GURU KASHI UNIVERSITY

Diploma in Radiology & Imaging Technology

Session: 2022-23

Department of Paramedical Science

Programme Learning outcomes

- Acquaint with the knowledge, skills and experience which make them extremely employable in the X-ray, CT, MRI Laboratories.
- Identify the professional and ethical manner, and practice industry-defined work ethics.
- Demonstrate the ability to use professional written and oral communication skills and technology to successfully communicate.
- Perform routine X-ray procedures within acceptable quality control in radiology.
- Demonstrate technical skills, social behavior and professional awareness for functioning effectively as a X-ray, CT, MRI technician.
- Apply problem solving techniques in identification and correction of pre analytical, post analytical & analytical variables.
- Recognize the impact of X-ray, CT, MRI in a global and environmental context.

Programme Structure

Semester: I							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	DRI101	Applied Chemistry	Core course	3	1	0	4
2	DRI102	Applied Physics	Core course	3	1	0	4
3	DRI103	Applied Mathematics-I	Core course	3	1	0	4
4	DRI104	English and Communication Skills	Skill Based	3	1	0	4
5	DRI105	Applied Chemistry (Practical)	Skill Based	0	0	6	3
6	DRI106	Applied Physics (Practical)	Skill Based	0	0	6	3
			Total	**12**	**4**	**12**	**22**

Semester: II							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	DRI201	Basic Electrical	Core course	3	1	0	4
2	DRI202	Basic Electronics	Core course	3	1	0	4
3	DRI203	Anatomy & Physiology-I	Core Course	3	1	0	4
4	DRI204	Health Education	Ability Enhancement	1	0	0	1
5	DRI205	Basic Electrical (Practical)	Technical Skill	0	0	6	3
6	DRI206	Basic Electronics (Practical)	Technical Skill	0	0	6	3
7	DRI207	Anatomy & Physiology I (Practical)	Technical Skill	0	0	6	3
			Total	**10**	**3**	**18**	**22**

Semester: III							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	DRI301	Clinical Radiography Positioning-I	Core course	3	1	0	4
2	DRI302	Conventional Radiography and Equipments-I	Core course	3	1	0	4
4	DRI303	Introduction to Quality and Patient Safety	Disciplinary Elective	3	1	0	4
5	DRI304	Principles of Management					
6	DRI305	Basic Computers and Information Science	Skill Based	4	0	0	4
7	DRI306	Clinical Radiography Positioning-I (Practical)	Technical Skill	0	0	6	3
8	DRI307	Conventional Radiography and Equipments-I (Practical)	Technical Skill	0	0	6	3
			Total	**13**	**3**	**12**	**22**

Semester: IV							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	DRI401	Clinical Radiography Positioning-II	Core course	3	1	0	4
2	DRI402	Basic Physics include Radiological Physics	Core course	3	1	0	4
3	DRI403	Conventional Radiography and Equipments-II	Core course	3	1	0	4
4	DRI404	Fundamental of Nursing	Skill Based	2	0	0	2
5	DRI405	Clinical Radiography Positioning-II (Practical)	Skill Based	0	0	6	3
6	DRI406	Basic Physics include Radiological Physics (Practical)	Technical Skill	0	0	6	3
7	DRI407	Conventional Radiography and Equipments-II (Practical)	Technical Skill	0	0	6	3
			Total	**11**	**03**	**18**	**23**

Semester: V							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	DRI501	Modern Radiological & Imaging Equipment including Physics	Core course	3	1	0	4
2	DRI502	Contrast & Special Radiography Procedures	Core course	3	1	0	4
3	DRI503	Physics of Newer Imaging Modalities	Core course	3	1	0	4
4	DRI504	Introduction to Health Care System	Ability Enhancement	1	0	0	1
5	DRI505	Modern Radiological & Imaging Equipment Including Physics (Practical)	Skill Based	0	0	6	3
6	DRI506	Contrast & Special Radiography Procedures (Practical)	Skill Based	0	0	6	3
6	DRI507	Physics of Newer Imaging Modalities (Practical)	Skill Based	0	0	6	3
			Total	**10**	**3**	**18**	**22**

Semester: VI							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**No. Of Credits**
1	DRI601	Professional Training/Internship (6 Months)	Skill Based	-	-	-	20
			Total	**0**	**0**	**0**	**20**

Evaluation Criteria

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

i. CA1 [10 Marks]
ii. CA2 [10 Marks]
iii. CA3 [05 Marks]

For Each Continues Assessment will conduct the Surprise Test, Quiz, Term paper and assignment etc.

A. Attendance [05 Marks]
B. Mid Semester Test - 1: [30 Marks]
C. Mid Semester Test - 2: [20Marks]
D. End-Term Exam: [20 Marks]

Semester-I

Course Title: Applied Chemistry
Course code: DRI101

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Perform laboratory experiments safely and effectively, including techniques for chemical analysis, synthesis, and characterization.
2. Understand the relationship between chemical structure and properties of different substances, such as polymers, catalysts, or nanomaterials, and their applications in specific industries.
3. Develop critical thinking and problem-solving skills to address real-world challenges in applied chemistry, such as pollution control, sustainable energy, or waste management
4. Continuously update knowledge in the field of applied chemistry through self-learning and keeping up with current research and advancements.

Course Contents

UNIT I **14 Hours**

Solid State Classification of solids based on different binding forces :molecular, ionic covalent and metallic solids, amorphous and crystalline solids(elementary idea),unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, packing efficiency, voids ,number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties, Band theory of metals ,conductors, semiconductors and insulators and n and p type semiconductors . Solutions Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties – relative lowering of vapor pressure.

UNIT II **16 Hours**

Raoult's law, elevation 8 of B.P., depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Vant Hoff factor. Electrochemistry Redox reactions;

conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells.

UNIT III **17 Hours**

Relation between Gibbs energy change and EMF of a cell, fuel cells; corrosion. Chemical Kinetics Rate of a reaction (average and instantaneous), factors affecting rates of reaction: concentration, temperature, catalyst; order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment). Activation energy, Arrhenious equation.

UNIT IV **13 Hours**

Surface Chemistry Adsorption – physisorption and chemisorption; factors affecting adsorption of gases on solids; catalysis: homogenous and ids and suspensions; lyophillic, lyophobic multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsions – types of emulsions.

General Principles and Processes of Isolation of Elements Principles and methods of extraction – concentration, oxidation, reduction electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and iron.

Transaction Modes

Video based teaching, Collaborative teaching, Case based teaching, Question-

Answer-Answer

SUGGESTED READINGS

1. *Rao, C. N. R. (2019). Applied Chemistry: A Textbook for Engineers and Technologists. New Delhi, India: Universities Press.*
2. *Chaudhuri, M. (2018). Principles of Applied Chemistry. Kolkata, India: Academic Publishers.*
3. *Sharma, O. P. (2017). Applied Chemistry: Fundamentals and Applications. Mumbai, India: Nirali Prakashan.*
4. *Kapoor, H. L. (2016). Applied Chemistry: A Practical Approach. New Delhi, India: Pearson Education India.*
5. *Singh, K. (2015). Concepts and Applications of Applied Chemistry. Chennai, India: S. Chand Publishing.*
6. *Gupta, S. K. (2014). Applied Chemistry: Principles and Practice. Jaipur, India: Ane Books Pvt. Ltd.*

Semester-I

Course Title: Applied Physics
Course code: DRI102

L	T	P	Cr.
3	1	0	4

Total Hours 60

Course Contents

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

1. Apply mathematical and scientific reasoning to analyze and solve problems in various areas of applied physics.
2. Demonstrate proficiency in laboratory techniques and experimental methods used in applied physics.
3. Develop critical thinking skills to evaluate and interpret experimental data and scientific literature.
4. Apply knowledge of applied physics principles to real-world applications and technological advancements.

UNIT I **15 Hours**

SI units, Need for measurement: units of measurement, system of units SI units. Fundamental and derived units, length and time measurements.

UNIT II **15 Hours**

Magnetic effects of current and magnetism,Concept of magnetic field, Oersted's experiment, Biot- Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long, straight wire, straight and toroidal solenoids.

UNIT III **15 Hours**

Atoms & nuclei, Alpha-particle scattering experiment, Rutherford's model of atom, Bohr model, Energy levels. hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes, isobars, isotones Radioactivity-alpha, beta and gamma particles/rays and their properties, radioactive decay law. Applications of radio activity.

