESS model, Build Effective Relationships with Stakeholders,

- What is a stakeholder?, Types of stakeholders, TREAT technique for managing stakeholders,

- Conflict Management: Identify and Resolve Conflicts, Reasons for conflicts, Techniques to resolve conflicts, CALM approach.

Module 4: **Customer Centricity**
- Types of Customers, Potential, Past, Current, Types of personalities (OCEAN), Responding Effectively to Customers, Importance, LAST approach.

Module 5: **Attitudes and Behavioural Skills**
- Time and task management: Plan and Manage Tasks Within a Timeline, Time management definition, Planning and managing tasks, Staying organized, PLOT approach, Time and task management: Plan, Prioritise, and Manage Tasks, Managing time, Organizing and prioritizing tasks, TRAIN model,

- Quality consciousness: Introduction to Quality, Defining quality consciousness, The importance of establishing standards, Quality Consciousness: Understand the Impact of Errors, Defining errors, The impact of errors, Avoiding mistakes,

- Result Orientation: Introduction to Result Orientation, Defining result orientation, The importance of a result-oriented mindset, How to succeed and get desired results?, Result Orientation: Plan Tasks to Achieve Goals, Becoming result-oriented, Result orientation process, Self-Development - Positive Attitude, Defining attitude, The importance of positive mindset, GLAD model,

- Self-Awareness: Know Yourself, Defining self-awareness, Identifying strengths, Interests and areas of improvement, Using strengths to achieve goals,

- Responding to Change: Understand and Adjust to Change, Defining change, Reacting to change, Ways to adapt to change, Personal Health, Hygiene, and Grooming, The importance of grooming, Importance of personal hygiene, Grooming essentials, Effects of not maintaining appearance,

- Adopting safety practices: Health, Environment, and Safety Awareness, Ways to stay fit and healthy, Keeping surroundings clean, Keeping yourself safe, PASS technique for fire extinguishers, Gain Financial Literacy, Importance of financial literacy, Financial tools in daily life, Components of salary, Types of bank accounts, Importance of insurance.

Module 6: Problem Solving

- Problem Solving: Introduction to Critical Thinking, Importance of critical thinking, Applications, Analysing problems, Link between ideas, REASON model,

- Problem Solving: Introduction to Creative Thinking, Defining creative thinking, Importance, Applications,

- Problem-Solving: Introduction to Decision Making, Defining decision making, Importance, Elements of decision making, Decision Making: Respond Effectively to a Situation, Decision-making process, Application in different scenarios, DECIDE model.

Module 7: Workplace Awareness

- Cultural Fitment and Gender Diversity, Stereotyping and unconscious bias, Diversity issues and how to resolve them, Features of a diverse workplace, Behavioural elements of a diverse workplace, Identify and Align with High-growth Sectors, Types of skill sets, Steps before applying for a job, Organisational Structure and Values, Organizational structure and hierarchy, Organizational values, Work environment and culture, Searching and Applying for Relevant Job, Platforms for finding job vacancies, Creating a resume, Cover letter formats, Job application requirements.

Module 8: Success in Job Interviews

- How to Prepare for a Job Interview - Gaining Confidence, Describing strengths and qualities, Do's and Don'ts for identifying strengths, Researching roles and responsibilities, Knowing your resume, The importance of knowing about the company, Asking questions to the interviewer,

- How to Prepare for Job Interview - Getting Ready, List of documents for the interview, Behaviour at the interview venue, Grooming and appearance for the interview, How to Conduct Yourself at the Venue, How to make a good first impression, Tips for conducting yourself well at the venue, How to Answer Questions During the Interview, Making a good impression, Tips to answer questions effectively, How to Effectively Conclude the Interview, Asking relevant questions to the interviewer, How to follow up after the Interview, Following up to know the application status, Accepting the job offer, Handling negative results, Ace your Job Interview, Identify and describe your strengths and weaknesses, Updating resume, Mock interviews, Tricks to do well in an interview.

Suggested Readings

1. "Employability Skills" by Christine Lockwood
2. "The 7 Habits of Highly Effective People" by Stephen Covey
3. "Essential Skills for Business Success" by R. Glenn
4. "The Employability Skills Handbook" by Carol Dixon
5. "How to Get a Job: The Ultimate Guide to Finding a Job" by K. McGregor.

Semester III

Course Code	MC-6	**Course Name**	Instrumentation of Specialized Radiology Equipment	**Course Category**	Skill	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall that specialized radiology equipment includes devices like X-ray machines, CT scanners, MRI machines, and fluoroscopes, used to capture detailed images of the body.	1
CLO2	Explain how each piece of radiology equipment works, such as how an X-ray machine uses ionizing radiation to create images or how an MRI uses magnetic fields to produce detailed soft tissue images.	2
CLO3	Apply the understanding of radiology equipment by demonstrating how to correctly operate a CT scanner to obtain high-resolution images of internal structures.	3
CLO 4	Analyze how the choice of radiology equipment affects diagnostic accuracy, with specialized equipment offering detailed imaging for specific medical conditions.	4
CLO5	Evaluate how malfunctioning or improper use of radiology equipment can lead to poor-quality images, misdiagnosis, or unnecessary radiation exposure.	5

Module 1: Introduction to Specialized Radiology Equipment

- Types of specialized radiology equipment, Basic principles of operation for each equipment type, Components of radiology equipment, Calibration and maintenance of radiology instruments, Equipment testing and quality assurance.

Module 2: X-ray and Fluoroscopy Equipment

- X-ray machine components and functioning, Fluoroscopy principles and equipment design, Contrast agents used in fluoroscopy, Image intensifiers and digital fluoroscopy, Radiation dose reduction in fluoroscopy.

Module 3: Computed Tomography (CT) Equipment

- CT scanner components and working principles, Image acquisition and processing techniques, CT safety protocols and radiation dose management, CT angiography and specialized CT applications, Artifacts in CT imaging and their causes.

Module 4: Magnetic Resonance Imaging (MRI) Equipment

- MRI machine components and functioning, MRI safety concerns (magnetic fields, metallic implants), MRI image acquisition and techniques, MRI sequences and their applications, Advances in MRI technology (functional MRI, diffusion tensor imaging).

Module 5: Ultrasound and Specialized Imaging Equipment

- Ultrasound technology and equipment components, Doppler ultrasound and its applications, Emerging imaging technologies (e.g., PET, SPECT), 3D and 4D ultrasound imaging, Ultrasound-guided procedures (biopsies, injections).

Practical:

1. Identify and describe the components of X-ray, CT, MRI, and ultrasound machines using physical models or diagrams.
2. Operate X-ray and fluoroscopy equipment on phantoms or simulators to understand image acquisition procedures.
3. Demonstrate CT scanner operation and acquire images for specific anatomical areas under supervision.
4. Identify MRI machine components and follow safety protocols related to magnetic fields and patient screening.
5. Prepare and handle contrast agents and perform contrast-based fluoroscopy simulations.
6. Perform basic quality assurance checks and calibration procedures on radiology equipment.
7. Identify and analyse common CT image artefacts using sample images or software.
8. Compare different MRI sequences using software or case examples to understand their diagnostic value.
9. Operate ultrasound equipment and perform basic Doppler imaging to visualise blood flow.
10. Evaluate PET and SPECT imaging techniques through virtual tools or demonstration videos.

