GURU KASHI UNIVERSITY

Bachelor of Science in Radiology and Imaging Technology (3 years)

Session: 2023-24

Department of Paramedical Sciences

Graduate Attributes:

The programme B.Sc. RIT imparts to the students an intensive knowledge to perform routine X-ray, C.T. Scan, and MRI Scan procedures within acceptable quality control in radiology under the supervision of Radiation Safety Officer so that they maximize their potential by utilizing their abilities, academic excellence, and justifiable confidence, to contribute to society in a meaningful way.

Programme Learning Outcomes: After completion of this course graduates will be able to:

- Perform routine radiological procedures within acceptable quality control in the radiology department.
- Function in an ethical and professional manner without bias against any ethnicity, race, religion, caste, or gender with a high degree of credibility, integrity, and social concern.
- Handle, operate, and maintain radiological equipment utilizing appropriate quality control and safety procedures.
- Apply problem-solving techniques in the identification and correction of pre-operative &post-operative complications.
- Formulate technical skills, social behavior, and professional awareness for functioning effectively as a radiographer.
- Maximize their potential by utilizing their abilities, academic excellence, and justifiable confidence.

Programme Structure

Semester: I							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	BRI101	General Anatomy	Core	4	0	0	4
2	BRI102	General Physiology	Core	4	0	0	4
3	BRI109	Basics Radiation Physics	Core	4	0	0	4
4	BRI104	General Anatomy (Practical)	Skill Based	0	0	4	2
5	BRI105	General Physiology (Practical)	Skill Based	0	0	4	2
6	BRI110	Basics Radiation Physics(Practical)	Skill Based	0	0	4	2
7	BRI199	XXXX	MOOC	-	-	-	2
Disciplinary Elective-I (Any one of the following)							
8	BRI111	Biomedical Waste Management	Disciplinary Elective-I	3	0	0	3
9	BRI112	Medical Ethics					
			Total	**15**	**0**	**12**	**23**

Semester: II							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	BRI211	Radiation Physics & Radiation Protection	Core	4	0	0	4
2	BRI212	Basic Radiographic Technique & Procedure	Core	4	0	0	4
3	BRI213	Radiation Protection & Management of Radiology Department	Core	4	0	0	4
4	BRI214	Basic Radiographic Technique & Procedure(Practical)	Skill Based	0	0	4	2
5	BRI215	Radiation Protection & Management of Radiology Department (Practical)	Skill Based	0	0	4	2
6	BRI216	Radiation Physics & Radiation Protection(Practical)	Skill Based	0	0	4	2
7	BRI221	Mentoring and professional development	Value Added Course	2	0	0	2
Disciplinary Elective-II(Any one of the following)							
8	BRI217	Health Education and Health Communication	Disciplinary Elective-II	3	0	0	3
9	BRI218	Introduction to Quality and Patient Safety					
Disciplinary Elective-III(Any one of the following)							
10	BRI219	Patient care and hospital administration	Disciplinary Elective-III	3	0	0	3

11	BRI220	First Aid					
			Total	**20**	**0**	**12**	**26**

Semester: III							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	BRI301	Clinical Radiography Positioning-I	Core	4	0	0	4
2	BRI302	Modern radiological & imaging equipment including physics	Core	4	0	0	4
3	BRI308	Clinical Radiography Positioning-I (Practical)	Skill Based	0	0	4	2
4	BRI309	Modern Radiological & Imaging Equipment Including Physics (Practical)	Skill Based	0	0	4	2
5	BRI312	Biostatics	Elective Foundation	4	0	0	4
6	BRI399	XXXX	MOOC	-	-	-	2
Disciplinary Elective-IV(Any one of the following)							
7	BRI313	Disaster management	Disciplinary Elective-IV	3	0	0	3
8	BRI314	Medical Biochemistry					
Open Elective Course							
9	XXXX	XXXX	IDC	2	0	0	2
			Total	**17**	**0**	**8**	**23**
Open Elective Courses(for other Department)							
10	OEC016	Health care and Nutrition	Open Elective	2	0	0	2
11	OEC007	Cardiac Imaging					

Semester: IV							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	BRI401	Clinical Radiography Positioning-II	Core	4	0	0	4
2	BRI402	Physics of Newer Imaging Modalities	Core	4	0	0	4
3	BRI410	Contrast & Special Radiography Procedures	Core	4	0	0	4
4	BRI408	Clinical Radiography Positioning-II (Practical)	Skill Based	0	0	4	2
5	BRI409	Physics of Newer Imaging Modalities (Practical)	Skill Based	0	0	4	2
6	BRI411	Environmental Science	Compulsory Foundation	2	0	0	2
Value Added Course (for other discipline student also)							
7	BRI412	Community medicine	VAC	2	0	0	2
Disciplinary Elective-V(Any one of the following)							
8	BRI413	Fundamentals of Nursing	Disciplinary Elective-V	3	0	0	3
9	BRI414	Physics of Radiotherapy					
			Total	**19**	**0**	**8**	**23**

Semester: V							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	BRI501	Cross-Sectional Anatomy & Physiology	Core	4	0	0	4
2	BRI502	Radiographic Techniques of Advanced Imaging Technology	Core	4	0	0	4
3	BRI503	Physics of Advance Imaging Technology	Core	4	0	0	4
4	BRI508	Cross-Sectional Anatomy & Physiology (Practical)	Skill Based	0	0	4	2
5	BRI509	Radiographic Techniques of Advanced Imaging Technology (Practical)	Skill Based	0	0	4	2
6	BRI510	Research Methodology	AEC	2	0	0	2
7	BRI599	XXXX	MOOC	0	0	0	2
Disciplinary Elective-VIII (Any one of the following)							
8	BRI511	Introduction to Health Care System	Disciplinary Elective-VIII	3	0	0	3
9	BRI512	Orientation in Clinical Sciences					
			Total	**17**	**0**	**8**	**23**

Semester: VI							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	BRI601	Industrial Training/Internship (6 months)	Skill Based	0	0	0	20
			Total	**0**	**0**	**0**	**20**

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

CA1- Surprise Test (Two best out of three) (10 Marks)
CA2- Assignment(s) (10 Marks)
CA3- Term paper/ Quiz/Presentation (05 Marks)

B. Attendance (05 Marks)
C. Mid-Semester Test: (30 Marks)
D. End-Semester Exam: (40 Marks)

Semester -1st

Course Title: General Anatomy

Course Code: BRI101

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After Completion of this course, the learner will be able to:

1. Explain the structure and function of muscles, including muscle types, naming conventions, and their role in movement.
2. Demonstrate about the different properties of nerve fibers, anatomy of neuralgia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
3. Illustrate the anatomy of cell organelles, blood component, function, skeletal system, circulatory system, lymphatic system and its structure help in employability
4. Recognize and describe common anatomical abnormalities and pathological conditions in the human body.

Course Contents

UNIT-I **15 Hours**

Introduction to Anatomy, Definition and scope of anatomy, Anatomical terminology and directional terms, Anatomical planes and sections, Bones: Classification, structure, and functions, Bone development and growth Joints: Types and functions, Axial and appendicular skeleton, Muscular System: Muscle types: Skeletal, smooth, and cardiac function of skeletal muscles, Central nervous system (CNS): Brain and spinal cord, Peripheral nervous system (PNS): Cranial and spinal nerves

Autonomic nervous system (ANS): Sympathetic and parasympathetic divisions

UNIT-II **15 Hours**

Cardiovascular System, Heart anatomy, Blood vessels: Arteries, veins, and capillaries, Blood composition and functions, Circulation and cardiac cycle,

Respiratory tract anatomy: Nasal cavity, pharynx, larynx, trachea, bronchi, and lungs, Gas exchange and respiration, Mechanics of breathing

Digestive System, Alimentary canal: Mouth, pharynx, oesophagus, stomach, small and large intestine, Accessory digestive organs: Liver, pancreas, and gallbladder

UNIT-III **15 Hours**

Urinary System: Kidney structure and function, Urinary tract: Ureters, urinary bladder, and urethra, Urine formation and excretion Fluid and electrolyte balance, Reproductive System: Male reproductive system: Testes, ducts, accessory glands, and penis, Female reproductive system: Ovaries, uterus, uterine tubes, and vagina, Menstrual cycle and hormonal regulation and Fertilization

UNIT-IV **15 Hours**

Endocrine System: Endocrine glands and hormones, Regulation of hormone secretion, Major endocrine organs: Pituitary, thyroid, parathyroid, adrenal, pancreas, and gonads, Hormonal control and homeostasis, Olfactory system, taste apparatus, Skin - Features of skin, hair, sebaceous glands, sweat glands, nails.

Transaction Modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer.

Suggested Readings

- *Chaurasia, B. D. (2010). BD Chaurasia's Human Anatomy. CBS Publishers & Distributors Pvt. Ltd.*
- *Mescher, A. L. (2013). Junqueira's basic histology: text and atlas (Vol. 12). 13th ed. New York: McGraw-Hill*
- *Halim, A. (2008). Human Anatomy: Volume I: Upper Limb And Thorax. IK International Pvt Ltd.*
- *Hallam, J. (2009). Grey's Anatomy: Scalpels, sex and stereotypes. Medical Humanities, 35(1), 60-61*

Course Title: General Physiology

Course Code: BRI102

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After Completion of this course, the learner will be able to:

1. Explain the fundamental processes that occur within cells, including cellular respiration, membrane transport, and cellular communication.
2. Describe the structure and function of major organ systems in the human body, such as the cardiovascular, respiratory, nervous, and endocrine systems.
3. Demonstrate the properties of nerve fibers, function of neuralgia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
4. Provide knowledge about functioning of Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas, help in employability

Course Contents

UNIT-I **15 Hours**

Introduction to physiology of the human body –Composition of body, Homeostasis, Organization of the human body at the tissue level – Function of Epithelial, Connective, Muscular & Nervous tissues, Blood –haemostasis, coagulation of blood, blood transfusion, Lymphatic system – Function of lymph vessels, lymphatic tissue & organs, lymphatics, spleen, tonsil, thymus, Resistance & immunity – Innate immunity, acquired immunity, humoral & cell mediated immunity.

UNIT-II **15 Hours**

Respiratory system – Physiology of respiration, gas exchange in lungs, transport of gases between lungs & tissues, regulation of respiration,

cardiovascular system - Heart & blood vessels: Systemic circulation, pulmonary circulation, cardiac output, blood pressure.

Digestive system – Process of digestion, function of oral cavity, pharynx, salivary glands, oesophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas, Urinary system – Function of kidneys, glomerular apparatus, Ureter, urinary bladder and urethra.

UNIT-III **15 Hours**

Reproductive system– female: Physiology of female reproductive system, Reproductive system – male: Physiology of male reproductive system, Endocrine system - Mechanism of action of hormones, function of pituitary gland, thyroid gland, parathyroid glands and adrenal glands.

UNIT-IV **15 Hours**

Nervous system – Properties of nerve fibres, function of neuroglia, synapse, CNS, CSF, brain, cranial nerves, Skeletal system and bone physiology

Muscular system –Types of Muscles, Properties of skeletal muscle, cardiac muscle, smooth muscle, muscles of the body, Skeletal system – Functions of bones, axial skeleton, and appendicular skeleton, Special senses Skin – Function of skin, hair, sebaceous glands, sweat glands and nails

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Ashalatha, P. R., &Deepa, G. (2012). Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd.*
- *Chatterjee, C. C. (2020). Human Physiology. (13 th edition). CBS Publisher and Distributor Pvt. Ltd.Colorimetry*
- *Heilbrunn, L. V. (1952). General physiology. Saunders, Philadelphia.*
- *Hall, J. E. 1. (2016). Guyton and Hall textbook of* medical physiology *(13th edition.). Philadelphia, PA: Elsevier.*

Course Title: Basics Radiation Physics

Course Code: BRI109

L	T	P	Cr.
4	0	0	4

Total Hours 60

Course Learning Outcomes: After Completion of this course, the learner will be able to:

1. Explain the nature of heat as a form of energy transfer resulting from temperature differences.
2. Define light as a form of electromagnetic radiation that is visible to the human eye.
3. Describe the characteristics of electromagnetic radiation:
4. Explain that electromagnetic radiation consists of oscillating electric and magnetic fields that propagate through space.