UNIT IV **15 Hours**

Optics**,** Reflection of light: spherical mirrors & its types. Refraction of Light: lenses & its types. Image formations, magnification& power of a lens, Refraction and dispersion of light through a prism. Scattering of light-blue colour of the sky and reddish appearance of the sun at sunrise and sunset. Microscope & their Magnifying Powers Photo chromatography

Transaction Modes

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

SUGGESTED READINGS

1. *Mishra, P. (2019). Applied Physics: Principles and Applications. New Delhi, India: McGraw-Hill Education.*
2. *Verma, S. (2018). Fundamentals of Applied Physics. Mumbai, India: Pearson Education India.*
3. *Gupta, R. (2017). Introduction to Applied Physics. Chennai, India: S. Chand Publishing.*
4. *Singh, H. (2016). Applied Physics for Engineers. Kolkata, India: Wiley India Pvt. Ltd.*
5. *Kapoor, H. (2015). Principles of Applied Physics. New Delhi, India: Cengage Learning India.*
6. *Sharma, A. (2014). Applied Physics: A Textbook for Engineers. Jaipur, India: Laxmi Publications.*

Semester-I

Course Title: Applied Mathematics-I
Course code: DRI103

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Understand and apply mathematical concepts and techniques to solve real-world problems in various disciplines.
2. Develop analytical and critical thinking skills to analyze and interpret mathematical models and data.
3. Apply mathematical methods, such as differential equations, linear algebra, and calculus, to model and solve problems in engineering, physics, economics, and other fields.
4. Use mathematical software and programming languages to perform computations, simulations, and data analysis.

Course Contents

UNIT I **15 Hours**

Set theory and real number system, Define and denote sets, Find subsets of a set and represent the sets in venn diagrams, The concept of sets, specification of sets, representation and types of sets, Venn diagrams, Find the union, intersection, complement and difference of given sets, Define cardinality of a finite set, Solve verbal problems using set operations. Prove algebra of sets

Define real numbers, absolute value, open and closed intervals and inequalities, Use the concept of set in selected problems. Proof of the Algebra of sets, De-Morgan's law, Problems related to cardinality of sets, Set operation, set of numbers, Cartesian products and relation, domain and range of relation,

Real number system and the types of numbers, real numbers line, absolute value, open and closed intervals, inequalities.

UNIT II **15 Hours**

Function and graph-Define a function, Classify functions. Identify the different functions, Define domain and range of relation, Functions and their inverse and related problems. Composite function and related problems. Algebraic only, Domain and range (excluding inverse and composite function) Exponential and Logarithmic functions, Matrices and determinants, Define the term matrix. Write the rows, columns and order of the matrices., Classify matrices according to their properties. Define the addition and multiplication of matrices (of order m x n, with its different types in 3x3 order). Define a determinant and list the properties of a determinant, Define the inverse of a matrix. Definition of matrix and its notation and order

UNIT III **15 Hours**

Types of matrices and simple algebra of matrices. Transpose, Adjoint and inverse of a matrix and related problems, Definition of a determinant. Minors and cofactors, Properties of determinants. Application of matrix and determinant to solve linear system of equation (inverse of matrix and Cramer's Rule) Algebra& Straight Line Recall the formula of distance between two points and its slope Find the angle between two lines and derive the Condition of perpendicularity and parallelism. Find the distance two parallel line. Find the area of triangle. Define quadratic equations and its roots. Define the nature of roots. Formula of distance between two points and its slope Angle between two lines and condition of perpendicularity and parallelism. Distance two parallel line. Area of triangle. Quadratic equations, its roots and nature of

UNIT IV **15 Hours**

Derivatives and their Applications. Define the term derivatives. Apply definition to get derivatives of the functions xn, (ax + b) n, sin (ax + b), cos (ax + b), ex and logax.Definition of the term derivatives. Geometrical meaning of derivatives.Use the sum, difference, product, quotient and chain rule of derivates to calculate the derivates of algebraic function only. Apply derivate to calculate maximum and minimum values of a given algebric function and other related problems. Application of definition to get derivatives of the functions xn, (ax + b) n, sin (ax + b), cos (ax + b), ex and logax. Using the sum, difference, product, quotientand chain rule of derivates to calculate thederivates of algebric function only. Application of derivate: increasing, decreasing and stationary points. Maximum, minimum values of agiven algebric function and point of inflection. concave upward and concaved own ward (algebraic only)

Transaction Modes

Video based teaching, Collaborative teaching, Case based teaching, Question-

Answer

SUGGESTED READINGS

1. *Gupta, C. B. (2019). Applied Mathematics for Engineers. New Delhi, India: S. Chand Publishing.*

2. *Singh, R. K. (2018). Applied Mathematics: Methods and Applications. Mumbai, India: Pearson Education India.*
3. *Agarwal, R. P. (2017). Applied Mathematics: A Contemporary Approach. New Delhi, India: Wiley India Pvt. Ltd.*
4. *Mishra, P. K. (2016). Applied Mathematics for Science and Engineering. Kolkata, India: CRC Press.*
5. *Kapoor, A. (2015). Applied Mathematics: Techniques, Models, and Applications. Chennai, India: Cambridge University Press India.*
6. *Sharma, R. (2014). Applied Mathematics: Concepts and Methods. Jaipur, India: Laxmi Publications.*

Semester-I

Course Title: English and Communication Skills
Course code: DRI104

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Develop effective verbal communication skills: Students will be able to express their ideas and thoughts clearly and concisely through oral communication, using appropriate language, tone, and delivery techniques.
2. Enhance written communication skills: Students will be able to produce well-structured and coherent written documents, including emails, memos, reports, and other professional forms of communication.
3. Improve listening skills: Students will develop active listening skills, enabling them to comprehend and interpret spoken information accurately and effectively.
4. Enhance reading comprehension: Students will develop strategies to improve their reading comprehension, including identifying main ideas, making inferences, and understanding complex texts.

Course Contents

UNIT I **15 Hours**

Basics of Grammar- Part I Vocabulary, Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies, and Portmanteau words. Basics of Grammar – Part II Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and

Euphemisms, Writing Skills, Letter writing, E mail, and Essay, Articles, and Memos, one-word substitutes, note making and Comprehension

UNIT II **15 Hours**

Writing and Reading, Summary writing, Creative writing, newspaper reading Practical Exercise, Formal speech, Phonetics, semantics, and pronunciation Communication, Introduction: Communication process, Elements of communication, Barriers of communication and how to overcome them, Nuances for communicating with patients and their attenders in hospitals.

UNIT III **15 Hours**

Speaking: Importance of speaking efficiently; Voice culture, Preparation of speech. Secrets of good delivery, Audience psychology, handling, Presentation skills, Individual feedback for each student, Conference/Interview technique. Listening: Importance of listening, Self-assessment, Action plan execution, Barriers in listening, Good and persuasive listening.

UNIT IV **15 Hours**

Reading: What is efficient and fast reading, Awareness of existing reading habits, tested techniques for improving speed, Improving concentration and comprehension through systematic study.
Non Verbal Communication: Basics of non-verbal communication, Rapport building skills using neuro- linguistic programming (NLP).

Transaction Modes

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

SUGGESTED READINGS

1. *Mukherjee, R. (2019). English Communication Skills: A Practical Guide. New Delhi, India: Oxford University Press.*
2. *Gupta, R. K. (2018). Effective English Communication: Tips and Techniques. Mumbai, India: S. Chand Publishing.*
3. *Singh, S. (2017). Mastering English: Communication Skills for Success. Kolkata, India: Pearson Education India.*
4. *Kapoor, N. (2016). Business Communication Skills: A Practical Approach. Chennai, India: Cambridge University Press India.*
5. *Sharma, A. (2015). English for Communication: Skills and Strategies. Jaipur, India: Laxmi Publications.*

Semester-I

Course Title: Applied Chemistry (Practical)
Course code: DRI105

L	T	P	Cr.
0	0	6	3

Total Hours 45

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

1. Developing the ability to critically analyze chemical problems, interpret data, and formulate solutions based on scientific principles
2. Demonstrating competence in synthesizing compounds and characterizing them using various analytical techniques such as spectroscopy, chromatography, and microscopy.
3. Effectively communicating scientific findings through written reports, oral presentations, and visual representations.
4. Understanding the ethical responsibilities and professional standards associated with the practice of chemistry.
5. Understand and adhere to safety protocols in chemical laboratories and demonstrate ethical behavior in chemical research and applications.

Course Contents

List of Practical's / Experiments:

1. Cleaning of the laboratory glass ware.
2. Preparation of distilled water
3. Principle, working and maintenance of pH meter.
4. To prepare 0.1 N NaoH solution.
5. To prepare 0.2N HCl solution.
6. To prepare 0.1 molar H2SO4
7. To prepare 0.2 Molar Sodium carbonate solution.

