ALL INDIA COUNCIL FOR VOCATIONAL AND PARAMEDICAL SCIENCE

SYLLABUS

OF

DIPLOMA IN MAGNETIC RESONANCE IMAGING TECHNOLOGY - DMRIT 10

REGULAR PROGRAMME

DIPLOMA IN MAGNETIC RESONANCE IMAGING TECHNOLOGY - DMRIT 10

Eligibility	:	10^{th}
Programme Duration	:	2 Years
Programme Objectives	:	MRI is the art and science of producing medical images using MRI. Technologists produce images for the radiologist's interpretation to aid in medical diagnoses. The program prepares you, under the direction of a medical specialist (radiologist), to work in the hospital medical imaging department, at the patient's bedside, in the operating room or Emergency or in private imaging clinics. Our Diploma program in Radiography Technology has been designed to integrate the academic environment with the clinical setting. We are one of the few premium institutes in India to offer this program.
Job Prospects	:	Upon successful completion of the Diploma you can explore a career as a radiologist technician. You will find ample opportunities in Hospitals, Clinics and Doctors' offices. You may further pursue a bachelor's degree to continue your education and specialize. Common job profiles of students after completing DRIT include: Technician in Hospitals, Nursing Homes and Diagnostic Labs

YEAR I

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
101T	Communication For Professionals	70	30	4
102T	Basic Anatomy & Physiology	70	30	5
103T	Patient Care Relevant to Diagnostic Radiology	70	30	5
104T	Radiography and Dark Room Techniques	70	30	5
105T	Radiation Physics and Modern Imaging Techniques	70	30	5
106P	Basic Anatomy & Physiology	35	15	1
107P	Patient Care Relevant to Diagnostic Radiology	35	15	1
108P	Radiography and Dark Room Techniques	35	15	1
109P	Radiation Physics and Modern Imaging Techniques	35	15	1
110	Hospital Training-I	200		1
			TOTAL	29

DETAILED SYLLABUS

INSTRUCTIONAL METHOD: Personal contact programmes, Lectures (virtual and in-person), Assignments, Labs and Discussions, Learning projects, Industrial Training Programmes and Dissertation.

YEAR I

COMMUNICATION FOR PROFESSIONALS- 101T

UNIT	CONTENTS
1.	**Parts of Speech:** Definition of all the sight parts along with examples and their use in language. **Definite and Indefinite articles:** A, an, and, the, Definition and its uses along with examples. **Types of Pronouns:** Personal, Reflexive, Emphatic, Demonstrative, Relative, Indefinite, Interrogative and Distributive pronouns. **Noun:** Defining noun along with types and categories, Gender, Number case **Adjective:** Adjective, Comparison, Adjective used as nouns, Positions of the Adjective and Correct use of Adjectives. **Verb:** Definition, its forms, Verbs of incomplete predication, Phrases (defining it along with examples). Adjective, Adverb and Noun phrase. **Clauses:** Defining it along with examples: Adverb, Adjective and Noun Clauses. **Sentence and its Types:** Simple, Compound and Complex, Subject and Predicate (parts of a sentence), Transformation of Sentences. Active and Passive voice, Mood and Narration (Direct and Indirect speeches).
2.	**Words and Phrases:** Word formation (prefix, suffix), Idioms, Synonyms and antonyms, Phonetics, Speech sound, The phoneme, The syllable and IPA transcription.
3.	**Business Correspondence I**: Paragraph writing, Introductory remarks, Principles, Writing of single paragraphs and precise writing, Letter writing, Quotations, Orders and tenders, Inviting and sending quotations, Placing orders and inviting tenders.
4.	**Business Correspondence II:** Notices, Agenda and Minutes, Application letter, Importance and function, Drafting the application, Elements structure, Preparing CV's.
5.	**Applied Grammar:** Correct usage of Grammar, Structure of sentences, Structure of paragraphs, Enlargements of

	vocabulary.
6.	**Business Writing:** Written composition, Precise writing and summarizing, Writing of Bibliography, and Enlargement of vocabulary.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. English Grammar and Composition Wren and Martin. S. Chand & Company Ltd.