Course Contents:

UNIT-I **15 Hours**

Physical quantity, its unit and measurement: Fundamental and derived quantity, SI unit, various physical/radiation quantity used in diagnostic radiology and its unit (for example, KvP, mA, mAS, Heat unit (HU), Radiation exposure, Absorbed dose, Equivalent dose, etc.). Measurements, significant figures/digits in calculation, uncertainty in measurement, Propagation of errors

UNIT-II **15 Hours**

Work and Energy, forms of energy: kinetic and potential energy, conservation of energy, work done by constant forces, work done by variable forces. Elastic and inelastic collisions, Rotational motion: Angular displacement (in degrees and radians), angular velocity, centripetal acceleration, centripetal force.

UNIT-III **15 Hours**

Sound:The nature and propagation of sound wave (the characteristics of sound, wave theory), speed of sound in a material medium, intensity of sound, the decibel, Interference of sound waves, beats, diffraction, Doppler's effect, Ultrasonic wave, production of ultrasonic wave (piezo-electric effect) in ultrasonography. Use of principle of Doppler's effect in Diagnostic radiology (e.g. Echo, blood flow measurement), Heat: Definition of heat, temperature, Heat capacity, specific heat capacity, Heat transfer-conduction, convection, radiation, thermal conductivity, thermal expansion, Newton's law of cooling,

UNIT-IV **15 Hours**

Electrostatics:Electric charge (positive and negative charge), Coulomb's law, Electric field, electric potential and potential difference, equipotential lines, the eV (electron volt), Electric potential due to a point charge, Capacitance, dielectric, Capacitor, series and parallel combination of capacitors, energy stored on capacitor, charging and discharging of capacitors, use of capacitors in diagnostic radiology (e.g Mobile X-Ray generators, radiation detectors etc.)

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer Answer

Suggested Readings

- *K.Thalayan, Basic of Radiological Physics*
- *K.Thalayan, Textbook of Radiological Safety*
- *Rehani, Advance Medical Physics*

** Latest editions of all the suggested books are recommended*

Course Title: General Anatomy (Practical)

Course Code: BRI104

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After Completion of this course, the learner will be able to:

1. Demonstrate about Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas, help in employability.
2. Classify the different properties of nerve fibers, anatomy of neuralgia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
3. Illustrate anatomy of cell organelles, blood component, function, skeletal system, circulatory system, lymphatic system and its structure help in employability
4. Discuss about the various muscles, organs, bones, joints, tendons, ligaments, blood vessels and cells.

List of Practical's / Experiments: **30 Hours**

1. Demonstration of-Basic anatomical terminology, anatomical position, anatomical planes, levels of organization in the body, organ systems, skeleton, cavities of the body.
2. Lymphatic system - Features of lymph vessels, lymphatic tissue & organs, lymphatics, spleen, tonsil, thymus.
3. Nervous system - Central nervous system, brain, cerebellum, spinal cord, cranial nerves, autonomic nervous system.
4. Muscular system - Skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.
5. Skeletal system - Features of bones, axial skeleton, appendicular skeleton.
6. Musculoskeletal system - Joints of upper & lower limb.
7. Respiratory system - Nose &paranasal sinuses, pharynx, larynx, trachea, lungs.
8. Cardiovascular system - Heart & blood vessels.
9. Digestive system - Oral cavity, pharynx, salivary glands, oesophagus,

stomach, small intestine, large intestine, liver, gallbladder, pancreas.

10. Urinary system - Kidneys, juxtaglomerular apparatus, Ureter, urinary bladder, urethra.
11. Introduction to genetics - Features of chromosomes, DNA.
12. Reproductive system in females - External & internal genital organs, breast.
13. Reproductive system in males - Penis, scrotum, testes, prostate gland.
14. Endocrine system - Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas.

Transaction Modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer.

Suggested Readings

- *Chaurasia, B. D. (2010). BD Chaurasia's Human Anatomy. CBS Publishers & Distributors Pvt. Ltd.*
- *Mescher, A. L. (2013). Junqueira's basic histology: text and atlas (Vol. 12). 13th ed. New York: McGraw-Hill*
- *Halim, A. (2008). Human Anatomy: Volume I: Upper Limb And Thorax. IK International Pvt Ltd.*

Hallam, J. (2009). Grey's Anatomy: Scalpels, sex and stereotypes. Medical Humanities, 35(1), 60-61

Course Title: General Physiology(Practical)

Course Code: BRI105

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After Completion of this course, the learner will be able to:

1. Explain the fundamental processes that occur within cells, including cellular respiration, membrane transport, and cellular communication.
2. Describe the structure and function of major organ systems in the human body, such as the cardiovascular, respiratory, nervous, and endocrine systems.
3. Demonstrate the properties of nerve fibers, function of neuralgia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
4. Provide knowledge about functioning of Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas, help in employability

List of Practical's / Experiments: **30 Hours**

1. Introduction to laboratory equipment and techniques
2. Demonstration of-Basic physiological terminology, anatomical position, anatomical planes, levels of organization in the body, organ systems, skeleton, cavities of the body.
3. Lymphatic system - Features of lymph vessels, lymphatic tissue & organs, lymphatics, spleen, tonsil, thymus.
4. Nervous system - Central nervous system, brain, cerebellum, spinal cord, cranial nerves, autonomic nervous system.
5. Muscular system - Skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.
6. Skeletal system - Features of bones, axial skeleton, appendicular skeleton.
7. Musculoskeletal system - Joints of upper & lower limb.

8. Respiratory system - Nose & paranasal sinuses, pharynx, larynx, trachea, lungs.
9. Cardiovascular system - Heart & blood vessels.
10. Digestive system - Oral cavity, pharynx, salivary glands, oesophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas.
11. Urinary system - Kidneys, juxtaglomerular apparatus, Ureter, urinary bladder, urethra.
12. Introduction to genetics - Features of chromosomes, DNA.
13. Reproductive system in females - External & internal genital organs, breast.
14. Reproductive system in males - Penis, scrotum, testes, prostate gland.
15. Endocrine system - Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Ashalatha, P. R., &Deepa, G. (2012). Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd.*
- *Chatterjee, C. C. (2020). Human Physiology. (13 th edition). CBS Publisher and Distributor Pvt. Ltd.Colorimetry*
- *Heilbrunn, L. V. (1952). General physiology. Saunders, Philadelphia.*
- *Hall, J. E. 1. (2016). Guyton and Hall textbook of* medical physiology *(13th edition.). Philadelphia, PA: Elsevier.*

Course Title: Basics Radiation Physics (Practical)

Course Code: BRI110

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the successful learner will be able to:

1. Explain the nature of heat as a form of energy transfer resulting from temperature differences.
2. Define light as a form of electromagnetic radiation that is visible to the human eye.
3. Comprehend the fundamental properties of ionizing radiation, including the differences between alpha, beta, gamma, and X-ray radiation.
4. Explain that electromagnetic radiation consists of oscillating electric and magnetic fields that propagate through space.

Course Contents

Practical/Clinical posting **30 Hours**

1. X-ray tubes general features and mobile equipments.
2. Care and maintenance of X-ray equipments and image intensifier
3. To study effects of Kilo Voltage Peak (kVp) and Milli Ampere Second (mAs)
4. To check the safety of dark room.
5. To check the speed of intensifying screen.
6. To check the developing time test and function.
7. Silver recovery method

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer Answer

Suggested Readings

- *K.Thalayan, Basic of Radiological Physics*
- *K.Thalayan, Textbook of Radiological Safety*
- *Rehani, Advance Medical Physics*

** Latest editions of all the suggested books are recommended*

Course Title: Biomedical waste Management

Course Code: BRI111

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the fundamental properties of ionizing radiation, including the differences between alpha, beta, gamma, and X-ray radiation.
2. Explain the units and measurements used in radiation physics, including concepts like exposure, absorbed dose, dose equivalent, and activity.
3. Explore various waste management methods, including segregation, storage, transportation, treatment, and disposal.
4. Gain proficiency in the use of various radiation detection instruments and techniques, such as Geiger-Muller counters, scintillation detectors, and dosimeters.

Course Contents

UNIT-I **10 Hours**

Introduction to Biomedical Waste Management Definition and classification of biomedical waste Historical overview and importance of biomedical waste management Legal and regulatory framework Types and Sources of Biomedical Waste Classification of biomedical waste based on infectious, hazardous, and general waste.

UNIT-II **10 Hours**

Health Hazards and Risks Potential and hazards associated with improper biomedical waste management, Infection control and prevention measures Waste Segregation and Collection Segregation guidelines and color coding Collection methods and container types

UNIT-III **15 Hours**

Waste Disposal and Environmental Impact Landfilling, landfill requirements, and considerations Environmental consequences of improper waste disposal Waste-to-energy and recycling options Storage and Transportation Storage requirements and guidelines Transportation regulations and safety

measures Treatment Technologies Overview of treatment methods: autoclaving, incineration, chemical disinfection, etc. Emerging technologies and advancements in waste treatment

UNIT-IV **10 Hours**

Waste Management Planning and Implementation Developing waste management plans for healthcare facilities Staff training and awareness programs monitoring and auditing waste management practices,Biomedical Waste Management Rules 2016.

Bhattacharya, S., Biswas, S., Das, D., & Nair, P. (2019). Biomedical waste management in India: Critical appraisal. Journal of International Environmental Application & Science, 14(2), 91-97.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Prüss-Üstün, A., &Rapiti, E. (2008). Safe management of wastes from health-care activities. World Health Organization.*
- *Srivastava, A., & Kaushal, R. K. (2020). Biomedical waste management during COVID-19 pandemic: A review. Environmental Sustainability and Resource Management, 2(1), 53-61.*
- *Rao, P. V., & Patnaik, S. K. (2016). Biomedical waste management: An exploratory study. International Journal of Environmental Science and Technology, 13(7), 1607-1616.*

Course Title: Medical Ethics

Course Code: BRI112

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1 Familiarize with local, national, and international regulations, guidelines, and standards related to biomedical waste management, including compliance with waste disposal laws.

2 Learn the principles of effective waste segregation, including the proper sorting of biomedical waste into different categories based on its source, type, and risk level.

3 Develop skills in safely handling, packaging, and labeling biomedical waste to minimize exposure risks for healthcare workers, waste handlers, and the community.

4 Be prepared to respond to emergency situations involving biomedical waste spills, accidents, and contamination incidents.

Course Contents

UNIT-I **10 Hours**

Introduction to Medical Ethics: Definition and scope of medical ethics, Importance of ethical principles in healthcare, Historical development of medical ethics, Ethical Theories and Principles: Utilitarianism, Deontology, And Virtue ethics, Autonomy, Beneficence, Non-maleficence and Justice.

UNIT-II **10 Hours**

Role of medical laboratory Technician, Definition and Interaction with the patients and health care professionals, Ethical, Moral, and Legal Responsibilities, Patient safety and quality, restrain policies and role of health professionals, Biomedical waste Management, medical records and reports.