Transaction Modes

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

SUGGESTED READINGS

1. *Rao, C. N. R. (2019). Applied Chemistry: A Textbook for Engineers and Technologists. New Delhi, India: Universities Press.*
2. *Chaudhuri, M. (2018). Principles of Applied Chemistry. Kolkata, India: Academic Publishers.*
3. *Sharma, O. P. (2017). Applied Chemistry: Fundamentals and Applications. Mumbai, India: Nirali Prakashan.*
4. *Kapoor, H. L. (2016). Applied Chemistry: A Practical Approach. New Delhi, India: Pearson Education India.*
5. *Singh, K. (2015). Concepts and Applications of Applied Chemistry. Chennai, India: S. Chand Publishing.*
6. *Gupta, S. K. (2014). Applied Chemistry: Principles and Practice. Jaipur, India: Ane Books Pvt. Ltd.*

Semester-I

Course Title: Applied Physics (Practical)
Course code: DRI106

L	T	P	Cr.
0	0	6	3

Total Hours 45

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

1. Apply mathematical and scientific reasoning to analyze and solve problems in various areas of applied physics.
2. Demonstrate proficiency in laboratory techniques and experimental methods used in applied physics.
3. Develop critical thinking skills to evaluate and interpret experimental data and scientific literature.
4. Apply knowledge of applied physics principles to real-world applications and technological advancements.

Course Contents

List of Practical's / Experiments:

Demonstration of-
1-Basic Physics
2-Sound
3-Heat
4-Fundamentals of Dc Circuits
5-Ac Circuits

6-Magnetic Circuits

7-Rectification

Transaction Modes

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

SUGGESTED READINGS

1. *Mishra, P. (2019). Applied Physics: Principles and Applications. New Delhi, India: McGraw-Hill Education.*
2. *Verma, S. (2018). Fundamentals of Applied Physics. Mumbai, India: Pearson Education India.*
3. *Gupta, R. (2017). Introduction to Applied Physics. Chennai, India: S. Chand Publishing.*
4. *Singh, H. (2016). Applied Physics for Engineers. Kolkata, India: Wiley India Pvt. Ltd.*
5. *Kapoor, H. (2015). Principles of Applied Physics. New Delhi, India: Cengage Learning India.*
6. *Sharma, A. (2014). Applied Physics: A Textbook for Engineers. Jaipur, India: Laxmi Publications*

Semester-II

Course Title: Basic Electrical
Course code: DRI201

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Understand the fundamental concepts and principles of electricity, including voltage, current, resistance, and power.
2. Analyze and solve basic electrical circuits using Ohm's law, Kirchhoff's laws, and various circuit analysis techniques.
3. Identify and analyze different types of electrical sources and their characteristics.
4. Demonstrate an understanding of electrical components such as resistors, capacitors, and inductors, including their properties and behaviors in circuits.

Course Contents

UNIT I **15 Hours**

Introduction to Electrical Engineering, Overview of electrical engineering Electrical units and measurements, Basic concepts: voltage, current, resistance, Circuit Analysis. Ohm's Law and Kirchhoff's Laws, Series and parallel circuits, Network theorems: Thevenin's theorem, Norton's theorem, Superposition theorem

UNIT II **15 Hours**

DC Circuits, DC voltage sources and resistors, Analysis of DC circuits, Node and mesh analysis, Power and energy calculations.AC Circuits, Sinusoidal waveforms, Phasors and complex numbers. AC circuit analysis, Impedance and admittance, Power factor and power factor correction,

UNIT III **15 Hours**

Electric and Magnetic Fields, Electric fields and Gauss's Law, Magnetic fields and Ampere's Law, Faraday's Law of electromagnetic induction, Transformers and inductors, Electric Machines

UNIT IV **15 Hours**

Semiconductor materials and devices, Diodes and rectifiers, Transistors: bipolar junction transistors (BJTs) and field-effect transistors (FETs), Electrical Safety and Codes, Electrical safety precautions, Introduction to electrical codes and standards

Transaction Modes

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

SUGGESTED READINGS

1. *Boylestad, R. L., & Nashelsky, L. (2019). Introductory Circuit Analysis. Pearson.*
2. *Nilsson, J. W., & Riedel, S. A. (2014). Electric Circuits. Pearson.*
3. *Fitzgerald, A. E., Kingsley Jr, C., & Umans, S. D. (2016). Electric Machinery. McGraw-Hill Education.*
4. *Chapman, S. J. (2016). Electric Machinery Fundamentals. McGraw-Hill Education.*
5. *Hayt, W. H., & Kemmerly, J. E. (2014). Engineering Circuit Analysis. McGraw-Hill Education.*
6. *Alexander, C. K., & Sadiku, M. N. O. (2017). Fundamentals of Electric Circuits. McGraw-Hill Education.*

Semester-II

Course Title: Basic Electronics
Course code: DRI202

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Analyze and design basic electronic circuits.
2. Use electronic measuring instruments to test and troubleshoot circuits.
3. Apply Ohm's Law and other basic laws and theorems to solve electronic circuit problems.
4. Gain practical skills in soldering, bread boarding, and prototyping.
5. Apply safety measures while working with electronic components and circuits.

Course Contents

UNIT I **15 Hours**

Introduction to Electronics, Definition and importance of electronics
Overview of electronic systems and applications, Introduction to basic electronic components: resistors, capacitors, and inductors, Electrical Fundamentals, Voltage, current, and resistance, Ohm's Law and power calculations, Series and parallel circuits, Semiconductor Basics, Introduction to semiconductors, Diodes: types, characteristics, and applications, Transistors: types, functions, and basic applications

UNIT II **16 Hours**

Amplifiers and Operational Amplifiers, Introduction to amplifiers, Common amplifier configurations, Operational amplifiers: characteristics and applications, Analog Electronics, Filters: types and applications, Oscillators: principles and applications, Voltage regulators: principles and applications, Digital Electronics Basics, Introduction to digital electronics, Binary numbering system, Logic gates and truth tables

UNIT III **14 Hours**

Combinational Logic Circuits, Boolean algebra, Combinational logic circuits: design and analysis, Multiplexers, DE multiplexers, and decoders, Sequential

Logic Circuits, Introduction to sequential logic circuits, Flip-flops: types and applications, Counters and registers, Introduction to Microcontrollers, Overview of microcontrollers, Microcontroller architecture and programming basics, Interfacing peripherals with microcontrollers

UNIT IV **15 Hours**

Introduction to Communication Systems, Analog and digital communication Modulation and demodulation techniques, Introduction to wireless communication, Electronic Circuit Design and Simulation, Circuit design methodologies, Introduction to circuit simulation software, Design and simulation of basic electronic circuits

Transaction Modes

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

SUGGESTED READINGS

1. *Boylestad, R. L., & Nashelsky, L. (2018). Electronic Devices and Circuit Theory (11th ed.). Pearson.*
2. *Floyd, T. L. (2019). Electronic Devices: Conventional Current Version (10th ed.). Pearson.*
3. *Streetman, B. G., & Banerjee, S. K. (2015). Solid State Electronic Devices (7th ed.). Pearson.*
4. *Malvino, A. P., & Bates, D. J. (2018). Electronic Principles (8th ed.). McGraw-Hill Education.*
5. *Sedra, A. S., & Smith, K. C. (2014). Microelectronic Circuits (7th ed.). Oxford University Press.*

Semester-II

Course Title: Anatomy & Physiology-I
Course code: DRI203

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Demonstrate knowledge of anatomical terminology, including directional and regional terms used to describe the human body's structures.

2. Identify and describe the major anatomical systems and organs in the

human body, including the skeletal, muscular, nervous, cardiovascular, respiratory, digestive, and reproductive systems.

3. Explain the physiological processes underlying various bodily functions, such as digestion, respiration, circulation, neural transmission, and hormonal regulation.

4. Analyze the relationships between anatomical structures and physiological functions, demonstrating an understanding of how structure relates to function in the human body.

5. Describe common health issues and medical conditions related to the different anatomical systems and their impact on overall human health.

Course Contents

UNIT I **14 Hours**

Introduction to Anatomical terms of the human body - Basic anatomical terminology, anatomical position, anatomical planes, levels of organization in the body, organ systems, skeleton, cavities of the body, Organization of the human body at the cellular level - Structure of the cell comprising of cell membrane, cytoplasm, cell organelles, nucleus, cell extensions etc. Organization of the human body at the tissue level - Epithelial, Connective, Muscular& Nervous tissue., Blood - Composition of blood, Features of red blood cells, white blood cells, platelets. Lymphatic system - Features of lymph vessels, lymphatic tissue & organs, lymphatics, spleen, tonsil, thymus., Nervous system - Central nervous system, brain, cerebellum, spinal cord, cranial nerves, autonomic nervous system. Muscular system - Skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.