Suggested Readings

1. Medical Imaging Physics by William R. Hendee and E. Russell Ritenour
2. Fundamentals of Radiology by Peter C. R. and Bruce A. M.
3. Instrumentation and Control Systems by C.D. Johnson
4. Medical Imaging Technology by J. T. Jones
5. Diagnostic Imaging: A Teaching File by William W. Wong

Course Code	MC-7	**Course Name**	Radiation safety and quality control	**Course Category**	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	Bloom's Taxonomy (Bt) Level
CLO1	Explain the biological effects of ionizing radiation on human tissues and cells.	2
CLO2	Understand radiation protection principles, dose limits, and regulatory guidelines.	2
CLO3	Apply radiation safety measures to minimize exposure to patients and healthcare professionals.	3
CLO4	Implement quality control techniques to ensure consistent and accurate diagnostic imaging.	3
CLO5	Evaluate equipment performance and adherence to radiation safety standards.	5

Module 1: Biological Effects of radiation

- Ionization, excitation and free radical formation, hydrolysis of water, action irradiation on cell, Direct and indirect effects of radiation on cells, Chromosomal aberration ,

- Biological effects of radiation- somatic effects and hereditary effects, stochastic and deterministic effects, Acute exposure and chronic exposure: factors affecting radio-sensitivity.

Module 2: Radiation detection and Measurements

- Ionization of gases -Fluorescence and Phosphorescence -Effects on photographic emulsion,

- Measuring systems -Ionization Chambers, proportional counters, G.M counters-scintillation detectors ,

- Personnel monitoring devices: Free air ionization chamber, film dosimeter and chemical dosimeter, thermos luminescent dosimeter and Pocket dosimeter

Module 3: Radiation protection

- Radiation units -Exposure-roentgen, kerma, absorbed dose, RBE, Equivalent dose and effective dose, Principles of radiation protection, time - distance and shielding ,Radiation protection of self and patient., ALARA, ICRP, AERB: Responsibilities, organization, Safety Standard, Codes and Guides . Occupational exposure, protection Tools/devices and maintenance and safety handling of lead aprons.

Module 4: Radiation safety measures and calculations

- Radiation protection for radiation workers, general public, pregnant patient and staff,Use factor, occupancy factors, and different shielding material, Evaluation of workload versus radiation factors: Calculation of Work load, weekly calculated dose to radiation worker and General public ,Good work practice in Diagnostic Radiology, AERB specifications for site planning and mandatory guidelines

Module 5: Quality Assurance and quality control for radiology

- QA and QC, Acceptance testing and quality control tests in Radiology-Meaning of the terms used and aspects of a QA programme, equipment and staff requirements, benefits of QA procedures in an imaging department, Verification of Optical and Radiation field congruence, Beam alignment, Focal spot size, Linearity of tube current mA and Timer, applied potential, HVT and total tube filter, Contact between film and intensifying screen, contrast resolution, Grid alignment

Practical:

1. Exploration of different radiation detection instruments such as ionization chambers, GM counters, and scintillation detectors.
2. Familiarisation with various personal radiation monitoring devices including TLDs, film badges, and pocket dosimeters.
3. Observation and understanding of radiation dose calculations, including absorbed dose, equivalent dose, and effective dose.
4. Introduction to the principles of time, distance, and shielding in the context of basic radiation protection planning.
5. Observation of radiation safety protocols for healthcare workers, with emphasis on special groups like pregnant patients and the general public.
6. Study of methods to check alignment between optical and radiation fields using congruence assessment tools.
7. Examination of beam alignment and focal spot size testing procedures using standard quality assurance techniques.
8. Understanding of how to assess the linearity of mA and timer settings in X-ray equipment.
9. Review of procedures to determine Half-Value Thickness (HVT) and total tube filtration in radiology equipment.
10. Observation of image quality assurance methods including contrast resolution, screen-film contact, and grid alignment.

11. Overview of site planning procedures in line with AERB guidelines, including factors like use, occupancy, and workload.

Suggested Readings

1. Radiobiology for the Radiologist by Eric J. Hall and Amato J. Giaccia
2. Radiation Detection and Measurement by Glenn F. Knoll
3. Introduction to Health Physics by Herman Cember and Thomas E. Johnson
4. Radiation Protection and Dosimetry: An Introduction to Health Physics by Michael G. Stabin
5. Health Physics and Radiological Health by Herman Cember

Course Code	MDP-3	**Course Name**	Environmental Sciences	**Course Category**	MDP		L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Identify and describe the components of the environment and their interactions with humans.	1
CLO2	Explain ecosystem concepts including trophic levels, food chains, ecological pyramids, and energy flow in different ecosystems.	2
CLO3	Discuss global environmental problems such as greenhouse effect, ozone depletion, deforestation, and biodiversity loss.	3
CLO4	Analyze causes, impacts, and control strategies of air, water, and land pollution in various environments.	4
CLO5	Evaluate environmental management practices, related laws, and international policies for environmental protection and conservation.	5

Module 1: Components of Environment

- Hydrosphere, lithosphere, atmosphere and biosphere – definitions with examples; Interaction of man and environment;

Module 2: Ecosystem

- Basic concepts, components of ecosystem, Tropic levels, food chains and food webs, Ecological pyramids, ecosystem functions, Energy flow in ecological systems, Characteristics of terrestrial fresh water and marine ecosystems

Module 3: Global Environmental Problems

- Green House Effect, Acid rain, El Nino, Ozone depletion, deforestation, desertification, salination, biodiversity loss; chemical and radiation hazards

Module 4: Environmental pollution and degradation

- Pollution of air, water and land with reference to their causes, nature of pollutions, impact and control strategies; perspectives of pollution in urban, industrial and rural areas. Habitat Pollution by Chlorinated Hydrocarbons (DDT, PCBs, Dioxin etc, Endocrine disrupting chemicals, Nutrient pollution

Module 5: Environmental Management

- Concept of health and sanitation, environmental diseases – infectious (water and air borne) and pollution related, spread and control of these diseases, health hazards due to pesticide and metal pollution, waste treatment, solid waste management, environmental standards and quality monitoring.

Module 6: Environmental Protection Act

- Environmental Laws, national movements, environmental ethics – holistic approach of environmental protection and conservation, IUCN – role in environmental protection. Concept with reference to UN – declaration, aim and objectives of human right policies with reference to India, recent north-south debate on the priorities of implementation, Environmental Protection Agency (EPA)

Module 7: Bioremediation

- Oil spills, Wastewater treatment, chemical degradation, heavy Metals.

Suggested Readings

1. Environmental Studies by Erach Bharucha – UGC-recommended, simple and well-illustrated for beginners.
2. A Textbook of Environmental Studies by D.K. Asthana and Meera Asthana – Covers pollution, biodiversity, and sustainability.
3. Environmental Science: Principles and Practices by C. Cunningham and M. Cunningham – Good balance of theory and application.
4. Fundamentals of Environmental Studies by R. Rajagopalan – Concise and ideal for paramedical/vocational courses.
5. Environment and Ecology by R. Rajagopalan – Suitable for understanding human impact on environment and public health.

Course Code	AEC-1	**Course Name**	Communication Skills (English)	**Course Category**	AEC		L	P	Pr	C
							0	4	0	4
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Use basic English to communicate effectively in everyday situations	3
CLO2	Exchange information and give instructions clearly and effectively	3
CLO3	Describe past experiences, current activities, and future plans	2

Module 1: Everyday English Basics

- Getting Started: Alphabet, Colors, Nice to Meet You, About You: Getting to know you, Where are you from?, This is my Family, School: In the classroom, At school, Time: My Day, My Week, My Month, Shopping: How much is it?, Shopping for clothes, Food: At the supermarket, At a restaurant, Food I like, Health: Making an appointment, At the doctor, Community: Finding an apartment, Around town, Work: Jobs, Getting a job, Getting to work, Calling in sick.