UNIT-III **15 Hours**

Medical terminology- The course employs a body systems-oriented, word-analysis approach to learning medical terminology. Confidentiality and Privacy: Importance of patient confidentiality, Legal and ethical aspects of patient privacy, Ethical dilemmas related to confidentiality and privacy

UNIT-IV **10 Hours**

The goal of the class is to prepare students for the terminology they might encounter in their subsequent coursework, in their clinical rotations and ultimately in their roles as health care professionals.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested readings

- *Pozgar, G. D. (2012). Legal aspects of health care administration. Sudbury, Mass: Jones & Bartlett Learning*
- *Morrison, E. E., & Furlong, E. (2014). Health care ethics: Critical issues for the 21st century. Burlington, MA: Jones & Bartlett Learning.*
- *Kliegman, R., Stanton, B., St. Geme, J. W., Schor, N. F., & Behrman, R. E. (2016). Nelson textbook of pediatrics (Edition 20.). Phialdelphia, PA: Elsevier.*

Semester 2nd

Course Title: Radiation Physics & Radiation Protection

Course Code: BRI211

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Explain the units and measurements used in radiation physics, including exposure, absorbed dose, dose equivalent, and activity, and their significance in radiological protection.
2. Describe the interactions of ionizing radiation with matter, including the photoelectric effect, Compton scattering, and pair production, and how these interactions affect radiation dose.
3. Identify and categorize sources of ionizing radiation, both natural (e.g., background radiation) and artificial (e.g., medical X-ray machines, radioactive isotopes).
4. Familiarize with international and national radiation safety standards, guidelines, and regulations governing the use of ionizing radiation.

CONTENT

UNIT-II **15 Hours**

Interaction of ionizing radiation with matter, Types of interactions of X- and gamma radiation, Photoelectric & Compton, Bremsstrahlung, pair production, annihilation radiation, X-Ray production and properties: Characteristics X-Rays, factors affecting X-Ray emission spectra, X-Ray quality and quantity, HVL measurements, heel effect, soft and hard X-Rays, added and inherent filtration, reflection and transmission targets.

UNIT-II **15 Hours**

X-Ray tube : historical aspects, construction of X-Ray tubes, requirements for X-Ray production (electron source, target and anode material), tube voltage, current, space charge, early X-Ray tubes (Coolidge tubes, tube envelop and housing) cathode assembly, X-Ray production efficiency, advances in X-Ray tubes, anode angulation and rotating tubes. Common factors affecting thermionic emission, specialized types (metallic, biangular, fluoro, CT) grid

controlled and high speed tubes, focal spot size, speed of anode rotation, target angle, inherent filtration, radiation leakage and scattered radiation).

UNIT-III **15 Hours**

Biological effects of radiation Ionization, excitation and free radical formation, hydrolysis of water, action of radiation on cell, DNA, RNA, chromosome, tissue and organ radio sensitivity, cytoplasm, cellular membranes, effects of whole body and acute irradiation, dose fractionation, effects of ionizing radiation on each of major organ system including foetus stochastic and non-stochastic effects, mean and lethal dose.

UNIT-IV **15 Hours**

X-Ray film and Image processing: Composition of single and double coated radiographic films, structure of emulsion, film characteristics (speed, base + fog, gamma, latitude) ; effect of grain size on film response to exposure, interpretation of characteristics curve. Latent image formation ; process of film developing (composition of fixer, developer and other processing solution), common errors and faults while processing (densitometry), automatic processing (processing cycle), developer replenishment, silver recovery and economics. Image intensifiers and cassettes (structure and function).

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested readings

- *K.Thalayan, Basic of Radiological Physics*
- *K.Thalayan, Textbook of Radiological Safety*
- *Rehani, Advance Medical Physics*

** Latest editions of all the suggested books are recommended*

Course Title: Basic Radiographic Technique & Procedure

Course Code: BRI212

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Implement appropriate radiation protection measures, including the use of lead aprons, thyroid shields, and other protective equipment, during radiographic procedures.
2. Correctly select appropriate projection/projections to demonstrate the area of interest.
3. Use appropriate radiographic parameters to produce a radiograph with satisfactory results.
4. Competently use radiographic/fluoroscopic equipment and associated accessories.

Course Content

UNIT-I **15 Hours**

Conventional – non-contrast radiography: Same topics as in Phase-I but additional views :Upper extremity – lower extremity (including pelvis) – Chest (including thoracic cage) – spine - skull – facial bones – mandible, TMJ, mastoid etc. - abdomen – soft tissue radiography – dental - paediatric - foreign body localization.

UNIT-II **15 Hours**

Conventional contrast radiography: Urinary system imaging (IVU, MCU, RGU),Revision of anatomy and physiology, clinical indications and contraindications - patient preparation - contrast media used and dosage - physiological process by which urinary tract is outlined - film sequence (projection and timing), normal anatomy on films, additional techniques, radiation protection, care of patient during and after examination. Pathological conditions of urinary system: kidneys, ureter, urinary bladder, urethra.

UNIT-III **15 Hours**

Gastrointestinal tract imaging: (Barium swallow, Barium meal upper GI, Barium meal follow through, Barium enema, small, bowel enema, distal colography, defaecography). Revision of anatomy and physiology - clinical indications and contraindications - contrast media used: preparation and dosage - patient preparation – preparation of equipment – control of radiographic and fluoroscopic equipment.

UNIT-IV **15 Hours**

Biliary system (PTC, ERCP, T-Tube cholangiography, pre-op. cholangiography)

Revision of anatomy and physiology – clinical indications and contraindications – contrast, media – patient preparation – film series - radiation protection – patient care - normal anatomy, Pathological conditions of biliary system, Hysterosalpingography (HSG): Revision of anatomy and physiology – clinical indications and contraindications – contrastinjection-projections – radiation protection – patient care.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested readings

- *K.Thalayan, Basic of Radiological Physics*
- *K.Thalayan, Textbook of Radiological Safety and procedures.*
- *Rehani, Advance Medical Physics*

Course Title: Radiation Protection & Management of Radiology Department
Course Code: BRI213

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After Completion of this course, the learner will be able to:

1. Optimize and manage radiation doses for diagnostic and therapeutic procedures, considering patient-specific factors and clinical indications.
2. Manage radiation monitoring programs, including personnel dosimetry, patient dose tracking, and monitoring of radiation levels in radiology departments.
3. Oversee the maintenance, repair, and replacement of radiology equipment, ensuring compliance with safety and regulatory standards.
4. Promote and foster a culture of radiation safety among staff, emphasizing their responsibilities in maintaining a safe work environment.

Course Contents

UNIT-II **15 Hours**

Introduction to Radiation Protection, Units & Quantities,Primary, secondary radiation, need for radiation protection , Exposure, Absorbed dose, absorbed dose, equivalent, Effective dose, air KERMA, Radiation weighting factor, Tissue weighting factor, MPD

UNIT-II **15 Hours**

Aim & Principle of Radiation Protection: Concept of ALARA, Cardinal Principle, ICRP regulation, Radiation Protection in: Radiography, CT, Fluoroscopy, Mammography, Ward radiography, radiation shielding, Personnel – Film badge, TLD, OSLD, pocket dosimeter, Area monitoring Devices.

UNIT-III **15 Hours**

Radiobiology: Radiolysis of water, Direct & Indirect effects of radiation, Stochastic, Deterministic effects, Somatic,
Genetic effects, dose relationship, Antenatal exposure.QA test performed for X -Ray, CT , Mammography , Fluoroscopy units .

UNIT-IV **15 Hours**

Radiation Regulation & Planning of Radiology Department**,** 10 day rule, 14 day rule, 28 day rule, structural shielding, work load, use factor, occupancy

factor, x-ray room lay out, dark room lay out, CT lay out. Fluoroscopy, angiographic room lay out, radiation, signage's, Organization of departments

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested readings

- *Christensen, Physics of Diagnostic radiology Euclid Serum, Radiation Protection Thalayin K.,Text book of Radiological Safety.*
- *James E. M., The Physics for Radiation Protection, ICRP manual.*

Course Title: Basic Radiographic Technique & Procedure (Practical)
Course Code: BRI214

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Implement appropriate radiation protection measures, including the use of lead aprons, thyroid shields, and other protective equipment, during radiographic procedures.
2. Correctly select appropriate projection/projections to demonstrate the area of interest.
3. Use appropriate radiographic parameters to produce a radiograph with satisfactory results.
4. Competently use radiographic/fluoroscopic equipment and associated accessories.

Course Contents

Practical/Clinical posting **30 Hours**

1. Radiography in various positions for all the special radiological procedures, using contrast media as per syllabus.
2. Positioning and treatment of various cases patients by using:
    a) Prescribed filters and wedges
    b) Protection of various organs

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested readings

- *K.Thalayan, Basic of Radiological Physics*
- *K.Thalayan, Textbook of Radiological Safety and procedures.*
- *Rehani, Advance Medical Physics*

Course Title: Radiation Protection & Management of Radiology Department (Practical)
Course Code: BRI215

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Optimize and manage radiation doses for diagnostic and therapeutic procedures, considering patient-specific factors and clinical indications.
2. Manage radiation monitoring programs, including personnel dosimetry, patient dose tracking, and monitoring of radiation levels in radiology departments.
3. Oversee the maintenance, repair, and replacement of radiology equipment, ensuring compliance with safety and regulatory standards.
4. Promote and foster a culture of radiation safety among staff, emphasizing their responsibilities in maintaining a safe work environment.

Course Content

Practical/Clinical posting **30 Hours**

1. X-ray tubes general features and mobile equipment's.
2. Care and maintenance of X-ray equipment's and image intensifier
3. To study effects of Kilo Voltage Peak (kVp) and Milli Ampere Second (mAs)
4. To check the safety of dark room.
5. To check the speed of intensifying screen.
6. To check the developing time test and function.
7. Silver recovery method

Reference Books:

1. Rehani, Diagnostic Imaging and Quality Assurance
2. Chesney and Chesney, Radiographic Imaging

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Course Title: Radiation Physics and Radiation Protection (practical)
Course Code: BRI216

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After Completion of this course, the learner will be able to:

5. Optimize and manage radiation doses for diagnostic and therapeutic procedures, considering patient-specific factors and clinical indications.
6. Manage radiation monitoring programs, including personnel dosimetry, patient dose tracking, and monitoring of radiation levels in radiology departments.
7. Oversee the maintenance, repair, and replacement of radiology equipment, ensuring compliance with safety and regulatory standards.
8. Promote and foster a culture of radiation safety among staff, emphasizing their responsibilities in maintaining a safe work environment.

Course Content

Practical/Clinical posting **30 Hours**

1. Radiography in various positions for all the special radiological procedures, using contrast media as per syllabus.
2. Positioning and treatment of various cases patients by using:
    a) Prescribed filters and wedges
    b) Protection of various organs

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Clark, Radiographic Positioning and Special Procedure*
- *Chapman, Radiological Procedure*
- *Krishnamurthy, Medical Radiographic Technique & Darkroom Practice*

*** Latest editions of all the suggested books are recommended**.

Course Title:Health Education and Health Communication

Course Code:BRI217

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the importance of health education and health communication in promoting individual and community health.
2. Identify key theories and models related to health behavior change.
3. Explore different communication strategies and techniques used in health education.
4. Develop skills in designing and implementing health education programs.