UNIT II **16 Hours**

Skeletal system - Features of bones, axial skeleton, appendicular skeleton. Musculoskeletal system - Joints of upper & lower limb. Respiratory system – Nose & paranasal sinuses, pharynx, larynx, trachea, lungs. Cardiovascular system - Heart & blood vessels. Digestive system - Oral cavity, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas.Urinary system - Kidneys, juxtaglomerular apparatus, ureters, urinary bladder, urethra. Introduction to genetics - Features of chromosomes, DNA. Reproductive system in females - External & internal

genital organs, breast. Reproductive system in males - Penis, scrotum, testes, prostate gland. Endocrine system - Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas. Special senses - Olfactory system, taste apparatus, external middle & internal ear, eye.Skin - Features of skin, hair, sebaceous glands, sweat glands, nails.

UNIT III **15 Hours**

Introduction to physiology of the human body –Composition of body, Homeostasis, Introduction to chemistry of life. Organization of the human body at the cellular level – Function of lipids, carbohydrates, proteins & cell organelles. Organization of the human body at the tissue level – Function of Epithelial, Connective, Muscular & Nervous tissues. Blood – Haemopoesis, 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. Nervous system – Properties of nerve fibres, function of neuroglia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes. Muscular system – Properties of skeletal muscle, cardiac muscle, smooth muscle, muscles of the body. Skeletal system – Functions of bones, axial skeleton, appendicular skeleton. Musculoskeletal system – Movement in the joints of upper & lower limb.

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

UNIT IV **15 Hours**

Cardiovascular system - Heart & blood vessels: Systemic circulation, pulmonary circulation, ECG, cardiac output, blood pressure. Digestive system – Process of digestion, function of oral cavity, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas. Urinary system – Function of kidneys, juxtaglomerular apparatus, ureters, urinary bladder, urethra, physiology of urine formation, glomerular filtration, tubular reabsorption, water balance, micturition. Introduction to genetics - Features of chromosomes, DNA, protein synthesis, dominant inheritance, recessive inheritance, sex linked inheritance. 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, adrenal glands, endocrine pancreas. Special senses -

Physiology of olfaction, taste, hearing, balance & vision. Skin – Function of skin, hair, sebaceous glands, sweat glands, nails, temperature regulation.

Transaction Modes

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

SUGGESTED READINGS

1. *Ashalatha, P. R., &Deepa, G. (2012). Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd.*
2. *Chaurasia, B. D. (2004). Human anatomy (p. 53). CBS Publisher.*
3. *Guyton, A. C., & Hall, J. E. (2006). Medical physiology. Gökhan N, Çavuşoğlu H (Çeviren), 3.*
4. *Waugh, A., & Grant, A. (2014). Ross & Wilson Anatomy and physiology in health and illness. Elsevier Health Sciences*

Semester-II

Course Title: Health Education
Course code: DRI204

L	T	P	Cr.
1	0	0	1

Total Hours 15

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

1. Understand the concept of health and its dimensions, including physical, mental, emotional, social, and spiritual well-being.
2. Explain the importance of adopting healthy behaviors and making informed decisions that promote personal and community health.
3. Identify the factors that influence health and analyze their impact on individual and population well-being.
4. Demonstrate knowledge of basic anatomy and physiology related to the human body and its functions.
5. Develop skills for critical thinking, problem-solving, and decision-making related to health issues and challenges.

Course Contents

UNIT I **3 Hours**

Introduction to human body, its anatomy and physiology Elementary tissues of body and their classification along with brief description. Digestive System: Organs of digestion, histology of the digestive organs (stomach, small intestine, liver, pancreas), Process of digestion, Absorption and assimilation of food, Respiratory System, Organs of respiration and their histology (lungs and trachea), Respiration (Definition and Mechanism)

UNIT II **3 Hours**

The skin (Structure and functions), The excretory system, Organs of excretion (kidneys, ureter, bladder), Histology of kidney and its functions, Formation of urine and its composition, Structure of nephron, Circulatory system, Composition and functions of blood The heart anatomy and physiology, the chambers of heart, various vessels and valves, Circulation of blood, The blood pressure, Arteries and veins, Lymph and lymphatic system

UNIT III **4 Hours**

Nervous System Central nervous system (Brain and Spinal cord) Peripheral nervous system (cranial and spinal nerves) The reflex action and reflex arc
The transmission of nerve impulse, The sense organs (eye, ear, tongue and nose); structure and functions

UNIT IV **5 Hours**

Muscular System, Brief description of skeletal, smooth and cardiac muscles, Muscular contraction, Muscle Fatigue, Some important muscles of body Skeletal System- The skeleton, important bones and their brief description, Articulation of Bones – joints, Endocrine System- Short description of various endocrine glands and their functions, Reproductive System, Male and female reproductive system- Histology of Gonads, The ovarian cycle and ovulation

Transaction Modes

Video based teaching, Collaborative teaching, Case based teaching, Question-

Answer

SUGGESTED READINGS

1. *Anatomy & Physiology by Ross and Wilson*
2. *Anatomy and Physiology: Understanding the Human Body by Clark*
3. *Anatomy and Physiology for nurses by Evelyn Pearce*
4. *Anatomy and Physiology for nurses by Sears*
5. *Anatomy and Physiology for nurses by Pearson*
6. *Anatomy and Physiology by N-Murgeshn, Fertilization, Fertilitycontrol.*

Semester-II

Course Title: Basic Electrical (Practical)
Course code: DRI205

L	T	P	Cr.
0	0	6	3

Total Hours 45

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

1. Understand the fundamental concepts and principles of electricity, including voltage, current, resistance, and power.
2. Analyze and solve basic electrical circuits using Ohm's law, Kirchhoff's laws, and various circuit analysis techniques.
3. Identify and analyze different types of electrical sources and their characteristics.
4. Demonstrate an understanding of electrical components such as resistors, capacitors, and inductors, including their properties and behaviors in circuits.

Course Contents

List of Practical's / Experiments:

1. Introduction to electrical safety procedures, including personal protective equipment (PPE) and safe work practices.
2. Introduction to electrical circuits: series and parallel circuits, current flow, voltage, and resistance.
3. Application of Ohm's Law and calculation of current, voltage, and resistance in simple circuits.
4. Introduction to different measuring instruments, such as multimeters and oscilloscopes.
5. Techniques for measuring voltage, current, and resistance in circuits.
6. Introduction to alternating current (AC) circuits and voltage waveforms.
7. Calculation of power, power factor, and energy in AC circuits.

Transaction Modes

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

SUGGESTED READINGS

1. *Boylestad, R. L., & Nashelsky, L. (2019). Introductory Circuit Analysis. Pearson.*
2. *Nilsson, J. W., & Riedel, S. A. (2014). Electric Circuits. Pearson.*

3. *Fitzgerald, A. E., Kingsley Jr, C., & Umans, S. D. (2016). Electric Machinery. McGraw-Hill Education.*
4. *Chapman, S. J. (2016). Electric Machinery Fundamentals. McGraw-Hill Education.*
5. *Hayt, W. H., & Kemmerly, J. E. (2014). Engineering Circuit Analysis. McGraw-Hill Education.*
6. *Alexander, C. K., & Sadiku, M. N. O. (2017). Fundamentals of Electric Circuits. McGraw-Hill Education.*

Semester-II

Course Title: Basic Electronics (Practical)
Course code: DRI206

L	T	P	Cr.
0	0	6	3

Total Hours 45

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

1. Analyze and design basic electronic circuits.
2. Use electronic measuring instruments to test and troubleshoot circuits.
3. Apply Ohm's Law and other basic laws and theorems to solve electronic circuit problems.
4. Gain practical skills in soldering, bread boarding, and prototyping.
5. Apply safety measures while working with electronic components and circuits.