B. Intermediate English Grammar; Raymond Murphy Pub: Foundation Books, New Delhi

C. Eng. Grammar usage and Composition; Tickoo & Subramanian Pub: S. Chand and Co.

D. Living Eng. Structure; Standard Alien.

BASIC ANATOMY & PHYSIOLOGY- 102T

UNIT	CONTENTS
1.	**The Human Body:** Definitions, sub-divisions of Anatomy, Terms of Location and Position, Fundamental Planes, Vertebrate structure of man, Organization of the body cells, Tissues.
2.	**The Skeletal System:** Types of bones, Structure and growth of bones, Division of the skeleton Appendicle skeleton, Axial skeleton, Name of all the bones and their parts. Joints classification, Types of movements with examples.
3.	**Anatomy of Circulatory System:** Heart Size, Position coverings, Chambers, Blood supply, Nerve supply, Blood vessels. General plan of circulation, Pulmonary Circulation, Names of Arteries and Veins and their position. Lymphatic system general plan.
4.	**Anatomy of the Respiratory System:** Organs of respiratory system, Larynx, Trachea, Bronchial tree, Respiratory portion, Pleurae and Lungs. Brief knowledge of parts and position.
5.	**Anatomy of the Digestive System:** Components of Digestive System, Alimentary tube, Anatomy of organs of Digestive Tube, Mouth, Tongue, Tooth, Salivary Glands, Liver, Bleary Apparatus, Pancreas, Names, Position and brief functions.
6.	**Anatomy of the Nervous System:** Central nervous system, The Brain, Hind brain, Midbrain, Forebrain, Brief Structure, Locations, and Peripheral nervous system, Spiral card, Anatomy, Functions, Reflex – Arc, ménages. Injuries to spinal card and brain.
7.	**Anatomy of the Endocrine System:** Name of all Endocrine glands, their position. Hormones and their functions– Pituitary, Thyroid, parathyroid, adrenal glands, gonads & islets of pancreas.
8.	**Anatomy of Excretory System and Reproductive System:** Kidneys location, Gross structure, Excretory ducts, Urethras, Urinary Bladder, Urethra, Male Reproductive system, Testis, Duct system, Female reproductive system, Ovaries Duct

	system, accessory organs.
9.	**Blood:** Definitions, composition, properties and function of Blood, Haemogram (RBC, WBC, Platelet count, HB concentrations), Function of plasma proteins Haemopoiesis, Blood Group – ABO and RH grouping, Coagulation & Anticoagulants, Anemia causes effects & treatment, Body fluid compartments, composition, Immunity Lymphoid tissue, Clotting factors, mechanism of blood clotting, Disorders of white blood cells, Disorders of platelets, Disorders of clotting.
10.	**Cardio Vascular System:** Function of cardiovascular system, Structure of cardiovascular system, Cardiac cycle, functional tissue of heart & their function, Cardiac output, E.C.G., blood pressure, Heart Rate.
11.	**Respiratory System:** Function of Respiratory System, Functional (physiological) Anatomy of Respiratory system, Mechanism of Respiration, Lung volumes & capacities, Transport of Respiratory Gases.
12.	**Digestive System:** Function of digestive system, Functional Anatomy of Digestive System, Composition and functions of all digestive juices, Movements of Digestive System (intestine), Digestion & absorption of Carbohydrate, Proteins & Fats.
13.	**Muscle Nerve Physiology:** Type of muscle, Structure of skeletal muscle, Sarcomere, Neuromuscular junction & transmission, Excitation and contraction coupling (Mechanism of contraction).
14.	**Structure and Functions of Skin:** Body Temperature, Fever, Regulation of Temperature.
15.	**Excretory System:** Excretory organs, Kidneys-function, Nephron, Juxta Glomerular Apparatus, Renal Circulation, Mechanism of Urine Formation, Mechanism of Micturition, Cystometrogram, Diuretics, Artificial Kidney.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Text books of Physiology. Author : Guyton (Arthor C). Prism publishers Bangalore.