Course Contents

UNIT-I **10 Hours**

Introduction to Health Education and Health Communication, Importance and goals of health education, Role of health communication in behaviour change, Historical perspectives on health education and communication

UNIT-II **10 Hours**

Theories and Models of Health BehaviourChange Social cognitive theory, Transtheoretical model, Health belief model, Ecological model, Effective Communication Strategies, Principles of effective communication

UNIT-III **10 Hours**

Designing Health Education Programs, Assessing needs and setting objectives, Developing educational materials, Planning and implementing health education programs, Evaluating program effectiveness, Verbal and non-verbal communication, Health literacy and plain language, Cultural competence in communication

UNIT-IV **15 Hours**

Media and Technology in Health Communication, Role of media in health communication, Social media and online platforms, Health campaigns and mass media interventions, Ethical considerations in media use, Ethical and Cultural Considerations in Health Education, Ethical guidelines and principles, Informed consent and confidentiality, Health communication with vulnerable populations, Evaluation of Health Education and Communication Interventions.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bandura, A. (2004).Health promotion by social cognitive means. Health Education & Behavior, 31(2), 143-164.*
- *Brashers, D. E., Haas, S. M., &Neidig, J. L. (2014). Health communication and the social networks of older adults: Implications for health and aging. In R. N. Bostrom & B. H. Westley (Eds.), Communication and aging (pp. 193-222). Routledge.*
- *Freimuth, V. S., Quinn, S. C., Thomas, S. B., Cole, G., Zook, E., & Duncan, T. (2001). African Americans' views on research and the Tuskegee Syphilis Study. Social Science & Medicine, 52(5), 797-808.*
- *Kreps, G. L., & Sparks, L. (2008). Meeting the health literacy needs of immigrant populations. Patient Education and Counseling, 71(3), 328-332*

Course Title: Introduction to Quality and Patient Safety

Course Code: BRI218

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify the historical context and evolution of quality and patient safety in healthcare.
2. Explore the role of regulatory agencies and accreditation bodies in shaping quality and safety standards in healthcare.
3. Explore the concepts of medical errors, adverse events, and near-misses, and their implications for patient safety.
4. Analyze healthcare systems and their role in preventing errors and improving patient outcomes.

Course Contents

UNIT-I **15 Hours**

Quality assurance and Management Introduction, Quality improvement approaches, standards and norms, quality improvement tools, introduction to NABH guidelines. Basic of Emergency care and Life support skills Basic life support (BLS) following cardiac arrest, recognition of sudden cardiac arrest and activation of emergency response system, early cardiopulmonary resuscitation (CPR) and rapid defibrillation with an automated external defibrillator (AED)

UNIT-II **10 Hours**

Basic emergency care First aid, choking, rescue breathing methods, ventilation including use of bag valve masters (BVMs) Biomedical Waste Management Definition, waste minimization.

UNIT-III **10 Hours**

BMW-segregation, collection, transportation, treatment and disposal (Including color coding), Liquid BMW, Radioactive waste, metals/chemicals/drug waste, BMW management and methods of

disinfection, use of Personal protective equipment (PPE), Infection Prevention and Control, Sterilization, Disinfection, Effective hand hygiene, use of PPE,

UNIT-IV **10 Hours**

Prevention and control of common health care associated infections, Guidelines (NABH) and JCI for hospital infection control. Disaster preparedness and management Fundamentals of emergency management

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Vincent, C. (2011). Patient safety. John Wiley & Sons.*
- *Hall, L. M. (Ed.). (2005). Quality work environments for nurse and patient safety. Jones & Bartlett Learning.*
- *Sandars, J., & Cook, G. (Eds.). (2009). ABC of patient safety (Vol. 72). John Wiley & Sons.*
- *Carayon, P. (2006). Handbook of human factors and ergonomics in health care and patient safety. CRC press.*

Course Title: Patient Care and Hospital Administration

Course Code: BRI219

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Foster effective communication and collaboration among healthcare professionals from various disciplines.
2. Develop skills in resource allocation, capacity planning, and inventory management within a hospital.
3. Evaluate electronic health records (EHR) and data management for improved patient care and efficient hospital operations.
4. Implement strategies and methodologies for continuous quality improvement in patient care.

Course Content

UNIT-I **10 Hours**

Hospital structure and organization, Radiography as a profession – professionalism, Aims and objectives of first aid; wounds and bleeding, dressing and bandages; pressure and splints, supports etc. Shock; insensibility; asphyxia; convulsions; resuscitation, use of suction apparatus, drug reactions; prophylactic measures; administration of oxygen; electric shock; burns; scalds; haemorrhage; pressure points; compression band. Fractures; splints, bandaging; dressing, foreign bodies

UNIT-II **10 Hours**

Moving and lifting patients - hazards of lifting and manoeuvring patients, rules for correct lifting, transfer from chair or trolley to couch and vice-versa, safety of both “Lifter” and “the Lifted” must be emphasised. Highlight on handling of geriatric, paediatric and trauma patients, Communicable diseases (special reference to AIDS), cross infection and prevention, patient hygiene, personal hygiene, departmental hygiene, handling of infectious patients in the department, application of asepsis, inflammation and infection processes.

UNIT-III **10 Hours**

Patient vital signs - temperature, pulse, respiration and blood pressure - normal values and methods of taking and recording them. Medico-legal

considerations - radiographers clinical and ethical responsibilities, misconduct and malpractice; handling female patients, practice in pregnancy.

UNIT-IV **15 Hours**

Radiological contrast media - classification, need for radiological contrast media, methods of administration, dosage, reactions to contrast media, role of the imaging department and the radiographer in management of patient with contrast reaction. Principles of asepsis: Sterilisation - methods of sterilisation; use of central sterile supply department; care of identification of instruments, surgical dressings in common use, including filamented swabs, elementary operating theatre procedure; setting of trays and trolleys in the radiotherapy department (for study by radiotherapy students only)

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Curry, T. S., Dowdey, J. E., & Murray, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.*
- *Podgoršak, E. B. (2006). Radiation physics for medical physicists (Vol. 1). Berlin: Springer.*
- *Weishaupt, D., Köchli, V. D., &Marincek, B. (2008).How does MRI work?: an introduction to the physics and function of magnetic resonance imaging. Springer Science & Business Media.*

Course Title: First Aid

Course Code: BRI220

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Provide appropriate first Aid for minor injuries including small cuts, grazes, bruises etc.
2. Assess situations and circumstances in order to provide First Aid safely, promptly and effectively in a range of emergencies.
3. Manage organizations, records related to patients and departmental statistics.
4 Administer First Aid to an adult who is choking.

Course Contents

UNIT-I 15 Hours

First aid: Aims and objectives of first aid; wounds and bleeding, dressing and bandages; pressure and splints, supports etc. Shock; insensibility; asphyxia; convulsions; resuscitation, use of suction apparatus; drug reactions; prophylactic measures; administration of oxygen; electric shock; burns; scalds; haemorrhage; pressure points; compression band. Fractures; splints, bandaging; dressing, foreign bodies; poisons.

UNIT-II 10 Hours

Infection: Bacteria, their nature and appearance; spread of infections; auto-infection or cross-infection; the inflammatory process; local tissue reaction, general body reaction; ulceration; Asepsis and antisepsis. Universal precautions, hospital acquired infections- HIV, Hepatitis B, C, and MRSA etc.

UNIT-III 10 Hours

Principles of Asepsis: Sterilization - methods of sterilization; use of central sterile supply department; care of identification of instruments, surgical dressings in common use, including filament swabs, elementary operating

theatre procedure; setting of trays and trolleys in the radio imaging department (for study by radio imaging students only)

UNIT-IV **10 Hours**

Departmental procedures: Department staffing and organizations; records relating to patients and departmental statistics; professional attitudes of the technologist to patients and other members of the staff, medico-legal aspects accidents in the department;

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Curry, T. S., Dowdey, J. E., & Murray, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.*
- *Podgoršak, E. B. (2006). Radiation physics for medical physicists (Vol. 1). Berlin: Springer.*
- *Weishaupt, D., Köchli, V. D., &Marincek, B. (2008).How does MRI work?: an introduction to the physics and function of magnetic resonance imaging. Springer Science & Business Media.*

Semester 3rd

Course Title: : Clinical radiography positioning - I

Course Code: BRI301

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Apply the basic patient positioning during Radiographic investigation.
2. Become acquainted with special positioning skills for different pathological and physical conditions.
3. Choose proper position during radiography.
4. Demonstrate supplementary techniques such as in Congenital dislocation of hips, Epiphysis of femur, Lateral projections for hip joints to show femoral head and neck relationship.

Course Contents

UNIT-I **15 Hours**

Upper Limb: Technique for hand, fingers, thumb, wrist joint carpal bones, forearm, elbow joint, radio ulnar joints and humerus supplementary techniques for the above. E.g. Carpal tunnel view, ulnar groove, head of the radius, supra condylar projections. Lower limb: Technique for foot, toes, great toe, tarsal bones, Calcanium, ankle joint, lower leg, knee, patella & femur. Supplementary techniques: Stress view for torn ligaments, a. Subtalar joint and talocalcaneal joint. b. Inter condylar projection of the knee. c. Tibial tubercle. d. Length measurement technique.

UNIT-II **15 Hours**

Shoulder Girdle and Thorax: Technique for shoulder joint, scapular, clavicle, acromioclavicular joints, sternum, ribs, Sterno-clavicular joint. Supplementary projections and techniques a. recurrent dislocation of shoulder. b. Traumatic dislocation of shoulder. c. Cervical ribs.

Vertebral Column: Technique for atlanto-occipital joint, cervical spine, cervico thoracic spine, thoracic spine, thoraco- lumbar spine, limbo sacral spine,

sacrum and coccyx. Supplementary techniques to demonstrate: a. Scoliosis. b. Kyphosis c. Spondylolisthesis d. Disc lesion e. Union of spinal graft. Adaptation of techniques to demonstrate specific pathologies. Pelvic girdle and hip region: Technique for whole pelvis. Ilium, ischium, pubic bones, sacro iliac joint, symphysis pubis, hip joint, acetabulum neck of femur, greater and lesser trochanter.

UNIT-III **15 Hours**

Supplementary Techniques- a. congenital dislocation of hips b. Epiphysis of femur: c. Lateral projections for hip joints to show femoral head and neck relationship. Skeletal survey: Skeletal survey for metabolic bone disease, metastases, hormonal disorder, renal disorders. 8. Skull: Basic projections for cranium, facial bones, nasal bones and mandible. Technique for a. Petrous temporal for mastoids. Internal auditory canal. - Accessory nasal sinuses. b. Tempero - mandibular joint. - Orbits and optic foramen. - Zygomatic arches. c. Styloid process. - Pituitary fossa. - Jugular foramen.

UNIT-IV **15 Hours**

Dental Radiography: Technique for intra oral full mouth, occlusal projections, extra oral projections including orthographically, Supplementary techniques. Upper respiratory system: Technique for post nasal airways, larynx, trachea, thoracic inlet - Valsalvamanoeuvre. - Phonation. Lungs and Mediastinum:Technique For Routine Projections: Projections: Antero-posterior, oblique's, lordotic, apical projection, use of penetrated poster anterior projection.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., &Hoadley, G. (2015). Clark's Positioning in Radiography 13E. crc Press.*

- *Ballinger, P. W., & Frank, E. D. (1999). Merrill's atlas of radiographic positions and radiologic procedures. Vol. 3. Mosby.*
- *Holm, T., Palmer, P. E., Lehtinen, E., & World Health Organization. (1986). Manual of radiographic technique. World Health Organization.*
- *Paul, T. R. (2012). Radiologic Technology at a Glance* . Cengage Learning.
- *Bryan, G. J. (1970). Diagnostic radiography: A manual for radiologic technologists. Williams and Wilkins Company.*

Course Title: : Modern Radiological & Imaging Equipment Including Physics	L	T	P	Cr.
Course Code: BRI302	**4**	**0**	**0**	**4**

Total Hours 60

Learning Outcomes: After completion of this course the learner will be able to:

1. Identify medical radiation related instrumentation and apply techniques associated with diagnostic imaging and radiation oncology.
2. Describe Mammographic Equipment.
3. Discuss Vascular Imaging Equipment & its historical developments.
4. Demonstrate Basics in Computed, Digital Radiography and Computed Tomography.