Module 2: Everyday English – 1

- Greetings and Introductions: Ask - about personal details, what something is called (how to say things in English), where someone is from, Give someone personal details, Greet someone, Introduce - others, someone else, yourself, Talk about your nationality, Tell someone where you are from, Thank someone, Exchanging Information: Arrange a meeting, Ask what kind of work someone does, Give instructions, Talk about - computer parts, schedules, Tell someone what work you do,

- Family and Friends: Ask about marital status, Compliment someone, Describe someone, Greet someone, Introduce someone, Talk about - art, family, How much? How many?: Ask the price of something, Buy - food, tickets for a concert, Make a salad, Talk about - a band, breakfast, food, pets, quantities,

- Describing your home: Arrange a meeting, Buy things for - the bathroom, the bedroom, Describe an apartment, Make - plans, suggestions, Plan a party, Talk about - living room furniture, pets, things you use in the kitchen, Tell someone where you live, Thank someone,

- Describing Routines: Ask - a favor, about someone's daily routine, the time, what kind of work someone does, Disagree with someone, Give instructions, Plan a weekend, Tell someone the time, Talk about - family responsibilities, schedules, Things we can/can't do: Ask - about a birthday, the date, the price of something, Express feelings, Give information about - a party,

Invite someone to a party, Make plans, Offer - help, someone food and drink, Plan a party, Refuse politely, Shop for clothing, Solve a problem,

- What's happening?: Ask someone what's happening, Explain what you are doing, Introduce yourself, Make suggestions, Offer help, Talk about - art, basketball, current actions, dance, what you are doing, Tell someone what's happening.

Module 3: Everyday English – 2

- Greetings and Introductions: Ask - about a tourist attraction, about hotel facilities, where someone is from, Describe - a hotel room, how you feel, Excuse yourself, Greet someone, Introduce yourself, Spell a name, Talk about - likes and dislikes, professions,

- Routines and Actions: Ask - about a tourist attraction, where someone is, Talk about - art, free time, hunger, likes and dislikes, sports, Give - directions, someone your location, Describe - actions that are happening, how you feel, routines,

- Talking about the Past: Ask about past experiences and events, Describe - a burglary, how you feel, Report a burglary, Talk about the past, Thank someone,

- Past Experiences: Ask about past experiences and events, Explain Tai Chi, Talk about - animals, basketball, cooking, disappointments, free time, likes and dislikes, professions, sports, Keep in touch,

- Talking about the Future: Ask about the weather, Get information about the weather, Talk about - a future trip, future plans, space travel, the future, the weather, Give information about the weather,

- Let's Trade Apartments: Ask a favor, Buy presents, Plan a weekend, Talk about - a future trip, things we must / mustn't do, things we should / shouldn't do,

- Things we have done: Talk about - past experiences and events, sports, things you have / haven't done, your dreams, your interests, Solve problems on a trip,

- Comparing People and Things: Apologize, Go shopping for clothes, Keep in touch, Pack a suitcase, Say goodbye to a friend, Talk about a tour.

Practicals:

1. Participate in basic greetings and self-introduction role-plays to build comfort with spoken English in everyday contexts.

2. Practise exchanging personal information and giving simple instructions through paired speaking tasks.

3. Engage in classroom simulations such as making appointments, shopping conversations, and asking for directions.

4. Describe familiar people, places, and daily routines using guided sentence structures and picture prompts.

5. Conduct short interviews with classmates about their daily activities, weekend plans, and family routines.

6. Perform role-plays involving workplace conversations such as job applications, calling in sick, or describing job duties.

7. Take part in storytelling or discussion sessions to describe past events or personal experiences.

8. Practise talking about future plans or travel using guided dialogues and calendar-based prompts.

9. Participate in group discussions and games that involve comparing things, expressing likes and dislikes, and making polite requests.

10. Engage in listening comprehension activities using everyday dialogues to extract and respond to key information.

Suggested Readings

1. "English Communication for Technical Students" by M. Ashraf Rizvi
2. "English for Everyone: English Vocabulary Builder" by DK
3. "The Elements of Style" by William Strunk Jr. & E.B. White
4. "Improve Your English: English in the Workplace" by D. H. Palmer
5. How to Speak and Write Correctly" by Joseph

Semester IV

Course Code	MC-8	**Course Name**	**Physics and Hardware of MRI**	**Course Category**	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Define key concepts of electricity, magnetism, and MRI history, including MR active nuclei and basic NMR signal principles.	1
CLO2	Describe the components and types of MR instrumentation, including magnet systems, shielding, and coils.	2
CLO3	Explain spatial encoding mechanisms such as slice selection, phase and frequency encoding, k-space, and major MR sequences.	3
CLO4	Analyze factors affecting MRI image quality including SNR, CNR, spatial resolution, scan time, and common MRI artifacts.	4

Module 1: Basics Physics and Historical Aspects

- Electricity and Magnetism, History of MRI, MR active nuclei, Basic physical principles of NMR signals, Principles of Image acquisition and formation, Precession – Larmour frequency, Radiofrequency pulse, resonance, T1and T2 relaxation times, FID, Image weighting and contrast.

Module 2: MR Instrumentation and Installation

- Magnet system; Types of magnets and strengths, Open and Closed MR systems, Superconducting electromagnets, Magnet shielding, Shimming-Shim coils, Quench, gradient system, RF shielding Faraday Cage, RF receive coils

Module 3: Spatial Encoding

- Gradient coil and image encoding mechanism: Slice Selection, Phase and Frequency Encoding, Kspace and Fourier transformation, MR Sequences and their Acquisition, Basic MR Spin Echo sequences: conventional spin echo (SE), fast/turbo spin echo (FSE/TSE) – its types Proton density, Inversion Recovery (IR) – STIR, FLAIR, Gradient Echo- and its other weighting types, EPI

Module 4: Image quality and parameters

- Image quality – SNR, CNR, spatial resolution, scan time, MRI trade off and Factors affecting MR image, MRI artifacts

Module 5: Advances and Implications of MRI

- MR angiogram and venogram, DWI, MRS, FMRI, perfusion, MRI safety- specific absorption rate (SAR), Safety zones, Personnel, Device safety; The spatially varying static field, Electromagnetic (radiofrequency) fields, Time-varying gradient magnetic fields.

Practicals:

1. Identify and label the main components of an MRI system, including types of magnets, gradient coils, and RF coils, using diagrams or simulation tools.
2. Simulate basic MRI signal generation using software to demonstrate precession, resonance, and relaxation times (T1, T2), as well as signal decay (FID).
3. Demonstrate spatial encoding principles by visualising slice selection, frequency and phase encoding, and k-space filling using virtual lab environments or schematic exercises.
4. Compare image outputs from different MR sequences (e.g., SE, FSE, IR, GRE) and interpret how changes in parameters affect image contrast, resolution, and scan time.
5. Identify common MRI artifacts through sample image sets and explain their causes and methods of correction or reduction.

Suggested Readings

1. MRI in Practice, Catherine Westbrook, John Talbot , 5th edition
2. MRI physical and biological principles by Stewart Bushong.
3. MRI for technologists by Peggy Woodwa
4. MRI in Practice – Catherine Westbrook, John Talbot
5. MRI: Physical and Biological Principles – Stewart C. Bushong
6. MRI for Technologists – Peggy Woodward
7. Introduction to MRI Physics and Imaging – Richard B. Gunderman

Course Code	MC-9	**Course Name**	**Computed Tomography**	**Course Category**	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Recall that computed tomography (CT) uses X-ray technology and computer processing to create cross-sectional images of the body, providing detailed views of internal organs and structures.	1
CLO2	Explain how a CT scanner works by rotating an X-ray beam around the patient and capturing multiple images, which are then reconstructed into detailed cross-sectional images.	2
CLO3	Apply the principles of CT by demonstrating how it is used to diagnose conditions such as tumors, fractures, and internal bleeding through detailed imaging.	3
CLO4	Analyze how CT scans provide more detailed information compared to traditional X-rays, allowing for better diagnosis of complex medical conditions.	4
CLO5	Evaluate how excessive CT scans can lead to high radiation exposure, which may increase the risk of cancer if not properly managed.	5

Module 1: Introduction to Computed Tomography (CT)

- Principles of computed tomography, Overview of CT scanners and their components, Historical development of CT technology, Types of CT scanners (single-slice, multi-slice, and cone beam), Role of CT in diagnostic imaging.