B. Human Physiology. Author : Chaterjee (cc). Medical allied agency

C. Concise Medical physiology. Author : Choudhary (Sujit km.). New central books Kolkata.

D. Review Medical physiology. Author : Ganang. Application and Lange.

PATIENT CARE RELEVANT TO DIAGNOSTIC RADIOLOGY- 103T

UNIT	CONTENTS
1	**Radiological Contrast Agents:** Opaque agents and gases- Relationship of x-ray transmission to density and atomic number of the elements of contrast medium.

	Types of Barium Sulphate Solutions, Concentration and its particular uses, Flavouring agents.
2	**Iodine Preparation:** Organic compounds, Water - soluble group; Significance of iodine content, Proprietary preparations, Iodised oil, Application of various systems of human body , Volume, Contra-indications, Methods of administration and route.
3	**Iodine Preparation II:** Sensitivity test, Side effects and management, Elimination from the body. Gases- Air, Oxygen and Carbon dioxide application and dangers.
4	**Emergencies in the X-ray Department and Management:** External defibrillation, Direct cardiac massage, Internal defibrillation Complications- Cardiac arrest, Respiratory arrest. Bronchography Local anaesthetics- Reactions, Treatment.
5	**Special Procedures in Diagnosis Radiology:** The Gastro intestinal tract- Barium meal, Barium swallow, Small bowel enema, Barium enema The Renal tract- Intravenous urography, Intravenous cholangiography, Operative and post operative cholangiography, Percutaneous transhepatic cholangiography.
6	**Special Procedures in Diagnosis Radiology-II:** The Respiratory tract- Bronchography, Gynecology, Hysterosalpingography Cardio Vascular System- Angiography, Aortography, Cerebral angiography, Splenoportovenography The Lymphatic System- Lymphangiography Central Nervous System- Myelography, Sialography Ultrasound +Guided procedures General preparation, Care CT scan+guided procedures Safety measures MRI.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Care of patient in diagnostic Radiography Chesney & Chesney (Blackwell Scientific)

B. Chesney's Care of the patent in Diagnostic Radiography Pauline J Clumer (Black well Scientific)

C. Aid to Tray and Trolley Setting Marjorie Hougton (Bacilliere)

D. First Aid Haugher & Gardner (Hamlyn)

RADIOGRAPHY AND DARK ROOM TECHNIQUES- 104T

UNIT	CONTENTS
1	**X-ray Materials:** Types of emulsion-characteristic and control Screen and non-screen films Dental films X-ray paper Under and Over exposure speed contrast.
2	**Intensifying Screens:** Fluorescence Application of fluorescence in Radiography Types of Intensifying screens and Intensifying factors Cleaning and general care of screen-after glow.
3	**X-ray Cassettes** Testing and proving good screen Contract, General care.
4	**X-ray Developers:** Characteristics, Details and contrast Freedom from chemical fog and staining Function and constituent of developer Standardization by time and temperature Exhaustion of developer
5	**Replenishes:** Powder and liquid solution - Radium and high contrast developer Ultra rapid development methods Automatic processing.
6	**X-ray Fixers and Fixing:** Fixing agent's Acid and preservative in fixer Inclusion of hardener Time of fixation Silver recovery.
7	**Rinsing, Washing and Drying:** Objects Methods employed Methods of drying films
8	**Processing:** Preparation of solution Suitable water supply Nature of mixing vessels Order mixing solutions Filtrations Making of stock solutions Storage of dry chemical Storage of solution.
9	**Processing Apparatus:** Processing units Hanger's, Care of hanger's, Refrigeration and use of ice.