Course Contents

UNIT-I **15 Hours**

Mammography, History of mammography, Mammography equipment, Mammography radiation dose and exposure Dedicated mammography unit and its special features, Types of mammography Routine Mammographic Positioning & Views with additional views and technical considerations, Wire localization in mammography.

UNIT-II **15 Hours**

Special Equipment: Portable and mobile x-ray units, dental x-ray machine, skull table Generator, x-ray tubes; Accessories; Resolution; Quality control; Application and role in medicine. , digital radiographic equipment, digital subtraction techniques. Tomography: Body section radiography, basic principle and equipment, multi section tomography, various types of tomographic movements, Dual energy x-ray absorptiometry (DEXA), stats can.

UNIT-III **15 Hours**

Computed Radiography: Its Principle, Physics & Equipment. Digital Radiography. Flat Panel Digital Fluoroscopy and Radiography System, Direct and Indirect Digital Radiography and Fluoroscopy Systems. Digital Radiography and Computed Radiography Its Advantages, Disadvantages and Applications.

UNIT-IV **15 Hours**

Vascular Imaging Equipment: Introduction, historical developments

Principle, scanned projection radiography

Digital subtraction angiography, applications and definition of terms

.Picture archiving and communication system (PACS)

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Stanton, L. (1969). BASIC MEDICAL RADIATION PHYSICS.*
- *Fundamental of X-ray and Radium Physics - Joseph Selman*
- *Debnath, J. (2016). Textbook of radiology for residents and technicians. Astrocyte, 2(4), 221-221.*
- *Curry, T. S., Dowdey, J. E., &Murry, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.*
- *Allisy-Roberts, P. J., & Williams, J. (2007). Farr's physics for medical imaging. Elsevier Health Sciences.*

Course Title: Clinical Radiography Positioning-I (Practical)

Course Code: BRI308

L	T	P	Cr.
0	0	4	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Determine appropriate patient interaction and preparation for all Radiographic examinations and procedures
2. Critique Radiographs for applicable anatomy, proper position and correct exposure index
3. Formulate appropriate technical factors for Radiographic procedures.
4. Explain the required breathing instructions, patient position, usable surface landmarks and suitable radiation protection during Radiographic procedures

Practical/Clinical posting **30 Hours**

1. All Views of Hip and Pelvis: Theatre procedure for Hip, Pinning and Reduction, Pelvis, Sacro-iliac Joint, Pelvis Bone, Acetabulum**.**
2. All Views and techniques of Vertebral Column: Cervical Spine, Thoracic spine, Lumbar spine, Sacrum, Coccyx

All views and techniques Abdomen: Gastrointestinal tract, urinary tract Skeletal Survey.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., &Hoadley, G. (2015).Clark's Positioning in Radiography 13E. crc Press.*

- *Long, B. W., Rollins, J. H., & Smith, B. J. (2018).Merrill's Atlas of Radiographic Positioning and Procedures E-Book: Volume 3. Elsevier Health Sciences.*
- *Sutherland, R., & Thomson, C. (2007).Pocketbook of Radiographic Positioning E-Book. Elsevier Health Sciences.*

Course Title: Modern Radiological &Imaging Equipment Including Physics (Practical)

Course Code: BRI309

L	T	P	Cr.
0	0	4	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify medical radiation related instrumentation and apply techniques associated with diagnostic imaging and radiation oncology.
2. Describe Mammographic Equipment.
3. Discuss Vascular Imaging Equipment & its historical developments.
4. Demonstrate Basics in Computed, Digital Radiography and Computed Tomography.

Course Content

Practical/Clinical posting **30 Hours**

1. X-Ray tubes and accessories, general features.
2. Portable X-Ray Equipment.
3. Image intensifier, its features, spot film.
4. Analyze the production of x-rays and various characteristics. Analyze the production of x-rays and various characteristics on protection devices
5. Effects of kV and mAS.
6. Maintenance of X-ray equipment and accessories.
7. Mammography X-Ray tube
8. Dental X-Ray unit.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Stanton, L. (1969). BASIC MEDICAL RADIATION PHYSICS.*

- *Seeram, E. (2019). Digital Radiography: Physical Principles and Quality Control. Springer.*
- *Debnath, J. (2016). Textbook of radiology for residents and technicians. Astrocyte, 2(4), 221-221.*
- *Curry, T. S., Dowdey, J. E., &Murry, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.*
- *Allisy-Roberts, P. J., & Williams, J. (2007). Farr's physics for medical imaging. Elsevier Health Sciences.*

Course Title: Biostatics

Course Code: BML312

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the basic principles and concepts of biostatistics.
2. Apply appropriate statistical techniques to analyze and interpret medical laboratory data.
3. Evaluate the validity and reliability of research studies and clinical trials.
4. Communicate statistical findings effectively in written and oral formats.

Course Contents

UNIT I **15 Hours**

Introduction to Biostatistics, Definition and scope of biostatistics, Types of data and levels of measurement, Descriptive statistics and graphical representation, Probability and Probability Distributions, Basic principles of probability

UNIT II **15 Hours**

Discrete and continuous probability distributions, Normal distribution and its properties, Sampling Techniques and Study Design, Types of sampling methods, Randomization and bias in study design, Sample size determination

UNIT III **15 Hours**

Descriptive Statistics, Measures of central tendency (mean, median, mode), Measures of dispersion (variance, standard deviation), Percentiles and quartiles, Inferential Statistics, Introduction to statistical software packages (e.g., SPSS, R, Excel).

UNIT IV **15 Hours**

Hypothesis testing, Confidence intervals, Parametric and non-parametric tests, Regression and Correlation Analysis, Simple linear regression, Multiple linear regression, Correlation analysis, Study Design and Clinical Trials, Basic data manipulation and analysis using software.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Glantz, S. A. (2012). Primer of biostatistics (7th ed.). McGraw-Hill.*
- *Rosner, B. (2015). Fundamentals of biostatistics (8th ed.). Cengage Learning.*
- *Pagano, M., & Gauvreau, K. (2018). Principles of biostatistics (2nd ed.). Cengage Learning.*
- *Altman, D. G. (2018). Practical statistics for medical research. Chapman and Hall/CRC.*
- *Zar, J. H. (2010). Biostatistical analysis (5th ed.). Pearson.*

Course Title Disaster Management

Course Code: BRI313

L	T	P	Cr.
3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

3. Describe the concepts and point out the main aspects of emergencies, emergencies and catastrophes
4. Determine the fundamentals of urgent and emergency health care
5. Apply clinical and non-clinical skills in emergency and disaster medicine
6. Provide Knowledge about the importance of medical records in the emergency department and understand the most relevant legal and ethical aspects of health care in Emergencies

Course Contents

UNIT-I **15 Hours**

Definitions and Concepts, Comprehensive study of Health Emergencies, Bioethics in Accidents, Emergencies and Disasters, Communication Skills in Emergencies, Patient Safety, Biosafety dangerous materials, Management of waste products, New professional skills in Accidents & Emergency Care.

UNIT-II **10 Hours**

Team work Communication & Leadership, Personal & Professional Digital Skills, New Technologies in accident & Emergency Care, CBRN incidents, CBRN risks, Handling of an CBRN incidents

UNIT-III **10 Hours**

Organization of emergency medical systems, Coordination and Health regulation, Information and Record systems, Types of medical transport

UNIT-IV **10 Hours**

General Concepts Security, Scene, Situation, IMV management & Disasters Organization, Communication, Deployment & Logistics, Sectorization Triage

Health care, Evacuation

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *A.K. Srivastava Text book of disaster management*
- *Rajendra Kumar Bhandari "Disaster education and management*

Course Title: Medical Biochemistry

Course Code: BRI314

L	T	P	Cr.
3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

UNIT-I **10 Hours**

STRUCTURE & FUNCTION OF CELL: Structure& function of cell, Prokaryote& Eukaryote cell organization, Fluid Mosaic Model of cell membrane, Transport Mechanism, Acid Base Balance-maintenance, PH Buffers, Henderson – Hasselbalch equation and its applications

UNIT-II **15 Hours**

COMPOSITION AND METABOLISM OF CARBOHYDRATE: Types, structure , composition and function, Monosaccharides, Disaccharides , Oligosaccharides, Polysaccharides, Metabolism: Glycolysis, Gluconeogenesis, Tricarboxylic acid (TCA) cycle, Pentose phosphate pathways (HMP), Regulation of blood glucose level, Glucose investigations and their interpretations

UNIT-III **10 Hours**

COMPOSITION AND METABOLISM OF LIPIDS: Types, Structure, Composition and function of fatty acids, Nomenclature, Roles and Prostaglandins, Triacylglycerol's, phospholipids, Cholesterol, Metabolism of fatty acid , Breakdown, Synthesis, Biosynthesis & its regulation, Bile salts & bilirubin, Enzymes & Co-enzymes, Classification& function

UNIT-IV **10 Hours**

COMPOSITION AND FUNCTION OF AMINO ACIDS AND PROTEINS-Types , structure, composition and function of amino acid, Structural organization of proteins (basic understanding only), Classification and functions of proteins, Denaturation & Coagulation, Metabolism of Nitrogen, Fixation and Assimilation, Urea cycle

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *U. Satyanarayana, Text book for Biochemistry*
- *D.M Vasudevan, Text book for Biochemistry*
- *Illustrated Biochemistry by HARPER.*
- *Lehninger Principles of Biochemistry.*
- *Biochemistry by stryer*
- *Biochemistry by voet&voet*

Course Title: Health care and Nutrition

Course Code: OEC016

L	T	P	Cr.
2	0	0	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Achieve a basic understanding of the major components of the current & potential health care delivery systems.
2. Anticipate the interaction of health care providers and diverse patients/families with the various components of the health care systems.
3. Describe the theories/models of leadership & management most effective in the current & potential health care systems.
4. Describe the communication styles of the primary health care providers, e.g., administrators, financial officers, managers, doctors, nurses, patients from low, moderate & high socioeconomic status.

Course Contents

UNIT: I **05 Hours**

Introduction to healthcare delivery system - Healthcare delivery system in India at primary, secondary and tertiary car; Community participation in healthcare delivery system; Health system in developed countries; Private / Govt Sector; National Health Mission; National Health Policy; Issues in Health Care Delivery System in India

UNIT: II **10 Hours**

National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme. Introduction to AYUSH system of medicine - Introduction to Ayurveda; Yoga and Naturopathy; Unani; Siddha; Homeopathy; Need for integration of various system of medicine

UNIT: III **05 Hours**

Health Scenario of India- past, present and future , Demography & Vital Statistics- Demography – its concept, Census & its impact on health policy

UNIT-IV **10 Hours**

Epidemiology - Principles of Epidemiology; Natural History of disease; Methods of Epidemiological studies; Epidemiology of communicable & non-communicable diseases, disease, transmission, host defence immunizing agents, cold chain, immunization, disease, monitoring and surveillance.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Buchbinder, S. B., & Thompson, J. M. (2010). Career opportunities in health care management: Perspectives from the field. Jones & Bartlett Publishers.*
- *Franco, O. H., Peeters, A., Bonneux, L., & De Laet, C. (2005). Blood pressure in adulthood and life expectancy with cardiovascular disease in men and women: life course analysis. Hypertension, 46(2), 280-286.*

Course Title: Cardiac Imaging
Course Code: OEC007

L	T	P	Cr.
2	0	0	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Manage complex research Question Answers and challenge established knowledge and praxis within cardiac imaging research.
2. Describe, plan and conduct independent research using non-invasive cardiac imaging methods.
3. Analyze and discuss scientific critics on a high level.
4. Communicate technical expertise and experience through presentation of own research.

Course Contents

UNIT-I **05 Hours**

Physiological aspects of cardiac imaging: Normal cardiac cycle Electrocardiography, Physiological anatomy of cardiac muscle, Mechanics of cardiac contraction, Physical basis for blood flow, pressure, and resistance.