Course Contents

1. Lab safety guidelines and equipment familiarization
2. Introduction to breadboards and basic circuit assembly techniques
3. Measurement of voltage, current, and resistance using multimeters
4. Identification and testing of resistors, capacitors, and inductors
5. Measurement of component values using multimeters
6. Construction and measurement of simple resistor networks and voltage dividers
7. Identification and testing of diodes (such as silicon and Schottky diodes)
8. Measurement of forward and reverse diode voltage using multimeters
9. Identification and testing of NPN and PNP transistors
10. Measurement of transistor parameters (e.g., base-emitter voltage)

11. Introduction to operational amplifiers and their applications
12. Measurement of op-amp input and output voltage levels
13. Construction and measurement of basic op-amp circuits (e.g., inverting and non-inverting amplifiers)

Transaction Modes

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

SUGGESTED READINGS

1. *Boylestad, R. L., & Nashelsky, L. (2018). Electronic Devices and Circuit Theory (11th ed.). Pearson.*
2. *Floyd, T. L. (2019). Electronic Devices: Conventional Current Version (10th ed.). Pearson.*
3. *Streetman, B. G., & Banerjee, S. K. (2015). Solid State Electronic Devices (7th ed.). Pearson.*
4. *Malvino, A. P., & Bates, D. J. (2018). Electronic Principles (8th ed.). McGraw-Hill Education.*
5. *Sedra, A. S., & Smith, K. C. (2014). Microelectronic Circuits (7th ed.). Oxford University Press.*

Semester-II

Course Title: Anatomy & Physiology I (Practical)
Course code: DRI207

L	T	P	Cr.
0	0	6	3

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

Course Contents

1. Introduction to anatomical terminology and body planes.
2. Identification and labelling of major bones and bone features
3. Identification and labelling of major muscles and muscle groups Introduction to joints and their classifications.
4. Identification and labelling of major blood vessels and heart structures
5. Understanding the cardiac cycle and blood circulation
6. Blood pressure measurement and interpretation
7. Understanding the mechanics of breathing, Lung function tests and interpretation.

8. Identification and labeling of major digestive organs and structures
9. Understanding the process of digestion and nutrient absorption
10. Identification and labeling of major urinary structures
11. Understanding kidney function and urine formation
12. Urinalysis and interpretation of results
13. Identification and labeling of major nervous system structures

Transaction Modes

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

SUGGESTED READINGS

1. *Ashalatha, P. R., &Deepa, G. (2012). Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd.*
2. *Chaurasia, B. D. (2004). Human anatomy (p. 53). CBS Publisher.*
3. *Guyton, A. C., & Hall, J. E. (2006). Medical physiology. Gökhan N, Çavuşoğlu H (Çeviren), 3.*
4. *Waugh, A., & Grant, A. (2014). Ross & Wilson Anatomy and physiology in health and illness. Elsevier Health Sciences*

Semester-III

Course Title: Clinical Radiography Positioning-I
Course code: DRI301

L	T	P	Cr.
3	1	0	4

Total Hours 60

Course Learning Outcomes: On completion of this course, the successful students 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. Learn 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**

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. - Expiration technique. - Technique for pleural fluid levels and adhesions. Abdominal viscera: For plain film examination, Projection for acute abdomen patients. Technique to demonstrate

Transactional modes

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

Suggested Readings

1. Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., &Hoadley, G. (2015). *Clark's Positioning in Radiography 13E*. crc Press.
2. Ballinger, P. W., & Frank, E. D. (1999). *Merrill's atlas of radiographic positions and radiologic procedures. Vol. 3*. Mosby.
3. Holm, T., Palmer, P. E., Lehtinen, E., & World Health Organization. (1986). *Manual of radiographic technique*. World Health Organization.
4. Paul, T. R. (2012). *Radiologic Technology at a Glance* . Cengage Learning.
5. Bryan, G. J. (1970). *Diagnostic radiography: A manual for radiologic technologists*. Williams and Wilkins Company.

Semester-III

Course Title: Conventional Radiography and Equipments-I
Course code: DRI302

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Explain Production of X-rays: X-ray tube, construction working and limitation.

2. Understand rotating anode & stationary anode x - ray tube.

3. Gain knowledge about anode voltage and filament temperature; continuous and characteristics spectrum of x - rays, inherent filter and added filter.

4. Learn basics of the H.T. generator for x-ray machines, three phase rectifier circuits, three phase six rectifier circuit

5.Describe working and use of relays in diagnostic machines for over load protection.

Course Contents

UNIT-I **15 Hours**

Production of X-Rays: X-ray tube, gas filled x-ray tube, construction working and limitations; stationary anode x - ray tube; construction, working, methods of cooling the anode, rating chart and cooling chart; rotating anode x - ray tube: construction, working rating chart, speed of anode rotation, angle of anode inclination, dual focus and practical consideration in choice of focus, anode heel effect, grid controlled x - ray tube; effect of variation of anode voltage and filament temperature; continuous and characteristics spectrum of x - rays, inherent filter and added filter, their effect on quality of the spectrum.

UNIT-II **15 Hours**

High Tension Circuits: H.T. generator for x-ray machines, three phase rectifier circuits, three phase six rectifier circuit, three phase 12 rectifier circuit, high and medium frequency circuits; capacitance filter control and stabilizing equipment; mains voltage compensator, mains resistance compensator, compensation for frequency variation, control of tube voltage, kV compensator; high tension selector switch, filament circuit, control of tube current, space charge compensation.

Meters and Exposure Timers: Moving coil galvanometer: construction and working/conversion to millimeter, ammeter and voltmeter, meters commonly used in diagnostic x-ray machines, pre reading kV meter and millimeter, digital panel meters. Clockwork timers, synchronous motor timer, electronic timers, photo metric timers (fluorescent and photoelectric effect as applied in timers), ion chamber based timers, integrated timer. 4. Interlocking circuits: Relays: description and working, use of relays in diagnostic machines for over load protection, circuit diagram; simplified circuit and block diagrams illustrating sequence of events from mains supply to controlled emission of x-rays.

UNIT-III **15 Hours**

Control of Scattered Radiation: Beam limiting devices: cones, diaphragms, light beam collimator, beam centering device, methods to verify beam centering and field alignment; grids; design and control of scattered radiation, grid ratio, grid cut-off, parallel grid, focused grid, crossed grid, gridded cassettes, stationary and moving grid potter Bucky diaphragms, various types of grid movements; single stroke movement, oscillatory movement and reciprocator movement.

UNIT-IV **15 Hours**

Fluoroscopy: Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, construction of fluoroscopic screen and related accessories, tilting table, dark adaptation. Image intensifier - Construction and working, advantages over fluoroscopic device, principles and methods of visualizing intensified image, basic principles of closed circuit television camera and picture tube. Vision camera, CCD. Automatic brightness control, automatic exposure control, chamber selection during fluoroscopy. Serial radiography: Manual cassette changer, rapid automatic film changer, basic principles of cine fluoroscopy and angiography use of grid controlled x-ray tube.

Care and Maintenance of X-ray Equipment; General care; functional tests; testing the performance of exposure timers, assessing the MA settings, testing the available KV, measurement of focal spot of an x-ray tube, testing the light beam diaphragm, practical precautions pertaining to Brakes and locks, H.T.

cables, meters and controls, tube stands and tracks as well as accessory equipment.

Transactional modes

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

Suggested Readings

1. *Stanton, L. (1969). Basic Medical Radiation Physics.*
2. *Fundamental of X-ray and Radium Physics - Joseph Selman*
3. *Debnath, J. (2016). Textbook of radiology for residents and technicians. Astrocyte, 2(4), 221-221.*
4. *Curry, T. S., Dowdey, J. E., & Murry, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.*

Semester-III

Course Title: Introduction to Quality and Patient Safety
Course code: DRI303

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Categorize quality improvement approaches, NABH, NABL, JCI guidelines which purely focus on the quality measures and proper handling of equipment's.
2. Become acquainted with basic life support skills which can save many lives in Emergency cases.
3. Assess proper management of biomedical waste, reducing risk of infection due to waste handling by personnel and preventing cross infection which can occur due to improper handling.
4. Learn about Radioactive waste, metals/chemicals/drug waste, BMW management and methods of disinfection, use of Personal protective equipment (PPE).
5. Execute First aid, choking, rescue breathing methods, ventilation including use of bag valve master (BVMs)

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 **15 Hours**

Basic Emergency Care- First aid, choking, rescue breathing methods, ventilation including use of bag valve master (BVMs) Biomedical Waste Management, Definition, waste minimization, 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)

UNIT-III **15 Hours**

Infection Prevention and Control-Sterilization, Disinfection, Effective hand hygiene, use of PPE, Prevention and control of common healthcare associated infections, Guidelines (NABH) and JCI for hospital infection control.

UNIT-IV **15 Hours**

Disaster preparedness and management- Fundamentals of emergency management

Transactional modes

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

Suggested Readings

1. *Srinivasan, A. V. (Ed.). (2008). Managing a modern hospital. SAGE Publications India.*
2. *Estridge, B. H., & Reynolds, A. P. (2011).Basic clinical laboratory techniques. Cengage Learning.*

3. *Anderson, D. M., Anderson, L. E., & Glanze, W. D. (2002).Mosby's medical dictionary (Vol. 26, No. 43, p. 1866). St. Louis: Mosby.*
4. *Macpherson, G. (2002). Black's medical dictionary. A&C Black.*

Semester-III

Course Title: Principles of Management
Course code: DRI304

L	T	P	Cr.
3	1	0	4

Total Hours 60

Course learning Outcomes: On successful completion of this course, the students will be able to

1. Evaluate the management evolution and how it will affect future management.
2. Practice the process of management's functions: - planning, organizing, leading, directing and controlling.
3. Observe and evaluate social responsibility and ethical issue involved in business situations and logically articulate own position on such issue
4. Observe Functions of Management: Planning – Organizing – Directing – Controlling Planning.
5. Apply the concepts of Groups and Teams to work collaborator during surgeries.