Module 2: CT Scanner Components and Operation

- CT scanner components (X-ray tube, detector arrays, gantry), Working principles of the CT scanner, Image acquisition process, Gantry movements and its impact on image quality, CT system controls and settings.

Module 3: CT Image Reconstruction and Processing

- Basic concepts of image reconstruction in CT, Algorithms used in CT image reconstruction (filtered back projection, iterative reconstruction), Image processing techniques, 3D and multiplanar reconstructions, Artifacts in CT imaging and how to reduce them.

Module 4: CT Imaging Protocols and Techniques

- CT scanning protocols for various body parts (head, chest, abdomen, pelvis), Contrast administration and its impact on CT images, Pre- and post-contrast imaging techniques, Pediatric and geriatric CT imaging protocols, Considerations for patient positioning.

Module 5: CT Safety, Dose Management, and Quality Assurance

- Radiation safety principles in CT, Managing patient radiation dose (ALARA principle), Techniques to reduce radiation exposure, CT dose measurement (CTDI, DLP), Quality assurance and performance testing in CT imaging.

Practicals

1. Observe and identify the main components of a CT scanner using hands-on demonstrations or detailed visual aids.
2. Engage with simulators or case studies to understand gantry movements and image acquisition processes.
3. Perform exercises in CT image reconstruction and processing using software tools or simulated data.
4. Apply different CT scanning protocols on phantom models or through virtual simulations.
5. Conduct radiation dose measurements and quality assurance tests, including the identification of common CT imaging artifacts.

Suggested Readings

1. Computed Tomography: Physical Principles, Clinical Applications, and Quality Control by Euclid Seeram
2. CT and MRI Pathology: A Pocket Atlas by Charles B. Higgins
3. Computed Tomography for Technologists: A Comprehensive Text by Lois E. Romans
4. CT Scan: A Comprehensive Review by Sandra O. Wasik
5. Principles of CT Imaging by E. W. Kelsey.

Course Code	MC-9	**Course Name**	Basics of Ultrasonography	**Course Category**	Skill	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Recall that ultrasonography uses high-frequency sound waves to create real-time images of the inside of the body, commonly used for examining organs, tissues, and developing fetuses.	1
CLO2	Explain how an ultrasound machine emits sound waves that bounce off tissues, with the returning echoes being converted into images displayed on a screen.	2
CLO3	Apply the principles of ultrasonography by demonstrating how it is used to examine the abdomen, monitor pregnancy, or guide needle placement in medical procedures.	3
CLO4	Analyze how ultrasonography offers a non-invasive, radiation-free method to assess soft tissues and monitor various conditions in real-time.	4
CLO5	Evaluate how improper technique or equipment malfunction in ultrasonography can lead to inaccurate images, affecting diagnosis and treatment plans.	5

Module 1: Introduction to Ultrasonography

- Principles of ultrasonography, History and evolution of ultrasound technology, Types of ultrasound machines (2D, 3D, Doppler), Overview of ultrasound wave propagation and interaction with tissues, Applications of ultrasound in medical imaging.

Module 2: Ultrasound Equipment and Components

- Components of an ultrasound machine (transducer, console, monitor), Working principles of the transducer and piezoelectric effect, Types of ultrasound transducers (linear, convex, phased array), Image acquisition techniques, Image display and interpretation.

Module 3: Ultrasound Imaging Techniques

- Basic ultrasound scanning techniques, Patient positioning for various examinations, Role of gel in ultrasound imaging, Different imaging modes (B-mode, M-mode, Doppler), Image optimization techniques and quality control.

Module 4: Doppler Ultrasound and Its Applications

- Principles of Doppler ultrasound, Types of Doppler imaging (color Doppler, pulsed-wave Doppler, continuous-wave Doppler), Blood flow analysis and velocity measurements, Applications in cardiology, obstetrics, and vascular imaging, Interpreting Doppler ultrasound results.

Module 5: Ultrasound Safety, Artifacts, and Quality Assurance

- Safety considerations in ultrasound, Non-ionizing radiation and patient safety, Common artifacts in ultrasound imaging (shadowing, enhancement, speckle), Techniques for minimizing artifacts, Quality assurance procedures and routine equipment calibration.

Practical

1. Identify and familiarize with the main components of an ultrasound machine, including different types of transducers.
2. Demonstrate proper patient positioning and apply basic scanning techniques using ultrasound equipment on phantom models or volunteers.
3. Perform image acquisition in various ultrasound modes such as B-mode, M-mode, and Doppler imaging.
4. Conduct Doppler ultrasound examinations to assess blood flow and interpret velocity measurements.
5. Recognize common ultrasound artifacts and practice techniques to minimize them, along with performing routine quality assurance checks on the equipment.

Suggested Readings

1. Introduction to Ultrasonography by Stephen S. McGraw
2. Diagnostic Ultrasound: Physics and Equipment by Peter J. C. Brown
3. Fundamentals of Ultrasound Physics by William D. Middleton
4. Ultrasonography in Obstetrics and Gynecology by Peter W. Callen
5. Essentials of Abdominal Ultrasound by Anthony J. Orsini

Course Code	VAC-1	**Course Name**	Cultural Diversity in the Indian Society	**Course Category**	VAC	VAC	L	P	Pr	C
							2	0	0	2
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Define and describe the key components of Indian culture and explain the factors contributing to its diversity.	2
CLO2	Analyse the role of major religions in shaping India's societal fabric and historical coexistence.	2
CLO3	Examine the linguistic landscape of India and its impact on national identity and social cohesion.	3
CLO5	Evaluate the diversity of ethnic and tribal communities, their challenges, and contributions to India's cultural mosaic.	3
CLO6	Assess the impact of globalization and modernization on Indian culture and propose strategies to promote cultural harmony and integration.	2

Module 1: Foundation of Indian Diversity

- Define culture and its components (language, religion, customs, traditions, art, etc.), Explain the historical factors contributing to India's cultural diversity (geographic, linguistic, religious, and social), Analyse the concept of unity in diversity and its relevance to Indian society.

Module 2: Religious Diversity

- Describe the major religions of India (Hinduism, Islam, Christianity, Sikhism, Buddhism, Jainism) and their core beliefs, Examine the historical coexistence and conflicts among different religious groups, Analyse the role of religion in shaping Indian society and culture.

Module 3 - Linguistic Diversity

- Explain the linguistic landscape of India, including Indo-Aryan, Dravidian, and other language families., Analyse the impact of language diversity on identity, communication, and social cohesion, Discuss the role of language in nation-building and cultural integration.

Module 4 – Ethnic and Tribal Diversity

- Define ethnicity and tribe, and differentiate between them, Explore the diversity of ethnic and tribal groups in India, their geographical distribution, and cultural practices, Analyse the challenges faced by ethnic and tribal communities in contemporary India.

Module 5 – Cultural Dynamics and Challenges

- Examine the processes of acculturation, assimilation, and pluralism in Indian society, Analyse the impact of globalization and modernization on Indian culture, Discuss the challenges posed by cultural diversity, such as communalism, casteism, and regionalism, Explore

strategies for promoting cultural harmony and national integration.