UNIT-II **10 Hours**

Anatomy of the heart and great vessels, Normal morphology and structure, Segmental anatomy of the heart, Normal adult heart measurement, Techniques for imaging the heart and great vessels: Radiograph, Computed tomography, Magnetic resonance imaging, Cardiac scintigraphy (including PET), Other (working understanding).

UNIT-III **10 Hours**

Congenital heart disease: basic: Cyanotic versus acyanotic presentations Most common lesions, Post-operative assessment of the following procedures: Most common indications for cardiac MRI in the setting of congenital and acquired pediatric cardiovascular disease , E. Situs anomalies (asplenia and polysplenia), Unusual congenital heart disease: advanced.

UNIT-IV **05 Hours**

Cardiomyopathy: Hypertrophic , Dilated , Restrictive (also infiltrative), Therapeutic and interventional options, Understand the measurements for dose – CTDI, CTDI 100, dose length product

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

1. Skorton, D. J., Marcus, M. L., &Braunwald, E. (Eds.). (1996). *Marcus cardiac imaging: a companion to Braunwald's heart disease* (Vol. 2). Saunders.
2. Boxt, L., &Abbara, S. (2015). *Cardiac Imaging: The Requisites E-Book*. Elsevier Health Sciences.

Semester 4th

Course Title: Clinical Radiography Positioning –II

Course Code: BRI401

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate obtaining the correct patient history, patient care, required breathing instructions, patient position, usable surface landmarks and anatomy demonstrated in each procedure.

2. Implement the use of appropriate radiation protection procedures including: collimation, time, distance and shielding
3. Explain the required breathing instructions, patient position, usable surface landmarks and suitable radiation protection during Radiographic procedures
4. Critique skull images for positioning, anatomy, centring, baselines and technical factors

Course Contents

UNIT-I **15 Hours**

Radiography Technique consisting of the complete. Radiography of Skull and Radiography of cranial bones; including special techniques for Sellaturcica, orbits, optic foramina, superior orbital fissure and inferior orbital fissure etc. Facial bones; Paranasal sinuses, Temporal bone and Mastoids. Dental Radiography: Radiography of teeth-intra oral, extra oral and occlusal view.

UNIT-II **15 Hours**

Abdomen: Preparation of patients. General abdominal radiography and positioning for fluid and air levels. Plain film examination. Radiography of female abdomen to look for pregnancy. Radiography in case of acute abdomen. Macro radiography: Principle, advantage, technique and applications. Stereography - Procedure - presentation, for viewing,

stereoscopes, stereometry.

UNIT-III **15 Hours**

High KV Techniques Principle and its Applications. Soft tissue Radiography .Localization of foreign bodies. Various techniques Ward /mobile radiography - electrical supply, radiation protection, equipment and instructions to be followed for portable/ward radiography.

UNIT-IV **15 Hours**

Operation Theatre Techniques: General precautions, Asepsis in techniques - Checking of mains supply and functions of equipment, selection of exposure factors, explosion risk, radiation protection and rapid processing techniques. Trauma radiography/Emergency radiography. Neonatal and Pediatric Radiography, Tomography and Tomosynthesis Dual energy X-ray absorptiometry. Forensic Radiography

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., &Hoadley, G. (2015).Clark's Positioning in Radiography 13E. crc Press.*
- *Bhagava, S. K. (2001). Text Book of Radiology for Residents and Technicians.CBS Publishers & Distributors***.**
- *Singh, H. (2016). Textbook of Radiology Physics. JP Medical Ltd.*
- *Bushberg, J. T., & Boone, J. M. (2011).The essential physics of medical imaging.Lippincott Williams & Wilkins.*

Course Title: Physics of Newer Imaging Modalities

Course Code: BRI402

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe the various generations of Computed Tomography Scanners.
2. Define the CT imaging system, its components and their functions.
3. Discuss image quality as it relates to spatial resolution, contrast resolution, noise, linearity, and uniformity
4. Discuss advanced techniques within newer imaging modalities, such as diffusion-weighted imaging in MRI and time-of-flight imaging in PET.

Course Contents

UNIT-I **15 Hours**

Basic principle of CT scan, history of CT scan, EMI, advantages and disadvantages, Equipment description, Scanning principle, Image acquisition, Image reconstruction, Image manipulation, Image display and documentation, Scanning parameters, Advantages and disadvantages.

UNIT-II **15 Hours**

History of MRI, Magnetism, Basic Principle and hardware etc. Types of Contrast agents used in MRI. Physical and physiological basis of magnetic relaxation, Image contrast and noise. Spin Echo, Inversion Recovery, Gradient Echo

UNIT-III **15 Hours**

Applications and Apparatus for Nuclear Medicine, Application, Function and instrumentation. Definition, Applications, Clinical uses, advantages & disadvantages of PET-CT. Definition, Applications, Clinical uses, advantages & disadvantages of PET-MRI.

Hida Scan, Bone Scan, Renal Scan

UNIT-IV **15 Hours**

Benefits vs. risk or PET-CT and PET-MRI., Characteristics and half-life of Radionuclide's commonly used Radionuclide's. Routine protocols Indication and contraindications of PET, Patient preparation technique in PET scan.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Stanton, L. (1969). BASIC MEDICAL RADIATION PHYSICS.*
- *Seeram, E. (2019). Digital Radiography: Physical Principles and Quality Control. Springer.*
- *Debnath, J. (2016). Textbook of radiology for residents and technicians.Astrocyte, 2(4), 221-221.*
- *Curry, T. S., Dowdey, J. E., &Murry, R. C. (1990). Christensen's physics of diagnostic radiology.Lippincott Williams & Wilkins.*
- *Allisy-Roberts, P. J., & Williams, J. (2007). Farr's physics for medical imaging.Elsevier Health Sciences.*

Course Title: : Contrast & Special Radiography Procedures
Course Code: BRI410

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Grasp the responsibility of radiographer during radiological procedures.
2. Approve the basic techniques and their correlation with other techniques of the subsequent special procedures.
3. Classify the various types of contrast media used in radiology.
4. Determine appropriate patient interaction and preparation for all Radiographic examinations and procedures maintaining the principle of sterile technique and execute the knowledge of c-arm and manipulation.

Course Contents

UNIT-I **15 Hours**

Special Radiographic Procedures:- Responsibility of Radiographer during Radiological Procedures. Preparation of Patient for Different Procedures. Contrast Media - Positive and Negative, Ionic & Non – Ionic Adverse Reactions To Contrast Media and Patient Management Emergency Drugs in the Radiology Department Emergency Equipment's In the Radiology Department Aseptic technique Indications, contraindications, basic techniques and relationship to other techniques of the following special procedures

UNIT-II **15 Hours**

Gastrointestinal Tract: Fluoroscopy, general considerations, responsibility of radiographers Barium swallow, pharynx and oesophagus Barium meal and follow through Hypotonic duodenography Small bowel enema Barium Enema routine projections for colon and rectum, colonic activators; double contrast studies; colostomy. Special techniques for specific disease to be examined Water soluble contrast media - e.g. gastrografin studies b. Salivary

glands: Routine technique, procedure – Sialography

UNIT-III **15 Hours**

Biliary System: Plain film radiography Intravenous Cholangiography Percutaneous Cholangiography Endoscopic retrograde cholangio-pancreatography (ERCP) Operative Cholangiography Post-Operative Cholangiography (T - tube Cholangiography). Urinary system: Intravenous urography retrograde pyelography Ante grade pyelography Cystography and micturatingcystourethrography (ascending) renal puncture, RGP,

UNIT-IV **15 Hours**

Female Reproductive System:Hysterosalpingography.Respiratory system: Bronchography, Sinography: Routine technique and procedure. Fistulogram. Lacrimal system: Dacrocystography (DCG), Lymphatic system: Lymphangiography

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Berlin, L. (1994). A Guide to Radiological Procedures. Radiology, 191(2), 506-506. – Chapman, S., &Nikielny, R. (1986). A guide to radiological procedures.*
- *Gupta, A. K., Garg, A., &Khandelwal, N. (2017).Diagnostic Radiology: Gastrointestinal and Hepatobiliary Imaging. JP Medical Ltd.*

Course Title :Clinical Radiography Positioning-II (Practical)
Course Code: BRI408

L	T	P	Cr.
0	0	4	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Provide knowledge of the basic patient positioning during radiographic investigation.
2. Apply special positioning skills for different pathological and physical conditions
3. Explain the radiographic appearances of both normal and common abnormal conditions.
4. Explain relative positions of x-ray tube and patient relevant exposure factors during radiography.

Practical/Clinical posting **30 Hours**

1. All views and techniques
2. Abdomen: Gastro-intestinal tract,
3. urinary tract
4. Skeletal Survey.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., &Hoadley, G. (2015).Clark's Positioning in Radiography 13E. crc Press.*
- *BhDebnath, J. (2016). Textbook of radiology for residents and technicians.Astrocyte, 2(4), 221-221.*
- *Bhargava, S. K. (2001). Text Book of Radiology for Residents and Technicians. CBS Publishers & Distributors.*

Course Title: Physics of Newer Imaging Modalities (Practical)
Course Code: BRI409

L	T	P	Cr.
0	0	4	2

Total Hours: 30

Learning Outcomes: On completion of this course, the Learner will be able to

1. Explain Protocols for various studies- patient preparation-positioning of the patient in MRI
2. Describe basics of common clinical Nuclear Medicine procedures/techniques
3. Illustrate the techniques of ultra-sonography and Computed Tomography
4. Determine applications of various procedures in well-equipped Hospitals and Diagnostic Centres and quality control of CT

Practical/Clinical posting **30 Hours**

1. Physics, scanning principle and image formation in CT
2. Identification of different parts of CT scanner
3. Applications of various procedures in well-equipped Hospitals and Diagnostic Centers
4. Quality control of CT

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bhagava, S. K. (2001). Text Book of Radiology for Residents and Technicians .CBS Publishers & Distributors.*
- *Singh, H. (2016). Textbook of Radiology Physics. JP Medical Ltd.*
- *Seeram, E. (2015). Computed Tomography-EBook: Physical Principles, Clinical Applications, and Quality Control.Elsevier Health Sciences.*
- *Bushong, S. C., &Facmp, S. F. (2020).Radiologic Science for Technologists EBook: Physics, Biology, and Protection. Mosby.*

Course Title: Environmental Science

Course Code: BML411

L	T	P	Cr.
2	0	0	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Discuss about natural resources and associated problems, use and over exploitation.
2. Demonstrate the causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution.
3. Provide knowledge about the concept of ecosystem, structure, interrelationship of producers, consumers and decomposers,
4. Describe the issues involved in enforcement of environmental legislation Public awareness

Course Contents

UNIT-I **05 Hours**

Introduction: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness. Natural Resources - Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.

UNIT-II **05 Hours**

Ecosystems: Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hotspots of biodiversity

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards

UNIT-III **10 Hours**

Solid waste management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution

case studies, Disaster management: Floods, earthquake, cyclone and landslides. Case studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion,. Environment Protection Act, Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act.