Course Contents

UNIT-I **15 Hours**

Development of Management: Definitions of Management – Contributions of F.W. Taylor, Henry Fayola and others. Functions of Management: Planning – Organizing – Directing – Controlling Planning: Types of planning – Short–term and long plans – Corporate or Strategic Planning – Planning premises – Polices – Characteristics and sources – principles of policy making – Strategies as different from policies – Procedures and methods– Limitations of planning. Organizing: Importance of organization – Hierarchy – Scalar chain – Organization relationship – Line relationship – Staff relationship - Line staff relationship – Functional relationship - Committee organization – Management committees – Departmentation. Motivation**:** Motivation theories – McGregor's theory X and theory Y – Maslow's and Herzberg's theory – Porter and Lawler model of complex view of motivation– Other theories – Diagnostic signs of motivational problems – Motivational Techniques. Communication**:** Types of communication – Barriers of effective communication–

UNIT-II **15 Hours**

Techniques for improved communication: Directing: Principles relating to Direction process – Principles and theories of leadership – Leadership Styles – Delegation of authority. Controlling: Span of control – Factors limiting effective span of control – Supper management, General managers, Middles managers and supervisors – Planning and controlling relationships – Management control process – Corrective measures– Strategic control points – Budgetary control – Types of budgets. Co-ordination: Co-ordination and co-operation – Principles of co-ordination – Techniques of co-ordination charts and records – Standard procedure instructions.

UNIT-III **15 Hours**

Objective of Personnel Management – Role of Personnel Manager in an organization – Staffing and work distribution techniques – Job analysis and description – Recruitment and selection processes – Orientation and training – Coaching and counseling – disciplining – Complaints and grievances – Termination of employees – Performance appraisal – Health and safety of employees - Consumer Protection Act as applicable to health care services.

UNIT-IV **15 Hours**

Definition of financial Management – Profit maximization – Return maximization– wealth maximization – Short term Financing – Intermediate Financing – Long term Financing – leasing as a source of Finance – cash and Security Management – Inventory Management – Dividend policies – Valuations of Shares – Financial Management in a hospital – Third party payments on behalf of patients. Insurance – health schemes and policies.

Transactional modes

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

Suggested Readings:

1. *Sproull, L. S. (1984).“The Nature of Managerial Attention,” in L. S. Sproull (ed.), Advances in Information Processing in Organizations. Greenwich, CT: JAI Press.*
2. *Stewart, R. (1967). Managers and Their Jobs. London: Macmillan.*
3. *Pondy, L. R. (1978). “Leadership Is a Language Game,” in M. W. McCall, Jr. and M. M. Lombardo (eds.), Leadership: Where Else Can We Go? Durham, NC: Duke University Press.*
4. *Katz, Robert L., (1974). “Skills of an Effective Administrator.” Harvard Business Review.*

Semester-III

Course Title: Basic Computers and Information Science
Course code: DRI305

L	T	P	Cr.
4	0	0	4

Total Hours 60

Course Learning Outcomes: On completion of this course, the successful students would be able to

1. Understand the concepts of computer system, Windows operating system, Internet, various storage devices and computer Networks, e-waste
2. Analyze various components and Input output devices used in a computer system.
3. Utilize various applications and software's used
4. Creating and manipulating presentation, views, formatting and enhancing text, and slide with graphs
5. Investigate Various applications used in Clinical Setting.

Course Contents

UNIT-I **15 Hours**

Introduction to powerpoint: introduction, creating and manipulating presen tation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system.

UNIT-II **15 Hours**

Computer networks: introduction, types of network (LAN, MAN, WAN, Internet,Intranet), network topological (star, ring, bus, mesh, tree, hybrid), components of network.Internet and its Applications: definition, brief histor y, basic services (E-
Mail, File TransferProtocol, telnet, the World Wide Web (WWW)), WWW brow sers, use of the internet.Application of Computers in clinical settings.

UNIT-III **15 Hours**

Introduction of Windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Introduction to Computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

UNIT-IV **15 Hours**

Input Output Devices: Input devices (keyboard, point and draw devices, data scanning,devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems). Processor and Memory: The Central Processing Unit (CPU), main memory.

Transactional modes

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

Suggested Readings

1. *Schneider, G. M., & Gersting, J. (2018). Invitation to computer science. Cengage Learning.*
2. *Goel, A. (2010). Computer fundamentals. Pearson Education India.*
3. *Dandamudi, S. P. (2003). Fundamentals of computer organization and design (Vol. 7). New York: Springer.*

Semester-III

Course Title: Clinical Radiography Positioning-I (Lab.)
Course code: DRI306

L	T	P	Cr.
0	0	6	3

Total Hours 45

Course Learning Outcomes: On completion of this course, the successful students 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. Learn 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

List of Practical's / Experiments:

Regional Radiography:

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

Transaction Modes

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

Suggested Readings

1. *Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., & Hoadley, G. (2015). Clark's Positioning in Radiography 13E. crc Press.*
2. *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.*
3. *Sutherland, R., & Thomson, C. (2007). Pocketbook of Radiographic Positioning E-Book. Elsevier Health Sciences.*

Semester-III

Course Title: Conventional Radiography and Equipments-I	**L**	**T**	**P**	**Cr.**
Course code: DRI307	0	0	6	3

Total Hours 45

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

1. Explain Production of X-rays: X-ray tube, construction working and limitation.

2. Understand rotating anode & stationary anode x - ray tube.

3. Gain knowledge about anode voltage and filament temperature; continuous and characteristics spectrum of x - rays, inherent filter and added filter.

4. Learn basics of the H.T. generator for x-ray machines, three phase rectifier circuits, three phase six rectifier circuit

5.Describe working and use of relays in diagnostic machines for over load protection.

Course Contents

List of Practical's / Experiments:

1. Introduction to conventional radiography and its applications
2. Basic principles of X-ray generation and interactions with matter
3. Practicing positioning techniques for extremities
4. Positioning techniques for the chest and thoracic region
5. Review of exposure factors for different anatomical areas
6. Positioning techniques for the abdomen and pelvic region
7. Positioning techniques for the spine and vertebral column
8. Positioning techniques for the skull and facial bones
9. Positioning techniques for the upper and lower extremities
10. Positioning techniques for the shoulder and upper limb joints
11. Positioning techniques for the hip and lower limb joints

Transaction Modes

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

Suggested Readings

1. *Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., & Hoadley, G. (2015). Clark's Positioning in Radiography 13E. crc Press.*
2. *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.

3. *Sutherland, R., & Thomson, C. (2007). Pocketbook of Radiographic Positioning E-Book. Elsevier Health Sciences.*

Semester: IV

Course Title: Clinical Radiography Positioning-II
Course code: DRI401

L	T	P	Cr.
3	1	0	4

Total Hours 60

Course Learning Outcomes: On completion of this course, the successful students 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, centering, baselines and technical factors
5. Gain knowledge of high KVp technique, Micro and Macro Radiography

Course Contents

UNIT-I **Hours 15**

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 **Hours 15**

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 **Hours 15**

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 **Hours 15**

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

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

Course Title: Basic Physics include Radiological Physics
Course code: DRI402

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

1. Determine the nature and propagation of sound waves.
2. Explain Interference of sound waves, beats, diffraction, and Doppler's effect.
3. Differentiate between conduction, convection and radiation.
4. Analyse the applications of the Ampere's law, electromagnet and solenoids
5. Evaluate Concepts of Electromagnetic induction, efficiency of transformer, source of power loss.

Course Contents

UNIT-I **14 Hours**

Electricity and Magnetism: A.C. and D.C. power supply with examples, single phase and poly phase power supply, switches, fuses, circuit breakers, earthing etc. main voltage drop: causes and remedy, cables; low tension, high tension. DC circuit, Ohm's law, resistivity, series and parallel combination, EMF, Kirchhoff's law, heating effect of current, Ammeter, voltmeter, Galvanometer. Magnets and magnetic field, force on an electric current in a magnetic field, force on electric charge moving in a magnetic field, magnetic field due to straight wire; force between two parallel wires, Ampere's law, electromagnet and solenoids .