10	**OT Processing:** Operation theatre processing, Dish units.
11	**Technical and Processing faults:** Chemical reduction Chemistry and characteristics of Farmer's reducer Local and general application.
12	**X-Ray Dark Room:** Size, Light proof entrance, Hatches, Construction of walls of protection against chemical and Radiation, Ceiling, Colour Schemes, Waterproofing of floors, Loading bench design, Disposition of processing and accessory, Equipment for efficient working, Arrangement of drying cabinets in Dark Room or in adjacent room, Dark Room illumination and testing for safety, Ventilation.
13	**The Radiographic Image:** Radiographic factors affecting image contrast and sharpness Variation in exposure time in accordance with quality of Radiation filters, Distance, Intensifying screens, Grids, Film Speed, Developer and Development.
14	**Presentation of Radiograph:** Identification of films Aspect for direct and stereo (univeraprimatic) viewing Mounting dental films Accessories- Viewing boxes, Spot light illuminator, Projectors and viewing screens for miniature and cine radiography, magnifiers, Film identification, Lead letters and numbers, Actinic marker embossing machine, Film trimmers, Corner cutters, Dental mounts and cutter, Filling units.
15	**Dark Room Procedures and Techniques:** Dark room adaptation techniques Safe light test, Preparation of developer Fixer And its chemistry Design and planning of dark room, processing of exposed films, care of intensifying screens, storage of unexposed films Accessories of dark room- AFP tech. Dry camera and presentation of films etc. Manual and automatic processing, AFP tech. and presentation of films etc.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Physics for Radiographer-Hay & Hughes.

B. Fundamental of X-ray and Radium Physics-Joseph Selman

C. Basic Medical Radiation Physics-Stanton

RADIATION PHYSICS AND MODERN IMAGING TECHNIQUES- 105T

UNIT	CONTENTS
1	**Radiography:** Primary radiological image produced by Contrast Media Attenuation Linear and Mass Attenuation Coefficient factors affecting attenuation Application in radiology Filters- Inherent and Added Filters, Heavy metal filters X-ray beam restrictor aperture diaphragm cones and cylinder collimators Function of restrictors.
2	**Scattered Radiation:** Significance of Scatter Grid principle- design and type Evaluation of grid performance lead content Grid cut off Moving grids Grid selection Air gap technique.
3	**Fluoroscopy Equipment:** Direct fluoroscope Image intensifier design Brightness gain Imaging characteristics Multi field image intensifiers Close circuit television scanning- Television image quality Fluoroscopic image recorder TV image records.
4	**Radiographic Image:** Image clarity contract Factors affecting contrast Image quality Mottle sharpness and resolution Line spread function, Modulation transfer function Noise and wiener spectrum Magnification Distortion penumbra unsharpness Inverse square law Evaluation of resolution Quantum mottle patient exposure.
5	**Body Section Radiography:** Basic methods of Tomography, Terminology, Blurring section thickness, Narrow and Wide angle Tomography, Circular Tomography. Topographic motions Phantom Image Tomography Angel Determination.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Physics for Radiographer-Hay & Hughes.

B. Fundamental of X-ray and Radium Physics-Joseph Selman

C. Basic Medical Radiation Physics-Stanton

D. rsstudents.files.wordpress.com/2008/03/fluoroscopy.ppt

BASIC ANATOMY & PHYSIOLOGY- 106P

UNIT	CONTENTS
1	**Practical Anatomy:** Practical's related to anatomy & physiology such as knowledge of surface anatomy of human body, Identification of bones and parts on x-ray film as radiological anatomy.
2	**Charts and Identification:** Preparing charts of human anatomy systems & structures of human body, Identification and knowledge of pathological specimens, Visit of Anatomy & Pathology museum.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Text books of Anatomy. Author: Guyton (Arthor C). Prism publishers Bangalore.