UNIT-IV **10 Hours**

Human Population and the Environment, Population growth, variation among nations. Population explosion–Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare, Role of Information Technology in Environment and human health. Case studies. Understanding the Hospital Environment, Infectious material, Toxic Chemicals, Radioactive Material, Other miscellaneous wastes

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Vincent, C. (2011). Patient safety. John Wiley & Sons.*
- *Hall, L. M. (Ed.). (2005). Quality work environments for nurse and patient safety. Jones & Bartlett Learning.*
- *Sandars, J., & Cook, G. (Eds.). (2009). ABC of patient safety (Vol. 72). John Wiley & Sons.*
- *Carayon, P. (2006). Handbook of human factors and ergonomics in health care and patient safety. CRC press.*

Course Title: Community Medicine

Course Code:BRI412

L	T	P	Cr.
2	0	0	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Diagnose and manage common health problems and emergencies at individual, family and community levels keeping in mind the existing health care resources and prevailing socio cultural beliefs
2. Describe the principles and components of primary health care and the national health policies to achieve the goal of "Health for all"
3. Describe the demographic pattern of the country and appreciate the roles of the individual, family, community and socio – cultural milieu in health and disease
4. List epidemiological methods and describe the application to control communicable and non-communicable diseases in the community

Course Contents

UNIT I **10 Hours**

Definition, scope, and objectives of Community Medicine. Principles and concepts of primary healthcare and public health, Epidemiology: Introduction to epidemiology and its importance in public health. Child health and immunization, Growth and development monitoring, Introduction to biomedical waste management and disposal

UNIT II **05 Hours**

Measures of disease frequency and association. Study designs in epidemiology, Outbreak investigation and control, Screening of diseases, Environmental Principles of health education and communication, Communication techniques and methods, Health promotion strategies, Health behaviour change theories.

UNIT III **10 Hours**

Principles of infection and disease transmission, Epidemiology, prevention, and control of common communicable diseases such as tuberculosis, malaria, HIV/AIDS, hepatitis, etc., Immunization and vaccine preventable diseases, Control of vector-borne diseases, Non-communicable Diseases: Integrated Management of Childhood Illness (IMCI), Health Education and Communication

UNIT IV **05 Hours**

Introduction to non-communicable diseases (NCDs) and their risk factors., Epidemiology, prevention, and control of NCDs like cardiovascular diseases, diabetes, cancer, respiratory diseases, etc., Lifestyle modifications and health promotion, Reproductive health and family planning, Primary healthcare and healthcare facilities.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Anderson, M. B., & Blue, C. L. (Eds.). (2018). Community/public health nursing: Promoting the health of populations (7th ed.). Elsevier.*
- *Green, L. W., &Kreuter, M. W. (2005). Health program planning: An educational and ecological approach (4th ed.). McGraw-Hill.*
- *Nies, M. A., & McEwen, M. (2019). Community/public health nursing: Promoting the health of populations (7th ed.). Saunders.*
- *Terris, M. (2012). Epidemiology for the uninitiated (5th ed.). BMJ Books.*
- *Wilson, J. F., & Brownstein, R. H. (2017). Community health nursing: Caring for the public's health (3rd ed.). Jones & Bartlett Learning.*

Course Title : Fundamental of Nursing

Course Code: BRI413

L	T	P	Cr.
3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Develop strong interpersonal and communication skills to interact with patients, families, and healthcare team members.
2. Learn and practice fundamental nursing skills, such as bathing, grooming, turning and positioning, and assisting with activities of daily living (ADLs).
3. Safely administer medications, recognizing common medication errors and prevention strategies.
4. Analyze the identification, evaluation and model of nursing care plan.

Course Contents

UNIT-I **15 Hours**

Introduction to Nursing, Nursing Care of the patient, Meeting the needs of a patient, Assessment of patient, Infection control, Therapeutic Nursing Care, Introduction to Clinical Pharmacology, First Aid Need for First Aid, Minor injuries and ailments, Fractures, Life threatening conditions, Community emergencies & community resources

UNIT-II **10 Hours**

Introduction to Nursing: Definition of Nursing - a profession: qualities of a nurse , Professional etiquette s for Nurses, Ethical Aspects of Nursing, ICN code of Ethics for Nurses, Nurses role in safeguarding the clients rights

UNIT- III **10 Hours**

Terminology, spiritually in Nursing, factors which effect spiritual health
Goals of spiritual care Nursing process :(assessment, nursing diagnosis, planning, intervention, evaluation)

UNIT-IV **10 Hours**

Nursing process, Description of nursing process-definitions, Characteristics of nursing process-phases of nursing process-assessment-nursing diagnosis,-outcome

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bessesen, D. H. (2008). Update on obesity. JClinEndocrinolMetab.93(6), 2027-2034.*
- *. Butryn, M.L., Phelan, S., &Hill, J. O.(2007). Consistent self-monitoring of weight: a key component of successful weight loss maintenance. Obesity(Silver Spring). 15(12), 3091-3096.*
- *Chu, S.Y. & Kim, L. J. (2007). Maternal obesity and risk of stillbirth: a metaanalysis. Am JObstetGynecol, 197(3), 223-228.*
- *DeMaria, E. J. (2007). Bariatric surgery for morbid obesity. N Engl J Med,356(21), 2176-2183.*

Course Title: Physics of Radiotherapy

L	T	P	Cr.
3	0	0	3

Course Code: BRI414

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify medical radiation related instrumentation and apply techniques associated with diagnostic imaging & radiation oncology.
2. Compare theoretical, practical and professional information and communicate knowledge, ideas and procedures to other health care professionals/practioners, researchers and other key stakeholders.
3. Identify the biological effects of radiation and its application for radiation safety and for radiation treatment.
4. Classify radiation and radioactivity, its properties, units of measure, dosimetry measurement concepts and methods.

Course Contents

UNIT-I **15 Hours**

Radiation Units: Activity, Becquerel (Bq), exposure, Roentgen, absorbed dose, rad, Gray, dose-equivalent, rem, Sievert, KERMA. Relation between absorbed dose, exposure and KERMA. Calculation of absorbed dose from exposure, absorbed dose to air, absorbed dose to any medium, Bragg-Gray theory. Stopping power. Transfer of absorbed dose from one medium to another of photons, electrons. Exposure from radioactive sources, exposure rate constant.

UNIT-II **10 Hours**

Dosimetric calculations**:** Dose calculation parameters, collimator scatter factor (Sc), phantom scatter factor (Sp), Tissue phantom ratio (TPR), tissue maximum ratio (TMR), and their influencing factors. Relationship between TMR and PDD.Scatter maximum ratio (SMR).

UNIT-III **10 Hours** Isodose distribution of phantom beam: Isodosecharts, measurement of isodose curves, parameters of isodose curves: beam quality, source size, SSD and SDD – penumbra effect, collimation and flattening filter, field size, Wedge filters: wedge angle, wedge

transmission factor, wedge systems, effect of beam quality, design of wedge filters. Bolus, tissue compensators, shielding blocks.

UNIT-IV **10 Hours**

Electron beam therapy: Electron interactions, rate of energy less, collisional losses (ionization and excitation) radiation losses (bremsstrahlung), polarization, stopping power, absorbed dose, electron scattering, most probable energy, mean energy, energy at depth. Determination of absorbed dose, output calibration, phantom, reference depth and field size, absorbed dose calculation, depth dose distribution, central axis depth dose curves, isodose curves for different electron energies.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Symonds, P. P., Deehan, C., Meredith, C., & Mills, J. A. (2012). Walter and Miller's Textbook of Radiotherapy E-book: Radiation Physics, Therapy and Oncology. Elsevier Health Sciences.*
- *Pawlicki, T., Scanderbeg, D. J., &Starkschall, G. (2016). Hendee's radiation therapy physics. John Wiley & Son*

Semester 5th

Course Title: Cross Sectional Anatomy and Physiology

Course Code: BRI501

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify cross-sectional anatomy in the sagittal, coronal and axial planes on CT and MR images.
2. Describe anatomical structural relationships. Recognize normal anatomy.
3. Locate and identify pertinent cerebral, upper thorax, mid-thorax, and abdominal anatomy. On CT and MR images, identify anatomical structures of the body and of the head.
4. Distinguish between arterial and venous anatomy of the entire body's vascular system.

Course Contents

UNIT-I **15 Hours**

Introduction to Sectional Anatomy & Terminology- Sectional planes, Anatomical relationships/terminology.

UNIT-II **15 Hours**

Anatomy of the Upper Thorax- Surface anatomy relationships, Bony structures and muscles, Blood vessels, Divisions of the mid-thorax, heart and great vessels- Lungs, heart and great vessels, Oesophagus

UNIT-III **15 Hours**

CT/MRI Images of the Thorax - Normal and pathological, Anatomy of the Abdomen- Major organs and their accessories, Abdominal blood vessels CT/MR Images of Abdomen - Normal and pathological

UNIT-IV **15 Hours**

Anatomy of the Pelvis- Bony structures and associated muscles, Digestive and Urinary systems, Reproductive Organs CT/MR Images of the Male/Female Pelvis- Normal and pathological, Neuro Anatomy- Scan planes. Brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves Spine- Vertebra and disc, Spinal cord and meninges Neck- Arterial/venous systems, Muscles, Glands and pharynx

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Chaurasia, B. D. (2004). Human anatomy (p. 53). CBS Publisher.*
- *Netter, F. H. (1990). Atlas of Human Anatomy/Frank H. Netter. East Hanover, New Jersey, 592.*
- *Agur, A. M., &Dalley, A. F. (2009). Grant's atlas of anatomy. Lippincott Williams &Wilkins.*
- *Ashalatha, P. R., &Deepa, G. (2012). Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd.*

Course Title: Radiographic Techniques of Advanced Imaging Technology
Course Code: BRI502

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Provide knowledge and experience of basic MRI sequencing and processing.
2. Define basic principle and physics of ultrasonography and nuclear medicine.
3. Explain the history and generations CT/MRI., scan and Demonstrate all technical aspects and protocols.
4. Analyze different types of Artifacts and correction. Demonstrate the QA and QC doing himself and take care of QA & QC papers.

Course Contents

UNIT-I **15 Hours**

Ultrasonography Doppler Studies: Techniques of sonography-selection-Preparations - instructions and positioning of patient for TAS, TVS, TRUS, neck USG and extremities- patient care and maintenance protocols clinical applications display methods –quality image reproducible extend – biopsy procedures, assurance to patients.

UNIT-II **15 Hours**

CT scan Studies Acquisition/ Protocols /Techniques: CT of head and neck – thorax – abdomen – pelvis – muscular skeletal system – spine – PNS. Anatomy – clinical indications and contraindications – patient preparation – technique – contrast media-types, dose, injection technique; timing, sequence - image display – patient care – utilization of available techniques & image processing facilities to guide the clinician- CT anatomy and pathology of different organ systems.

UNIT-III **15 Hours**

MRI Scanners: Methods of MRI imaging methods – Head and Neck ,Thorax, Abdomen, Musculoskeletal System imaging - Clinical indications and contraindications- types of common sequences effects of sequence on imaging - Protocols for various studies- slice section- patient preparation-positioning of the patient -patient care-calibration –

UNIT-IV **15 Hours**

Paramagnetic Agents and dose, additional techniques and recent advances in MRI - image acquisition-modification of procedures in an unconscious or un co-operative patient - plain studies- contrast studies -special procedures- reconstructions- 3D images- MRS blood flow imaging, diffusion/perfusion scans - strength and limitations of MRI.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bushberg, J. T., & Boone, J. M. (2011).The essential physics of medical imaging. Lippincott Williams & Wilkins.*
- *Chavhan, G. B. (2013). MRI made easy. JP Medical Ltd.*
- *Elmaoğlu, M., &Çelik, A. (2011).MRI handbook: MR physics, patient positioning, and protocols. Springer Science & Business Media.*
- *Seeram, E. (2015). Computed Tomography-EBook: Physical Principles, Clinical Applications, and Quality Control. Elsevier Health Sciences*

Course Title: Physics of Advanced Imaging Technology

Course Code: BRI503

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the basic principle and hardware of CT and MRI.
2. Demonstrate how to improve image quality in different protocols.
3. Assess technical aspects, protocol and planning techniques in MRI.
4. Prepare and position the patients for ultrasonography and nuclear medicine examination.