UNIT-II **16 Hours**

Rectification and Transformers: Thermionic emission; - variation of anode current with anode voltage and filament temperature; principle of rectification, wave form of half wave and full wave current/voltage wave form; Rectifiers: Introduction, energy bands in solids, the semiconductor, p-type and n-type semiconductors, density of charge carriers and conductivity, p-n junction, p-n junction diode, p-n junction diode as rectifier (half- wave and full-wave

rectifier), rectifiers relative merits and demerits; silicon, germanium diodes. Principles of transformer, Electromagnetic induction, transformer design, efficiency of transformer, source of power loss

UNIT-III **15 Hours**

Electromagnetic Radiation: Electromagnetic radiation spectrum, common properties of electromagnetic radiation; relationship between energy, frequency, wavelength and velocity e.g. X-rays and gamma rays. Properties of X-rays and gamma rays; General properties of X-rays, velocity, frequency etc., photographic effect, photochemical effect – discoloration of salts, heating effect, biological effect; ionization of gases e.g. air.. Interaction of radiation with matter: Transmission through matter, law of exponential attenuation, half value layer, attenuation coefficients; interaction of radiation with matter, classical scattering, Compton scatter, photo electric absorption, pair production; practical aspects of radiation absorption and transmission through body tissues. Measurement of X-rays: Unit of quantity of radiation exposure - definition and application of 'roentgen', unit of quantity of radiation dose - definition and application of 'rad', 'gray' and 'rem';

UNIT-IV **15 Hours**

Principle and Application of ionizations chamber and ionization reader unit, film and densitometer, thermos luminescent dosimeter (TLD). X. Quality and quantity of X-rays: Specification and explanation of electron volt (eV), kilovolt (kV) and half value layer (H.V.L) as an index of penetration of the radiation. 9. Basic radiation protection: Historical development, dose equivalent limit, international recommendations and current code of practice for the protection of radiation workers and the public against ionizing radiation arising from medical and dental use; protective materials, lead - impregnated substances; building materials, lead equivalents of protective, personal monitoring; film badge, pocket dosimeter TLD badges and their uses and relative merits.

Transactional modes

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

Suggested Readings

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

Course Title: Conventional Radiography and Equipments-II
Course code: DRI403

L	T	P	Cr.
3	1	0	4

Total Hours 60

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

UNIT I **14 Hours**

Special Radiographic/Radiological procedures, Selection of Fluoroscopy Equipment, general considerations, responsibility of radiographers. Patient Preparation, Indications Contraindications Technique Post Care, and Preparation of Drug Trolley/Tray, Radiation Safety. Contrast Media - Positive and Negative, Ionic & Non – Ionic,

UNIT II **16 Hours**

Adverse Reactions to Contrast Media and Patient Management, Emergency Drugs in the Radiology Department, Aseptic technique for the following procedures. Gastrointestinal Tract: 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. Including water soluble contrast media - e.g. gastrograffin studies.

UNIT III **15 Hours**

Salivary glands: Routine technique, procedure - sialography. 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. Antegrade pyelography. Cystography and micturating cystouresthrography. Urethrography (ascending) renal puncture.

UNIT IV **15 Hours**

Reproductive system: All the Techniques relating to Male and Female reproductive system including Hysterosalpingography.

Breast Imaging: Mammography: Basic views, special views, wire localization. Ductography, Tomosynthesis, ABVS, Respiratory system: - Bronchography:

Sinography: Routine technique and procedure.

Transactional modes

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

Suggested Readings

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

Course Title: Fundamental of Nursing
Course code: DRI404

L	T	P	Cr.
2	0	0	2

Total Hours 30

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

1. Understand the historical development of nursing and the role of the nurse in healthcare.
2. Demonstrate knowledge of nursing theories, models, and frameworks.

3. Apply critical thinking and clinical judgment in the nursing process.
4. Conduct comprehensive health assessments, including physical examinations and psychosocial assessments.
5. Communicate effectively with patients, families, and the healthcare team using therapeutic communication techniques.

Course Content

UNIT I **8 Hours**

Introduction to nursing: historical perspectives and current trends.
Roles and responsibilities of the nurse in various healthcare settings.
Nursing theories and models. Nursing process: assessment, diagnosis, planning, implementation, and evaluation. Critical thinking and clinical judgment in nursing practice.
Health assessment: techniques, documentation, and use of assessment tools.
Physical examination skills: inspection, palpation, percussion, and auscultation.

UNIT II **8 Hours**

Psychosocial assessment: interviewing techniques and mental health assessment. Cultural competence and healthcare disparities. Therapeutic communication in nursing practice. Effective communication techniques with patients, families, and the healthcare team. Legal and ethical considerations in nursing. Patient rights, confidentiality, and informed consent.

UNIT III **8 Hours**

Infection control and prevention. Principles of asepsis and standard precautions. Medication administration: routes, dosage calculations, and safe medication practices. Patient education and medication safety.Vital signs assessment and interpretation. Monitoring and documentation of vital signs. Wound care and dressing changes. Principles of wound healing and preventing infection.

UNIT IV **6 Hours**

Patient mobility and safe body mechanics. Assisting patients with activities of daily living. Nursing care for patients with pain. Pharmacological and non-pharmacological pain management strategies. Patient-centered care: individualized care planning and patient advocacy. Holistic care: addressing spiritual, cultural, and psychosocial needs. Healthcare emergencies and disaster management. Patient safety and error prevention.

Transactional modes

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

Suggested Readings

1. *Fundamentals of Nursing" by Patricia A. Potter, Anne Griffin Perry, Patricia Stockert, and Amy Hall*
2. *Nursing: The Philosophy and Science of Caring" by Jean Watson*
3. *"Fundamentals Success: A Q&A Review Applying Critical Thinking to Test Taking" by Patricia M. Nugent and Barbara A. Vitale*

Course Title: Clinical Radiography Positioning-II (Practical)
Course code: DRI405

L	T	P	Cr.
0	0	6	3

Total Hours 45

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

1. Apply specialized positioning techniques for complex and challenging examinations.
2. Implement proper patient care and communication during radiographic procedures.
3. Optimize exposure factors to ensure high-quality diagnostic images.
4. Employ appropriate radiation protection measures for patients and personnel.
5. Adapt positioning techniques for pediatric, geriatric, and special patient populations.

Course Contents

1. Review of radiographic anatomy and positioning fundamentals.
2. Positioning techniques for the vertebral column and spinal studies.
3. Positioning techniques for the gastrointestinal system.
4. Positioning techniques for the urinary system.
5. Positioning techniques for the reproductive system.
6. Positioning techniques for the skeletal system.
7. Positioning techniques for the skull and facial bones.
8. Positioning techniques for the chest and thoracic studies.
9. Positioning techniques for the cardiovascular system.
10. Positioning techniques for pediatric and geriatric patients.

Transactional modes

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

Suggested Readings

1. *Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., &Hoadley, G. (2015).Clark's Positioning in Radiography 13E. crc Press.*
2. *Bhagava, S. K. (2001). Text Book of Radiology for Residents and*

Technicians.CBS Publishers & Distributors.

3. *Singh, H. (2016). Textbook of Radiology Physics. JP Medical Ltd.*
4. *Bushberg, J. T., & Boone, J. M. (2011).The essential physics of medical imaging.Lippincott Williams & Wilkins.*

Course Title: Basic Physics include Radiological Physics (Practical)
Course code: DRI406

L	T	P	Cr.
0	0	6	3

Total Hours 45

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

1. Demonstrate knowledge of radiation safety principles and radiation protection measures.
2. Perform laboratory experiments related to radiological physics and analyze the results.
3. Interpret and evaluate scientific data obtained from experiments and measurements.
4. Use appropriate scientific terminology and units of measurement in reporting experimental findings.
5. Demonstrate proficiency in the use of physics instruments and equipment in the laboratory.
6. Apply critical thinking skills to analyze and solve physics-related problems in radiology.

Course Contents

1. Introduction to physics and its applications in radiology.
2. Scientific method and principles of measurement.
3. Mechanics: motion, forces, and equilibrium.
4. Laws of motion, Newton's laws, and their application in radiology.
5. Conservation laws and energy transformations in radiological systems.
6. Principles of heat transfer and their relevance to radiological equipment.
7. Electricity and magnetism.
8. Principles of electrical circuits, electromagnetism, and their applications in radiology.
9. Nuclear physics and radioactivity.
10. Nature of ionizing radiation and radioactive decay.
11. Interaction of radiation with matter.
12. Absorption, scatter, and attenuation of radiation.
13. Radiation protection principles and regulations.
14. Dosimetry, shielding, and safety measures in radiology.