B. Human Physiology. Author: Chaterjee (cc). Medical allied agency

PATIENT CARE RELEVANT TO DIAGNOSTIC RADIOLOGY- 107P

UNIT	CONTENTS
1	Practical I- Practical knowledge of patient care Measuring of pulse, Measuring of BP Preparation for radiological investigations, Contrast media application, reaction management, allergy test Care of Anaesthetic patient Knowledge of catheterization Oxygen administration, Biopsy Method, Sympathetic and behavioral treatment Care of ambulatory patients Care of pregnant patient Non cooperating child Dignity of patient etc.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Care of patient in diagnostic Radiography Chesney & Chesney (Blackwell Scientific)

B. Chesney's Care of the patent in Diagnostic Radiography Pauline J clumer (Black well Scientific)

C. Aid to Tray and Trolley Setting Marjorie Hougton (Bacilliere)

RADIOGRAPHY AND DARK ROOM TECHNIQUES – 108P

UNIT	CONTENTS
1	Practical I- Dark room adaptation techniques Safe light test, Preparation of developer Fixer And its chemistry Design and planning of dark room, processing of exposed films, care of intensifying screens, storage of unexposed films Accessories of dark room- AFP tech. Dry camera and presentation of films etc. Manual and automatic processing, AFP tech. and presentation of films etc.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Physics for Radiographer-Hay & Hughes.

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RADIATION PHYSICS AND MODERN IMAGING TECHNIQUES–109P

UNIT	CONTENTS
1	Practical I-
	Practical of measuring instruments Ionisation chamber TLD measuring technique-Focal spot measurement, KV measurement Linearity of mA station Tube centering Radiographic tech. of whole body, all sp. Investigations imaging, etc. Table top dose measurement in fluoroscopy Image distortion of IITV Leakage of radiation through lead flaps Radiation level measurement during tube, Above table and Below table Removal of grids.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Physics for Radiographer-Hay & Hughes.

B. Fundamental of X-ray and Radium Physics-Joseph Selman

C. Basic Medical Radiation Physics-Stanton

HOSPITAL TRAINING-110

ALL INDIA COUNCIL FOR VOCATIONAL AND PARAMEDICAL SCIENCE

SYLLABUS

OF

DIPLOMA IN MAGNETIC RESONANCE IMAGING TECHNOLOGY - DMRIT 10

REGULAR PROGRAMME

DIPLOMA IN MAGNETIC RESONANCE IMAGING TECHNOLOGY - DMRIT 10

Eligibility	:	10^{th}
Programme Duration	:	2 Years
Programme Objectives	:	MRI is the art and science of producing medical images using MRI. Technologists produce images for the radiologist's interpretation to aid in medical diagnoses. The program prepares you, under the direction of a medical specialist (radiologist), to work in the hospital medical imaging department, at the patient's bedside, in the operating room or Emergency or in private imaging clinics. Our Diploma program in Radiography Technology has been designed to integrate the academic environment with the clinical setting. We are one of the few premium institutes in India to offer this program.
Job Prospects	:	Upon successful completion of the Diploma you can explore a career as a radiologist technician. You will find ample opportunities in Hospitals, Clinics and Doctors' offices. You may further pursue a bachelor's degree to continue your education and specialize. Common job profiles of students after completing DRIT include: Technician in Hospitals, Nursing Homes and Diagnostic Labs

YEAR I

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
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102T	Basic Anatomy & Physiology	70	30	5
103T	Patient Care Relevant to Diagnostic Radiology	70	30	5
104T	Radiography and Dark Room Techniques	70	30	5
105T	Radiation Physics and Modern Imaging Techniques	70	30	5
106P	Basic Anatomy & Physiology	35	15	1
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108P	Radiography and Dark Room Techniques	35	15	1
109P	Radiation Physics and Modern Imaging Techniques	35	15	1
110	Hospital Training-I	200		1
			TOTAL	29

DETAILED SYLLABUS

INSTRUCTIONAL METHOD: Personal contact programmes, Lectures (virtual and in-person), Assignments, Labs and Discussions, Learning projects, Industrial Training Programmes and Dissertation.