Suggested Readings

1. "India After Gandhi: The History of the World's Largest Democracy" by Ramachandra Guha
2. "The Wonder That Was India" by A.L. Basham
3. "India: A Sacred Geography" by Diana Eck
4. An Area of Darkness" by V.S. Naipaul
5. "India Unbound" by Gurcharan Das

Course Code	SEC-3	**Course Name**	Professional Skills (Career Skills)	**Course Category**	SEC		L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

COURSE LEARNING OUTCOME

CLO1	Prepare a professional fit to purpose résumé in line with the job description and digital and AI-era practices
CLO2	Prepare for job interviews
CLO3	Participate in recruitment-related group discussions
CLO4	Prepare self for achieving career goals through career planning and life-long learning
CLO5	Identify career opportunities in consideration of personal potential and aspirations.

Module 1: Résumé Skills

- **Résumé Skills: Preparation and Presentation** - Comprehend the importance of a résumé, identify essential components of a good résumé while preparing it.
- **Résumé Skills: Common Errors** - Identify common errors in a résumé.
- **Keywords Specific Resume** - Align resume to new-age AI-powered hiring practices
- **Skills vs Job Description** - Prepare a resume to map the job description
- **Make Specialized Resumes for Different Job Applications** - Create Resumes using AI Tools
- **Self-Presentation Even Before Interview** - Present a Video Resume
- **Work Portfolio** - Prepare a work portfolio
- **Digital Media Profiles** - Manage professional presence on digital media platforms

Module 2: Interview Skills

- **Introduction to Interviews** - Describe the meaning and types of interviews.
- **Common questions** - Describe the important questions generally asked in a job interview.
- **Exchange of views**
- **Interview Skills: Preparation and Presentation** - List key interviewee skills
- **Interview Procedure** - Describe the interview procedure
- **Interview Skills: Common Errors** - Identify common errors people make during an interview.

Module 3: Interview Simulation

- **Job Simulation Formats** - Critique the performance of a few simulated interviews
- **Comment Critically on Simulated Interviews** - Critique the performance of a few simulated interviews
- **Demonstrate an Ideal Interview** - Critique the performance of a few simulated interviews

Module 4: Group Discussion Skills

- **Meaning and Importance of Group Discussion** - Describe the meaning and importance of a Group Discussion in a selection process.
- **Procedure of a Group Discussion** - Describe the procedure of a Group Discussion, identify essential skills to be evaluated during a Group Discussion.
- **Group Discussion: Common Errors** - Identify common errors people commit in a Group Discussion.
- **Group Discussion: Simulation** - Identify common errors people commit in a Group Discussion.

Module 5: Career Planning

- **What is Career? Why a Specific Career?** - Explain the process of career development and its importance for professionals
- **Importance of Career Development** - Explain the process of career development and its importance for professionals
- **Knowing Yourself — Personal Characteristics (MBTI - personality Test)** - Explain the process of career development and its importance for professionals
- **Career Aptitude Tests** - Explain the process of career development and its importance for professionals
- **Career opportunities in Industry & Goals** - Explain the process of career development and its importance for professionals

Module 6: Exploring Career Opportunities

- **Knowledge about the World of Work** - Identify career opportunities in selected fields of work
- **Sources of Career Information** - Identify career opportunities in selected fields of work
- **Skills & Career - Current Trends** - Identify career opportunities in selected fields of work
- **Process of Career Exploration** - Identify career opportunities in selected fields of work

Module 7: Lifelong Learning

- **Developing Eligibility** - Develop skills and abilities to support career goals using life-long learning
- **Concept of Life-Long Learning** - Develop skills and abilities to support career goals using life-long learning
- **Sources of Life-long learning** - Develop skills and abilities to support career goals using life-long learning
- **Case Study** - Use the necessary components to prepare for a career in an identified occupation (as a case study).

SEMESTER V -

Course Code	MC-11	**Course Name**	**Interventional Radiology**	**Course Category**	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall the basic principles, instrumentation, and types of Digital Subtraction Angiography (DSA) recording systems.	1
CLO2	Explain the role of a radiographer in interventional procedures, including patient preparation, informed consent, and post-procedural care.	2
CLO3	Demonstrate the Seldinger technique and perform common neuro and non-neuro interventional procedures under supervision.	3
CLO4	Analyze various interventional radiology procedures to identify critical steps and potential complications.	4
CLO5	Evaluate radiation safety measures and quality assurance protocols to ensure optimal protection in interventional radiology.	5

Module 1: DSA

- DSA, Basic principle, Instrumentation and types of recording system, Contrast media types and administration, Image acquisition protocols, Digital image processing, Common artifacts and troubleshooting, Equipment maintenance and calibration.

Module 2: Role of Radiographer in Interventional Procedure

- Patient preparation, informed consent, post procedural care, patient monitoring, Catheters, Needles, Stents, Guidewires, Embolic agents, Sterilization techniques, Infection control, Patient positioning, Emergency protocols during intervention, Documentation and record keeping.

Module 3: Seldinger Technique, Neuro Interventional Procedures

- 4 vessel cerebral angiogram, Carotid angiography, aortogram, selective angiography, Venogram, endovascular embolization and stenting, Complications management, Neurovascular anatomy, Use of fluoroscopy, Radiation dose monitoring in neuro procedures, Contrast-induced nephropathy prevention.

Module 4: Non-Neuro Interventional Procedures

- Coronary angiogram, Renal angiography, Peripheral angiography, vertebroplasty, PTC, PTBD, TIPS, TARE, Angioplasty, drainage procedures, Radiofrequency ablation, Vascular access techniques, Ultrasound-guided interventions, Post-procedural imaging, Patient follow-up protocols.

Module 5: Radiation Safety

- Radiation safety, protection and room design, General care, Functional tests, Quality assurance and control, Principles of ALARA (As Low As Reasonably Achievable), Radiation monitoring devices, Personal protective equipment (PPE), Emergency response to radiation exposure, Regulatory guidelines and compliance, Staff training and education.

Practicals:

1. Identify and describe key components of DSA equipment, contrast media injectors, and image acquisition systems using model displays or virtual platforms.

2. Demonstrate patient preparation protocols including obtaining informed consent, monitoring vitals, and setting up a sterile field for interventional procedures.

3. Practice the Seldinger technique on phantoms or simulators, along with safe handling of catheters, guidewires, and embolic materials in simulated settings.

4. Observe or assist in simulated neuro and non-neuro interventional procedures, such as angioplasty or drainage, noting steps and safety protocols.

5. Evaluate radiation safety practices by inspecting PPE, dosimeter use, room shielding, and conducting mock quality assuran**ce** tests in a lab or demo environment.

Suggested Readings

1. "Interventional Radiology Basics: Technical Fundamentals and Clinical Applications" by Christoph A. Binkert
2. "Vascular and Interventional Radiology: The Requisites" by John A. Kaufman and Michael J. Lee
3. "Handbook of Interventional Radiologic Procedures" by Karthik Krishnan
4. "Essentials of Radiologic Science" by Robert A. Pooley and Terri L. Fauber (covers radiation safety and instrumentation)
5. "Radiation Protection in Medical Radiography" by Mary Alice Statkiewicz Sherer, Paula J. Visconti, E. Russell Ritenour

Course Code	MC-11	**Course Name**	Recent Advances and Guided Radiological Procedures	**Course Category**	MC	Major	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Describe the principles, techniques, and applications of Dual Source CT, Spectral CT, and hybrid imaging systems like SPECT-CT and PET-MRI.	1
CLO2	Explain recent advances in ultrasound technology including 3D/4D sonography, sonoelastography, HIFU, and contrast-enhanced ultrasound (CEUS).	2
CLO3	Discuss recent MRI advancements such as Diffusion Tensor Imaging (DTI), Parallel Imaging, and specialized imaging techniques like fetal MRI and breast spectroscopy.	3
CLO4	Demonstrate the use of ultrasound-guided procedures including biopsy techniques, drainage, and aspiration.	4
CLO5	Apply knowledge to perform and evaluate CT-guided procedures such as biopsies and pain management interventions.	5

Module 1: Dual Source CT , Spectral CT

- Technique and applications, Hybrid CT systems: SPECT-CT and PETCT SPECT-MRI and PET-MRI, 3D and 4D CT, New detector technology, quantum technology - Photon counting detector, Phase contrast CT

Module 2: Recent advances in ultrasound

- 3D/4D Sonography systems: Equipment, applications and limitations, Sono elastography, High intensity focused ultrasound (HIFU): Principles, equipment, applications and limitations, Contrast Media in Ultrasound, CEUS – Contrast Enhanced ultrasound.