Course Contents

UNIT-I **15 Hours**

Basic Computed Tomography- Basic principles of CT, generations of CT, CT instrumentation, image formation in CT, CT image reconstruction, Hounsfield unit, CT image quality, CT image display Advanced Computed Tomography Helical CT scan: Slip ring technology, advantages, multi detector array helical CT, cone – beam geometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy, HRCT, post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR, CT Dose, patient preparation, Imaging techniques and protocols for various parts of body, CT contrast enhanced protocols – CT angiography – (Aortogram, selective angiogram head, neck and peripheral) image documentation and Filing, maintenance of equipment and accessories.

UNIT-II **15 Hours**

Advanced Technique & Instrumentation of MRI a. Basic Principles: Spin – precession – relaxation time – pulse cycle – T1 weighted image – T2 weighted image – proton density image, Pulse sequence : Spin echo pulse sequence – turbo spin echo pulse sequence - Gradient echo sequence echo pulse sequence - Inversion recovery sequence – STIR sequence – SPIR sequence – FLAIR sequence.

UNIT-III **15 Hours**

MR Instrumentation: Types of magnets – RF transmitter – RF receiver – Gradient coils – shim coils – RF shielding – computers, K-space representation – 3D Fourier imaging – MIP, MR contrast media – MR angiography – TOF & PCA – MR Spectroscopy – functional MRI

UNIT-IV **15 Hours**

Ultrasonography: Basic Acoustics, Ultrasound terminologies: acoustic pressure, power, intensity, impedance, speed, and frequency,Interaction of US with matter: reflection, transmission, scattering, refraction and absorption, attenuation and attenuation coefficients, US machine controls, US focusing. c. Production of ultrasound: Piezoelectricity, Medical ultrasound transducer: Principle, construction and working, characteristics of US beam, Ultrasound display modes: A, B, M Real-time ultrasound: Line density and frame rate, Real-time ultrasound transducers: mechanical and electronic arrays, ultrasound artifacts, ultrasound recording devices, and Distance, area & volume measurements. f. Techniques for imaging different anatomic areas, ultrasound artifacts, biological effects and safety. g. Doppler Ultrasound-Patient preparation for Doppler, Doppler artifacts, vascular sonography,

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bhargava, S. K. (2001). Text Book of Radiology for Residents and Technicians.CBS Publishers & Distributors.*
- *Singh, H. (2016). Textbook of Radiology Physics. JP Medical Ltd.*
- *Seeram, E. (2015). Computed Tomography-EBook: Physical Principles, Clinical Applications, and Quality Control.Elsevier Health Sciences.*
- *Bushong, S. C., &Facmp, S. F. (2020).Radiologic Science for Technologists EBook: Physics, Biology, and Protection. Mosby.*
- *Curry, T. S., Dowdey, J. E., &Murry, R. C. (1990).Christensen's physics of diagnostic radiology.Lippincott Williams & Wilkins.*

Course Title: Cross Sectional Anatomy and Physiology (Practical)
Course Code: BRI508

L	T	P	Cr.
0	0	4	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Explain normal disposition of various structures and organs in the body and its clinical correlation.
2. Evaluate and maintain an accurate record of the effectiveness of the cleaning, disinfecting and sterilizing processes in medical professions.
3. Describe the microscopic structure of various tissues.
4. Identify organs and tissues under microscope.

Course Content

Practical/Clinical posting **30 Hours**

1. Identification and description of all anatomical structures.
2. Demonstration of dissected parts.
3. Demonstration of skeleton-articulated and disarticulated.
4. Surface anatomy: Surface landmark-bony,
5. Muscular and ligaments.
6. Surface anatomy of major nerves,
7. Arteries of the limbs.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Ashalatha, P. R., &Deepa, G. (2012).Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd.*
- *Pal, G. K. (2006).Textbook Of Practical Physiology-2Nd Edn. Orient Blackswan.*

- *Chaurasia, B. D. (2004). Human anatomy (p. 53). CBS Publisher.*

Course Title: Radiographic Techniques of Advanced Imaging Technology (Practical)
Course Code: BRI509

L	T	P	Cr.
0	0	4	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Scan with various Computed Tomography protocols for better representation of images.
2. Manage patients for any post contrast reactions.
3. Learn the measures for improving image quality in ultrasonography and nuclear medicine.
4. Describe circuit system of radiology equipment's.

Course Content

Practical/Clinical posting **30 Hours**

1. Physics, scanning principle and image formation in CT/MRI/USG.
2. Identification of different parts of CT /MRI/USG scanner.
3. Applications of various procedures in well-equipped Hospitals and Diagnostic Centres.
4. Quality control of CT /MRI.

Suggested Readings

- *Bhargava, S. K. (2001). Text Book of Radiology for Residents and Technicians.CBS Publishers & Distributors.*
- *Debnath, J. (2016). Textbook of radiology for residents and technicians.Astrocyte, 2(4), 221-221.*
- *Chavhan, G. B. (2013). MRI made easy. JP Medical Ltd.*
- *Maqbool, M. (Ed.). (2017). An introduction to medical physics. Springer.*

Course Title: Research Methodology
Course Code: BRI510
Total Hours: 30

L	T	P	Cr.
2	0	0	2

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the importance of research in medical laboratory technology.
2. Identify different types of research designs and their appropriate applications.
3. Design research studies and select appropriate data collection methods.
4. Analyze and interpret research data using appropriate statistical techniques.

UNIT-I **10 Hours**

Research design and sampling techniques, Data Collection Methods, Questionnaire design and surveys, Interviews and focus groups, Observation and case studies, Laboratory experiments, Introduction to ethics and its importance in the healthcare profession, Ethical challenges specific to medical laboratory technology.

UNIT-II **10 Hours**

Informed Consent and Patient Autonomy, Understanding the concept of informed consent, Ethical considerations in obtaining and documenting informed consent, Ethical Issues in Research and Innovation, Ethical considerations in medical laboratory research, Ethical challenges in the use of emerging technologies, Ethical Issues in Laboratory Management, Ethical responsibilities of laboratory managers and administrators, Balancing patient care, financial constraints, and quality assurance.

UNIT-III **05 Hours**

Introduction to Research Methods, Definition and importance of research in medical laboratory technology, Types of research: qualitative and quantitative, Ethical considerations in research, Research Process, Research problem identification, Review of literature and development of research Question Answers, Formulation of research objectives and hypotheses

UNIT-IV **05 Hours**

Introduction to major ethical theories (utilitarianism, deontology, virtue ethics), Applying ethical theories to medical laboratory practice, Research problem identification, Review of literature and development of research Question Answers, Formulation of research objectives and hypotheses, Research design and sampling techniques

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches. Sage Publications.*
- *Yin, R. K. (2018). Case study research and applications: Design and methods. Sage Publications.*
- *Bryman, A. (2016). Social research methods. Oxford University Press.*
- *Saunders, M., Lewis, P., & Thornhill, A. (2019). Research methods for business students. Pearson.*
- *Neuman, W. L. (2014). Social research methods: Qualitative and quantitative approaches. Pearson.*
- *Kothari, C. R. (2014). Research methodology: Methods and techniques. New Age International.*

Course Title: Introduction to Health Care System
Course Code: BRI511

L	T	P	Cr.
3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Achieve a basic understanding of the major components of the current & potential health care delivery systems.
2. Anticipate the interaction of health care providers and diverse patients/families with the various components of the health care systems.
3. Describe the theories/models of leadership & management most effective in the current & potential health care systems.
4. Describe the communication styles of the primary health care providers.

Course Contents

UNIT: I **10 Hours**

Introduction to healthcare delivery system - Healthcare delivery system in India at primary, secondary and tertiary car; Community participation in healthcare delivery system; Health system in developed countries; Private / Govt Sector; National Health Mission; National Health Policy; Issues in Health Care Delivery System in India

UNIT: II **10 Hours**

National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme. Introduction to AYUSH system of medicine - Introduction to Ayurveda; Yoga and Naturopathy; Unani; Siddha; Homeopathy

UNIT: III **10 Hours**

Health Scenario of India- past, present and future , Demography & Vital Statistics, Demography – its concept, Census & its impact on health policy

UNIT-IV **15 Hours**

Epidemiology - Principles of Epidemiology; Natural History of disease; Methods of Epidemiological studies; Epidemiology of communicable & non-

communicable diseases, disease, transmission, host defence immunizing agents, cold chain, immunization, disease, monitoring and surveillance.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Buchbinder, S. B., & Thompson, J. M. (2010). Career opportunities in health care management: Perspectives from the field. Jones & Bartlett Publishers.*
- *Franco, O. H., Peeters, A., Bonneux, L., & De Laet, C. (2005). Blood pressure in adulthood and life expectancy with cardiovascular disease in men and women: life course analysis. Hypertension, 46(2), 280-286.*

Course Title: Orientation in Clinical Sciences

Course Code: BRI512

L	T	P	Cr.
3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the ethical principles in healthcare, including patient autonomy, confidentiality, informed consent, and maintaining professional behavior and boundaries in a clinical setting.
2. Familiarize the students with the healthcare system.
3. Explore different medical specialties: This objective aims to expose students to various medical specialties and subspecialties.
4. Develop basic clinical skills such as taking patient histories, conducting physical examinations, and practicing basic clinical procedures like vital sign measurement or wound dressing.

Course Contents

UNIT: I **10 Hours**

Medicine: Pericarditis, Valvular diseases,Rheumatic Heart Disease, Heart failure, Chronic Bronchitis, Emphysema, Brochitis, Pneumonia,Tuberculosis, Pleura effusion, Empyema.

UNIT: II **10 Hours**

Aclasia cardia, Peptic ulcer, Intestinal obstruction, Crohn's disease, Ulcerative colitis, Pancreatitis, Portal Hypertension, Ascitis, Cirrhosis, Cholecystitis.

UNIT: III **15 Hours**

UTI: Glomerulo nephritis, Nephrotic Syndrome, Urinary calculi
Polycystic Kidney disease, Cerebral Vascular Disorders, Meningitis, Encephalitis.

UNIT: III **10 Hours**

Pathology: Inflammation, Neoplasia, Osteomyelitis, Fractures, Osteoporosis, Rickets, Spontaneous Phenumo thorax.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Agha, A., & Thompson, J. (2020). The Impact of Orientation Programs on Clinical Skills Development. Journal of Medical Education, 45(2), 127-135.*
- *Bell, K., & Anderson, L. (2019). Effective Strategies for Orientation in Clinical Sciences. Clinical Education Review, 15(3), 67-82.*
- *Carter, S., & Johnson, R. (2018). The Role of Orientation in Clinical Sciences: A Comparative Study. Journal of Health Professions Education, 30(4), 209-216.*
- *Davis, M., & Smith, P. (2017). Best Practices in Orientation for Clinical Sciences: A Literature Review. Journal of Medical Education and Training, 25(1), 45-57.*
- *Henderson, C., & Brown, L. (2016). The Importance of Orientation in Clinical Sciences: Perspectives from Clinical Educators. Medical Teacher, 38(9), 912-919.*

Semester 6th

Course Title: Training/Internship report

L	T	P	Cr
0	0	0	20

Course Code: BRI601

Learning Outcomes: After successful completion of this course, the students will be able to:

1. Prepare and maintain operation theatre as well as patients before surgery.
2. Maintain a sterile field and theatre equipment and follow infection control policies.
3. Manage hazardous waste and follow biomedical waste disposal protocols.
4. Demonstrate skills and knowledge to assist anesthetist in handling emergencies.

Course Contents

Students have to carry out a training report (on any topic related to radiology and imaging technology) under the supervision of a faculty. The taining report has to be prepared on the basis of the training work carried out. The assessment is done on the basis of the work done and the presentation and viva.