YEAR I

COMMUNICATION FOR PROFESSIONALS- 101T

UNIT	CONTENTS
1.	**Parts of Speech:** Definition of all the sight parts along with examples and their use in language. **Definite and Indefinite articles:** A, an, and, the, Definition and its uses along with examples. **Types of Pronouns:** Personal, Reflexive, Emphatic, Demonstrative, Relative, Indefinite, Interrogative and Distributive pronouns. **Noun:** Defining noun along with types and categories, Gender, Number case **Adjective:** Adjective, Comparison, Adjective used as nouns, Positions of the Adjective and Correct use of Adjectives. **Verb:** Definition, its forms, Verbs of incomplete predication, Phrases (defining it along with examples). Adjective, Adverb and Noun phrase. **Clauses:** Defining it along with examples: Adverb, Adjective and Noun Clauses. **Sentence and its Types:** Simple, Compound and Complex, Subject and Predicate (parts of a sentence), Transformation of Sentences. Active and Passive voice, Mood and Narration (Direct and Indirect speeches).
2.	**Words and Phrases:** Word formation (prefix, suffix), Idioms, Synonyms and antonyms, Phonetics, Speech sound, The phoneme, The syllable and IPA transcription.
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4.	**Business Correspondence II:** Notices, Agenda and Minutes, Application letter, Importance and function, Drafting the application, Elements structure, Preparing CV's.
5.	**Applied Grammar:** Correct usage of Grammar, Structure of sentences, Structure of paragraphs, Enlargements of

	vocabulary.
6.	**Business Writing:** Written composition, Precise writing and summarizing, Writing of Bibliography, and Enlargement of vocabulary.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. English Grammar and Composition Wren and Martin. S. Chand & Company Ltd.

B. Intermediate English Grammar; Raymond Murphy Pub: Foundation Books, New Delhi

C. Eng. Grammar usage and Composition; Tickoo & Subramanian Pub: S. Chand and Co.

D. Living Eng. Structure; Standard Alien.

BASIC ANATOMY & PHYSIOLOGY- 102T

UNIT	CONTENTS
1.	**The Human Body:** Definitions, sub-divisions of Anatomy, Terms of Location and Position, Fundamental Planes, Vertebrate structure of man, Organization of the body cells, Tissues.
2.	**The Skeletal System:** Types of bones, Structure and growth of bones, Division of the skeleton Appendicle skeleton, Axial skeleton, Name of all the bones and their parts. Joints classification, Types of movements with examples.
3.	**Anatomy of Circulatory System:** Heart Size, Position coverings, Chambers, Blood supply, Nerve supply, Blood vessels. General plan of circulation, Pulmonary Circulation, Names of Arteries and Veins and their position. Lymphatic system general plan.
4.	**Anatomy of the Respiratory System:** Organs of respiratory system, Larynx, Trachea, Bronchial tree, Respiratory portion, Pleurae and Lungs. Brief knowledge of parts and position.
5.	**Anatomy of the Digestive System:** Components of Digestive System, Alimentary tube, Anatomy of organs of Digestive Tube, Mouth, Tongue, Tooth, Salivary Glands, Liver, Bleary Apparatus, Pancreas, Names, Position and brief functions.
6.	**Anatomy of the Nervous System:** Central nervous system, The Brain, Hind brain, Midbrain, Forebrain, Brief Structure, Locations, and Peripheral nervous system, Spiral card, Anatomy, Functions, Reflex – Arc, ménages. Injuries to spinal card and brain.
7.	**Anatomy of the Endocrine System:** Name of all Endocrine glands, their position. Hormones and their functions– Pituitary, Thyroid, parathyroid, adrenal glands, gonads & islets of pancreas.
8.	**Anatomy of Excretory System and Reproductive System:** Kidneys location, Gross structure, Excretory ducts, Urethras, Urinary Bladder, Urethra, Male Reproductive system, Testis, Duct system, Female reproductive system, Ovaries Duct