Module 3: Recent Advances in MRI

- DTI, Parallel Imaging techniques, Amide Proton Transfer (APT), Magnetization Transfer Contrast (MTC), Fetal MRI, MR Mammogram, Breast spectroscopy, Iron quantification, pelvic floor imaging.

Module 4 – USG guided Procedures

- Biopsy needles, general principles – dynamic and static guidance, Drainage, aspiration of cyst, thoracentesis, paracentesis, breast biopsy, liver biopsy, prostate biopsy (TRUS), renal biopsy.

Module 5: CT guided procedures

- Bone biopsy, soft tissue biopsy, lung biopsy, liver biopsy, Pain management techniques – pain scale, stellate ganglion block, coeliac plexus block, facet joint injection, trigeminal nerve block, thoracic para vertebral block.

Practicals:

1. Demonstration of advanced imaging systems through virtual simulations or video demonstrations of Dual Source CT, Spectral CT, PET-MRI, and 3D/4D Ultrasound platforms.
2. Hands-on practice with ultrasound-guided techniques such as aspiration, drainage, and biopsy on phantoms or training models, focusing on static and dynamic guidance methods. Observation or simulation of CT-guided procedures, such as lung biopsy or pain management blocks, with attention to equipment setup, patient positioning, and procedure planning.
3. Interpretation and evaluation of advanced MRI techniques, including DTI and MRS, using pre-acquired datasets or case examples to assess diagnostic value and limitations.
4. Familiarisation with CEUS and sonoelastography via contrast agent simulation labs or image dataset reviews to understand diagnostic enhancements and artefact management.

Suggested Readings

1. Computed Tomography: Physical Principles, Clinical Applications, and Quality Control – Euclid Seeram
1. Diagnostic Ultrasound: Principles and Instruments – Frederick W. Kremkau
2. MRI: The Basics – Ray H. Hashemi and William G. Bradley Jr.
3. Ultrasound-Guided Interventional Procedures – Robert G. Gould
4. CT-Guided Procedures – Niranjan Khandelwal and Anupama Negi

Course Code	MI-1	**Course Name**	Hospital Administration	**Course Category**	MI	Minor	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Define hospital management, describe healthcare systems, hospital types, departmental structures, and the roles of hospital administrators.	1
CLO2	Explain healthcare policies, accreditation, licensing requirements, and ethical considerations in healthcare management.	2
CLO3	Discuss financial management concepts in healthcare organizations including budgeting, revenue cycle management, and cost containment strategies.	3
CLO4	Describe human resource management in healthcare covering recruitment, training, retention, employee relations, and legal/ethical issues.	4
CLO5	Analyze quality improvement methodologies, patient safety initiatives, adverse event reporting, and NABH standards in hospitals.	5

Module 1: Introduction to Hospital Management

- Introduction of healthcare system and hospital management: Definition, departments, types of hospital, hierarchy, roles and responsibilities of hospital administrators. Importance: hospital administration in healthcare delivery.

Module 2: Healthcare Policies and Regulations

- Introduction, compliance requirements (e.g., accreditation, licensing). Ethical considerations in healthcare management.

Module 3: Financial Management in Healthcare

- Financial management in healthcare organizations, Budgeting, revenue cycle management, and financial reporting. Cost containment strategies in healthcare

Module 4: Human Resource Management in Healthcare

- HR Policy: Recruitment, training, and retention of healthcare personnel.

- Employee relations and performance management: Legal and ethical issues in human resource management in healthcare.

Module 5: Quality Improvement and Patient Safety

- Concepts: methodologies of quality improvement in healthcare, Patient safety: Initiatives and adverse event reporting systems. Implementing quality improvement projects in

hospitals, Introduction to NABH, definition, 5 Patient chapter, 5 hospital Staff chapters as per NABH.

Module 6: Information Technology in Healthcare

- Introduction: Role of information technology in healthcare administration, Electronic health records (EHRs): implementation and interoperability, Data security and privacy in healthcare IT systems.

Suggested Readings

1. Hospital Management and Administration by V. K. Raina
2. Healthcare Management by Stephen Walston
3. Financial Management of Health Care Organizations: An Introduction to Fundamental Tools, Concepts, and Applications by William N. Zelman, Michael J. McCue, and Alan R. Millikan
4. Human Resource Management in Health Care: Principles and Practice by L. Fleming Fallon Jr.
5. Patient Safety and Healthcare Improvement at a Glance by Sukhmeet Panesar, Andrew Carson-Stevens, Sarah Salvilla, Aziz Sheikh

Course Code	MI-2	**Course Name**	Research Methodology and Biostatistics	**Course Category**	Minor	Minor	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	Bloom's Taxonomy (Bt) Level
CLO1	Define research methods, differentiate between experimental, exploratory, and other research types, and identify research problems.	1
CLO2	Explain ethical issues in research including clinical trials, the role of ethical committees, and social ethics.	2
CLO3	Describe basic biostatistics concepts, types of data, research tools, and data collection methods.	3
CLO4	Develop a comprehensive research proposal incorporating patient information and diagnostic data models.	4
CLO5	Utilize advanced research tools and software for reference management, document formatting, and plagiarism detection.	5

Module 1: Basic of Research

- Introduction to research methods, Identifying research problem, How this research differ from other experimental research, and exploratory research.

Module 2: Ethics

- Ethical issues in research, Research design, Ethics of clinical trials, permission of ethical committee, social ethics.

Module 3: Biostatistics

- Basic Concepts of Biostatistics, Types of Data, Research tools and Data collection methods, Need of biostatistics, Understanding of data in biostatistics, How and where to get relevant data, Relation between data and variables, Type of variables: defining data set

Module 4: Research Proposal

- Developing a research proposal-Models by engaging patients information and data-base of the diagnostic approaches

Module 5: Uses of Advanced Research Tools

- Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

Suggested Readings

1. Kothari, C.R. (2004). Research Methodology. New Age International Pvt Ltd Publishers. ISBN: 9788122436235
2. Peacock, Janet L., and Peacock, Philip J. (2011). Oxford Handbook of Medical Statistics. Oxford University Press. ISBN-13: 978-0199551286
3. Bhome, S., Prajapati, N., Deshmukh-Ghate, D., and Ghosh, A. (2015). Research Methodology. Himalaya Publishing House. ISBN: 978-93-5202-807-8
4. Goyal, R.C. (2013). Research Methodology for Health Professionals. Jaypee Brothers Medical Publishers. ISBN-13: 978-9350251010
5. Creswell, J.W. (2014). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. SAGE Publications. ISBN: 978-1452226101
6. Polit, D.F., and Beck, C.T. (2017). Nursing Research: Generating and Assessing Evidence for Nursing Practice. Wolters Kluwer. ISBN: 978-1496384548