Transactional modes

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

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: Conventional Radiography and Equipments-II (Practical)
Course code: DRI407

L	T	P	Cr.
0	0	6	3

Total Hours 45

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

1. Operate and troubleshoot radiographic equipment effectively.
2. Apply radiation protection principles and practices to ensure patient and personnel safety.
3. Assess radiographic image quality and troubleshoot technical issues.
4. Perform specialized radiographic examinations, including contrast studies and mobile imaging.
5. Understand the principles of quality control and quality assurance inradiographic imaging.

Course Contents

1. Describe X-Ray tube and its accessories.
2. Use Portable X-Ray Equipment in Wards.
3. Discuss Image intensifier and dental X Ray unit.
4. Implement Radiation protection practices
5. Handle X-ray equipment and accessories

Transactional modes

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

Suggested Readings

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

Semester: V

Course Title: Modern radiological & imaging Equipment including physics
Course code: DRI501

L	T	P	Cr.
3	1	0	4

Total Hours 60

Course Learning Outcomes: On completion of this course, the successful students 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. Gain Knowledge of Basics in Computed, Digital Radiography and Computed Tomography.
5. Discuss Vascular Imaging Equipment & its historical developments.

Course Contents

UNIT-I **Hours 15**

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 **Hours 15**

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 **Hours 15**

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 **Hours 15**

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

1. Stanton, L. (1969). BASIC MEDICAL RADIATION PHYSICS.
2. Fundamental of X-ray and Radium Physics - Joseph Selman
3. Debnath, J. (2016). Textbook of radiology for residents and technicians. *Astrocyte*, *2*(4), 221-221.

4. Curry, T. S., Dowdey, J. E., &Murry, R. C. (1990). *Christensen's physics of diagnostic radiology*. Lippincott Williams & Wilkins.
5. Allisy-Roberts, P. J., & Williams, J. (2007). *Farr's physics for medical imaging*. Elsevier Health Sciences.

Semester: V

Course Title: Contrast & Special Radiography Procedures
Course code: DRI502

L	T	P	Cr.
3	1	0	4

Total Hours 60

Course Learning Outcomes: On completion of this course, the successful students 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.
5. Discuss all the radiological examination namely MCU, RGU, IVP, and Barium studies.

Course Contents

UNIT-I **Hours 15**

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 **Hours 15**

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. gastrograffin studies b. Salivary glands: Routine technique, procedure – Sialography

UNIT-III **Hours 15**

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 micturating cysto urethrography (ascending) renal puncture, RGP,

UNIT-IV Hours 15

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

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

Semester: V

Course Title: Physics of Newer Imaging Modalities
Course code: DRI503

L	T	P	Cr.
3	1	0	4

Total Hours 60

Course Learning Outcomes: On completion of this course, the successful students 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. Gain knowledge of MRI, Mammography and Bone Density procedures.
5. Learn advantages & disadvantages of PET-CT & PET MRI

Course Contents

UNIT-I **Hours 15**

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 **Hours 15**

History of MRI, Magnetism, Basic Principle, 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 **Hours 15**

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. Head Scan, Bone Scan, Renal Scan

UNIT-IV **Hours 15**

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.

Radiotherapy: Its types and its applications

Transactional modes

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

Suggested Readings

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

Semester: V

Course Title: Introduction to Health Care System
Course code: DRI504

L	T	P	Cr.
1	0	0	1

Total Hours 15

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

1. Understand the structure and organization of the healthcare system.
2. Identify the key stakeholders involved in healthcare delivery.
3. Describe the different levels of care within the healthcare system.
4. Explain the roles and responsibilities of various healthcare professionals.
5. Analyze the challenges and opportunities within the healthcare system.

Course Contents

UNIT-I **3 Hours**

Introduction to the healthcare system: Definition, goals, and components. Historical development of healthcare systems. The World Health Organization (WHO) and its role in global health. Healthcare systems around the world: a comparative analysis. Public vs. private healthcare systems, Financing mechanisms in healthcare, Key stakeholders in healthcare: patients, healthcare professionals, insurers, government, etc.

UNIT-II **2 Hours**

Levels of care in the healthcare system: primary, secondary, and tertiary care. Understanding the healthcare delivery process. Healthcare facilities and infrastructure: hospitals, clinics, long-term care facilities, etc. Technology and its impact on healthcare delivery. Healthcare workforce: shortages, challenges, and workforce planning. Inter professional collaboration and team-based care.

UNIT-III **6 Hours**

Healthcare policies and regulations: local, national, and international perspectives, Health insurance and reimbursement systems. Quality and patient safety in healthcare, Accreditation and regulatory bodies. Healthcare disparities and social determinants of health, Addressing health inequities within the healthcare system.

UNIT-IV **4 Hours**

Roles and responsibilities of healthcare professionals: physicians, nurses, allied health professionals, administrators, etc. Healthcare ethics and legal considerations. Informed consent, confidentiality, and patient rights.
Healthcare research and evidence-based practice. The role of research in advancing healthcare. Emerging trends and innovations in healthcare: telemedicine, artificial intelligence, precision medicine, etc, Challenges and opportunities in the healthcare system.

Transactional modes

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

Suggested Readings

1. *Shi, L., & Singh, D. A. (2020). Delivering Health Care in America: A*

Systems Approach (8th ed.). Jones & Bartlett Learning.

2. *Kovner, A. R., Knickman, J. R., & Jonas, S. (Eds.). (2019). Jonas and Kovner's Health Care Delivery in the United States (12th ed.). Springer Publishing Company.*
3. *Sultz, H. A., & Young, K. M. (2018). Health Care USA: Understanding Its Organization and Delivery (9th ed.). Jones & Bartlett Learning.*
4. *Shi, L., & Singh, D. A. (2017). Essentials of the U.S. Health Care System (4th ed.). Jones & Bartlett Learning.*
5. *Kovner, A. R., & Knickman, J. R. (2015). Jonas and Kovner's Health Care Delivery in the United States (11th ed.). Springer Publishing Company.*

Semester: V

Course Title: Modern Radiological & Imaging Equipment Including Physics (Practical)
Course code: DRI505

L	T	P	Cr.
0	0	6	4

Total Hours 60

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

1. Analyze the production of x-rays and various characteristics
2. Understand contrast image acquisition techniques.
3. Compare various digital radiography image receptor and detector systems.
4. Discuss beam restriction and its effect on patient dose and image quality
5. Define the CT imaging system components and their functions

Course Contents

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

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

Semester: V

Course Title: Contrast & Special Radiography Procedures (Practical)
Course code: DRI506

L	T	P	Cr.
0	0	6	4

Total Hours 60

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

1. Perform mobile and surgical procedures maintaining the principles of sterile technique when applicable
2. Set up fluoroscopic rooms according to individual procedures.
3. Acquire knowledge of Contrast Media administration and management of contrast allergies
4. Perform Radiographic Procedures involving Digestive, Urinary and Reproductive system.
5. Determine appropriate patient interaction and preparation for all Radiographic examinations and procedures

Course Contents

1. Radiography in various positions for all the special radiological procedures, using contrast media
2. Identification of various films for all the special radiological procedures
3. using contrast media and related pathologies.

Transactional modes

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

Suggested Readings

1. *Debnath, J. (2016). Textbook of radiology for residents and technicians. Astrocyte, 2(4), 221-221.*
2. *. Bhargava, S. K. (2001). Text Book of Radiology for Residents and Technicians.CBS Publishers & Distributors.*

Semester: V

Course Title: Physics of Newer Imaging Modalities (Practical)
Course code: DRI507

L	T	P	Cr.
0	0	6	4

Total Hours 60

Course Learning Outcomes: On completion of this course, the successful students 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. Gain knowledge of MRI, Mammography and Bone Density procedures.
5. Learn advantages & disadvantages of PET-CT & PET MRI

Course Content

1. Investigate the effect of imaging parameters on MRI images. Vary parameters such as repetition time (TR), echo time (TE), flip angle, and field of view (FOV), and observe their impact on image contrast, signal-to-noise ratio (SNR), and acquisition time.
2. Radioisotope Decay and Imaging, Use a radioactive isotope, such as 18F-FDG.
3. Determine the spatial resolution and sensitivity of a PET scanner by imaging a phantom containing small radioactive sources at different locations.
4. Use various scattering phantoms or biological samples with different scattering properties.
5. Study the relationship between acoustic impedance and reflection of ultrasound waves.
6. Doppler Effect and Blood Flow Imaging
7. Investigate the Doppler effect in ultrasound imaging and its application in blood flow visualization.

Transactional modes

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

Suggested Readings

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

Course Title: Professional Training Internship
Course code: DRI601

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

Course Contents

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