Course Code	AEC -2	**Course Name**	Business Communication	**Course Category**	AEC		L	P	Pr	C
							0	4	0	4
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Discuss the scope and complexity of business communications	1
CLO2	Carry out effective interpersonal communication, including the use of listening skills, verbal skills and non-verbal communication	2
CLO3	Apply practical techniques for effective group communication, including presentations, interviews, meetings, conferences, public relations	3
CLO4	Carry out written business correspondence including letters, documents reports, etc.	4
CLO5	Communicate effectively with the help of digital media including emails, virtual meetings and social media posts	5

Module 1: Overview of Business Communications

- Introduction to Business communication – Introduction, Scope of Business Communications, Complexity of Business Communications, Importance of Communication for Business, Impact of Poor Communication, Definition and Introduction to Business Communication, Types and Levels of Business Communication, Types of Business Communication, Levels of Business Communication, Real-Life Examples-Based Exercises for Practice,

- Dimensions of communication in an Organisation – Introduction, Discussing the Scope and Complexity of Business Communications, Common Dimensions of Communication in an Organization, Common Channels of Communication in an Organization, Real-Life Examples-Based Exercises for Practice,

- Channels of communication in an organization – Introduction, Discussing the Scope and Complexity of Business Communications, Understanding and Applying the Level of Communication in Vertical and Horizontal Hierarchy,

- Barriers to Business Communication – Introduction, Discussing the Scope and Complexity of Business Communications, Discussing the Barriers Observed in Effective Business Communications, Engaging in Real-Life Examples-Based Exercises to Overcome Communication Barriers.

Module 2: Interpersonal Skills

- Effective interpersonal communication – Introduction, Carrying Out Effective Interpersonal Communication, Describing Effective Interpersonal Communication, Applying Knowledge through Real-Life Examples-Based Exercises,

- Listening Skills – Introduction, Carrying Out Effective Interpersonal Communication, Applying Effective Listening Skills, Enhancing Practical Mastery through Real-Life Examples-Based Exercises,

- Speaking Skills – Introduction, Carrying Out Effective Interpersonal Communication, Applying Effective Speaking Skills, Reinforcing Practical Mastery through Real-Life Examples-Based Exercises,

- Loud Reading Skills – Introduction, Understanding Non-Verbal Cues, Impact of Non-Verbal Communication, Developing Effective Non-Verbal Communication Skills, Real-Life Examples and Exercises,

- Non-Verbal Communication – Introduction, Reading Beyond the Surface, Reading and Interpersonal Communication, Decoding the Unspoken, Real-Life Examples and Exercises.

Module 3: Group Communications

- Principles of group communication – Introduction, Core Principles, Applicability Across Settings, Real-Life Exercises,

- Effective presentations – Introduction, Building a Winning Presentation, Time Management: Your Key Ally, Real-Life Examples and Exercises,

- Effective Meetings and conferences – Introduction, Building Effective Gatherings, Real-Life Examples and Exercises,

- Effective Interviews – Introduction, Preparation: Fueling Your Confidence, Shining in the Spotlight: Commanding the Conversation, Adapting to Diverse Stages: Navigating Different Dynamics, Beyond the Conversation: Leaving a Lasting Impression, Real-Life Exercises for Success.

Module 4: Written Business Correspondence

- Letter Writing – Introduction, Core Principles for Clarity and Impact, Exploring Diverse Forms of Correspondence, Ethical Considerations and Cultural Awareness, Real-Life Exercises for Growth,

- Report Writing – Introduction, Key Principles, Types of Business Reports, Real-Life Exercises,

- Documentation maintenance – Introduction, The Value of Good Maintenance, Navigating the Physical and Digital, Mastering the Maze: Organization and Categorization, Version Control: Preserving the Chain of History, Safeguarding the Knowledge: Security Measures, Real-Life Exercises.

Module 5: Digital Business Correspondence

- Email Etiquette – Introduction, The Pillars of Professionalism, To, CC, and BCC, Subject Line, Opening Salutation, Closing Salutation, Pro Tip,

- Virtual Meetings and Netiquette – Introduction, Choosing the Right Platform, Preparation is Key, Communication and Netiquette, Building Rapport and Collaboration, Real-Life Exercises, Visual Storytelling, Collaborative Learning, Expanding Your Toolbox, Examples for Real-Life Exercises,

- Digital Work Collaboration – Notion, etc. – Introduction, Building Bridges, Not Walls, The Digital Toolkit, Mastering the Symphony, Real-Life Exercises, Engaging Activities, Expanding Your Toolkit.

Module 6: Social Media Communications and Digital Marketing

- Introduction to social media communications – Discuss the various social media communications used in business and digital tools and best practices associated with them,

- Introduction to digital marketing – Discuss the various social media communications used in business and digital tools and best practices associated with them.

Suggested Readings

1. Business Communication: Process and Product by Mary Ellen Guffey
2. Business Communication Today by Courtland L. Bovee and John V. Thill
3. The Business Communication Handbook by Judith Dwyer
4. Effective Business Communication by Herta A. Murphy
5. Business Communication: A Case Method Approach by P.D. Chaturvedi

Semester -6

Course Code	MI 3	**Course Name**	Biomedical Waste Management	**Course Category**	Skill	Minor	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Recall the key principles and regulations of biomedical waste management.	1
CLO2	Explain the different types of biomedical waste and their proper classification and disposal methods.	2
CLO3	Apply appropriate procedures for handling, storage, and disposal of biomedical waste in healthcare settings.	3
CLO4	Analyze the environmental and health impacts of improper biomedical waste disposal and the importance of safe practices.	4
CLO5	Evaluate the effectiveness of biomedical waste management programs in minimizing health risks and ensuring regulatory compliance.	5

Module 1: Introduction to Biomedical Waste and Regulations

- Definition of biomedical waste, the various types of biomedical waste (infectious, non-infectious, hazardous), and the regulations governing its management, global standards and national guidelines for biomedical waste disposal, with a focus on the role of healthcare facilities in waste management.

Module 2: Classification and Segregation of Biomedical Waste

- Identifying and classifying different categories of biomedical waste, such as sharps, pathological waste, pharmaceutical waste, and chemical waste., importance of proper segregation at the source to ensure safe handling and disposal, including the use of color-coded bins and labels for each waste type.

Module 3: Handling, Storage, and Transportation of Biomedical Waste

- Safe handling and storage practices for biomedical waste to prevent contamination and exposure, guidelines on storing waste in appropriate containers, the need for secure transportation within healthcare facilities, and the protocols for safely moving waste to disposal sites.

Module 4: Treatment and Disposal Methods

- Various treatment and disposal methods for biomedical waste, including autoclaving, incineration, chemical disinfection, and landfilling, emerging technologies and techniques for reducing the environmental impact of waste disposal, as well as the criteria for selecting appropriate methods based on the type of waste.

Module 5: Health and Environmental Impact of Improper Waste Management

- Potential risks of improper biomedical waste management, including exposure to infections, toxins, and environmental pollution., consequences of inadequate waste disposal on public health and the environment, emphasizing the need for education, training, and adherence to waste management protocols to mitigate these risks**.**

Practicals:

1. Demonstration of biomedical waste segregation using colour-coded bins and labels, with mock samples representing various categories such as sharps, infectious, and pharmaceutical waste.
2. Hands-on practice in safe handling, storage, and internal transport of biomedical waste using standard PPE, appropriate containers, and trolleys in a simulated healthcare environment.
3. Simulation of treatment and disposal techniques including mock autoclaving procedures, chemical disinfection steps, and visual demonstrations of incineration and landfilling processes.
4. Scenario-based exercises to identify lapses in biomedical waste management, followed by group discussions on the health and environmental consequences of improper disposal.
5. Evaluation of a biomedical waste management plan or audit checklist through role-play or document review to assess compliance with regulatory guidelines and best practices.

Suggested Readings

1. Biomedical Waste Management by M.K. Jha
2. Manual of Biomedical Waste Management by Anil Kumar Bhatia
3. Waste Management in Health Care Facilities by M. A. S. S. Sudhakar
4. Biomedical Waste: A Manual for Healthcare Institutions by Vinay Kumar
5. Biomedical Waste Management and Infection Control by S. G. Joshi

Course Code	MI 4	**Course Name**	Lab Operation and Safety Process	**Course Category**	Skill	Minor	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Identify different types of laboratories and list the roles and responsibilities of laboratory personnel, safety equipment, and regulatory agencies like OSHA and EPA.	1
CLO2	Explain the principles behind key lab procedures such as sample handling, centrifugation, pipetting, and proper use of PPE and emergency protocols.	2
CLO3	Demonstrate safe handling, labeling, storage, and disposal of chemicals and biohazardous materials following MSDS and biosafety guidelines.	3
CLO4	Differentiate between biosafety levels (BSL-1 to BSL-4) and evaluate laboratory hazards including chemical, electrical, and mechanical risks.	4
CLO5	Assess laboratory compliance with SOPs, safety protocols, and regulatory standards through written exams, practical assessments, and continuous performance evaluation.	5

Module 1: Introduction to Laboratory Operations

- Overview of laboratory environments, Types of laboratories (clinical, research, industrial), Functions and settings of each type, Roles and responsibilities in the lab, Duties of lab technicians, technologists, and managers

Module 2: Laboratory Techniques and Equipment

- Sample collection and handling, Centrifugation techniques, Pipetting procedures, Operation of microscopes, spectrophotometers, and analyzers, Equipment maintenance, Ensuring precision and accuracy in procedures

Module 3: Laboratory Safety Protocols

- Personal protective equipment (PPE), Emergency procedures (chemical spills, fire, exposure), First aid practices, Location and use of safety equipment (exits, fire extinguishers, kits)

Module 4: Chemical Safety

- Safe chemical handling and storage, Labeling and containment, Material Safety Data Sheets (MSDS) interpretation, Chemical waste disposal methods, Environmental compliance

Module 5: Biological Safety

- Biosafety levels (BSL-1 to BSL-4), Containment procedures, Handling and disposal of biohazardous materials, Infection control protocols, Decontamination techniques

Module 6: Electrical and Mechanical Safety

- Safe operation of electrical equipment, Preventive maintenance schedules, Identifying mechanical hazards, Minimizing risks from moving parts and mechanical systems

Module 7: Health and Safety Regulations

- Safe chemical handling and storage, Labeling and containment, Material Safety Data Sheets (MSDS) interpretation, Chemical waste disposal methods, Environmental compliance

Module 8: Laboratory Procedures and Protocols

- Standard Operating Procedures (SOPs), Protocol development and revision, Documentation practices, Recordkeeping and protocol review, Adherence to procedural consistency

Module 9: Assessment and Evaluation

- Written examinations on theory and protocols, Practical exams on lab skills and safety, Continuous evaluation of performance and compliance

Module 10: Current Trends and Advancements

- Innovations in laboratory equipment and safety technologies, Updates to safety standards and practices, Emerging regulations in lab operations, Adapting to technological advancements

Practicals:

1. Demonstration of essential laboratory practices including proper use of PPE, emergency response protocols (eyewash stations, fire extinguishers), and first aid procedures through guided simulations or role-plays.
2. Hands-on practice in safe handling, labelling, storage, and disposal of chemicals and biological materials, following MSDS guidelines and biosafety protocols using mock substances and standard lab materials.
3. Simulation-based training on biosafety level environments (BSL-1 to BSL-4), including containment procedures, decontamination processes, and infection control strategies, using scenario-based exercises.
4. Operational training on key laboratory instruments such as centrifuges, pipettes, spectrophotometers, and microscopes, focusing on calibration, maintenance, and precision handling techniques.
5. Execution of a mock laboratory safety audit and SOP review, where students identify hazards, assess compliance, and suggest improvements in safety practices based on regulatory standards.

References and Suggested Readings

1. Medical Laboratory Science Review" by Robert R. Harr
2. "Laboratory Safety: A Guide for Users and Managers" by Philip A. Hagan
3. "Fundamentals of Medical Laboratory Practice" by Patricia A. Thomas and Kimberly A. Plake
4. "Introduction to Clinical Chemistry: A Textbook" by R. James
5. "Clinical Laboratory Management: Principles and Procedures" by Gary A. Thibault
6. "Biosafety in Microbiological and Biomedical Laboratories (BMBL)" by CDC and NIH
7. "Laboratory Safety: Principles and Practices" by J. M. F. Hester
8. "Quality Management in the Clinical Laboratory" by Barbara H. Estrada and Daniel J. P. Kral

Course Code	VAC-2	**Course Name**	Universal Human Resources	**Course Category**	General	VAC	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	**At the end of the course the learners will be able to:**	**Bloom's Taxonomy (Bt) Level**
CLO1	Explain the importance of living a harmonious life aligned with universal human values	2
CLO2	Discuss the vast potential of human beings and their responsibility to the universe on its account	2
CLO3	Develop universal human values and practice them consciously to be good human beings	3
CLO4	Conduct oneself in alignment with the universal human values while dealing with the ways of the world	3
CLO5	Explain the importance of living a harmonious life aligned with universal human values	2

Module 1: Introduction to Universal Human Values

- Concept of Universal Human Values – Overview, What are values?, Human values, What are universal human values?, Relation with holistic living – What is holistic living?, Relation of universal human values and holistic living.

Module 2: Living in Harmony

- Living in harmony - as a human – What is Living in Harmony?, Life in harmony, What does living in harmony look like for an individual?, Living in harmony - as a family – Key roles of shared values, Shared values of families, Living in harmony - as a society and a race – Respect, Equality, Kindness, Honesty, Safety, Diversity, Cooperation, Environmental Care, Freedom.

Module 3: Human Potential

- Human potential – individual – How do we unlock human potential?, How to identify our potential?, Human potential – collective – Overview, Collaboration and working together, Impact of individual self on environment – Ripple Effect of Your Interactions, Impact of social group on their environment – Impact of family on environment, Impact of peer group on environment, Who is responsible? – Harmful impact of humans, Positive impact of humans.

Module 4: Developing Universal Human Values

- Introduction to Developing Universal Human Values – Developing Human Values, Self Reflection, Educate Yourself, Promote Open-Mindedness, Volunteer and Service, Emulate Role Models in Actions, Engage in Dialogue, Develop Global Perspective, Love and Compassion – Love and its forms, Love, Compassion and Inter-relatedness, The greatest proponents of Love and Compassion, Practicing Love and Compassion, Truth – Introduction to Truth, Great Individuals who are remembered for their value of truth, Practising Truth, Non-Violence – Introduction to non-violence, Important people who followed and propagated non-violence, Practising non-violence, Service – Introduction to service, Various forms of Service, Constitutional Values, Justice and Human Rights – Fundamental Values, Fundamental Rights, Fundamental Duties, Patriotism, Pride and Gratitude for the Nation, Good Practices – Self Worth, Self-Care, Holistic Living, Mindfulness and Meditation, Self-Reflection, Journal Writing, Impact Assessment.

Module 5: Common Scenarios

- Routine Scenarios – Love and Compassion based scenarios, Truth based scenarios, Non-violence based scenarios, Peace based scenarios, Service based scenarios, Renunciation or Sacrifice based scenarios, Life-changing Scenarios – Career Dilemma, Relationship Conflict, Health Crisis, Moral and Ethical Dilemma, Personal Loss, Financial Crisis.

Suggested Readings

1. Human Values and Education by R. R. Gaur
2. The Universal Declaration of Human Rights by UNESCO
3. The Essence of Human Values by G. C. Pati
4. Human Values: A Sociological Perspective by M. H. Geyer