	system, accessory organs.
9.	**Blood:** Definitions, composition, properties and function of Blood, Haemogram (RBC, WBC, Platelet count, HB concentrations), Function of plasma proteins Haemopoiesis, Blood Group – ABO and RH grouping, Coagulation & Anticoagulants, Anemia causes effects & treatment, Body fluid compartments, composition, Immunity Lymphoid tissue, Clotting factors, mechanism of blood clotting, Disorders of white blood cells, Disorders of platelets, Disorders of clotting.
10.	**Cardio Vascular System:** Function of cardiovascular system, Structure of cardiovascular system, Cardiac cycle, functional tissue of heart & their function, Cardiac output, E.C.G., blood pressure, Heart Rate.
11.	**Respiratory System:** Function of Respiratory System, Functional (physiological) Anatomy of Respiratory system, Mechanism of Respiration, Lung volumes & capacities, Transport of Respiratory Gases.
12.	**Digestive System:** Function of digestive system, Functional Anatomy of Digestive System, Composition and functions of all digestive juices, Movements of Digestive System (intestine), Digestion & absorption of Carbohydrate, Proteins & Fats.
13.	**Muscle Nerve Physiology:** Type of muscle, Structure of skeletal muscle, Sarcomere, Neuromuscular junction & transmission, Excitation and contraction coupling (Mechanism of contraction).
14.	**Structure and Functions of Skin:** Body Temperature, Fever, Regulation of Temperature.
15.	**Excretory System:** Excretory organs, Kidneys-function, Nephron, Juxta Glomerular Apparatus, Renal Circulation, Mechanism of Urine Formation, Mechanism of Micturition, Cystometrogram, Diuretics, Artificial Kidney.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Text books of Physiology. Author : Guyton (Arthor C). Prism publishers Bangalore.

B. Human Physiology. Author : Chaterjee (cc). Medical allied agency

C. Concise Medical physiology. Author : Choudhary (Sujit km.). New central books Kolkata.

D. Review Medical physiology. Author : Ganang. Application and Lange.

PATIENT CARE RELEVANT TO DIAGNOSTIC RADIOLOGY- 103T

UNIT	CONTENTS
1	**Radiological Contrast Agents:** Opaque agents and gases- Relationship of x-ray transmission to density and atomic number of the elements of contrast medium.

	Types of Barium Sulphate Solutions, Concentration and its particular uses, Flavouring agents.
2	**Iodine Preparation:** Organic compounds, Water - soluble group; Significance of iodine content, Proprietary preparations, Iodised oil, Application of various systems of human body , Volume, Contra-indications, Methods of administration and route.
3	**Iodine Preparation II:** Sensitivity test, Side effects and management, Elimination from the body. Gases- Air, Oxygen and Carbon dioxide application and dangers.
4	**Emergencies in the X-ray Department and Management:** External defibrillation, Direct cardiac massage, Internal defibrillation Complications- Cardiac arrest, Respiratory arrest. Bronchography Local anaesthetics- Reactions, Treatment.
5	**Special Procedures in Diagnosis Radiology:** The Gastro intestinal tract- Barium meal, Barium swallow, Small bowel enema, Barium enema The Renal tract- Intravenous urography, Intravenous cholangiography, Operative and post operative cholangiography, Percutaneous transhepatic cholangiography.
6	**Special Procedures in Diagnosis Radiology-II:** The Respiratory tract- Bronchography, Gynecology, Hysterosalpingography Cardio Vascular System- Angiography, Aortography, Cerebral angiography, Splenoportovenography The Lymphatic System- Lymphangiography Central Nervous System- Myelography, Sialography Ultrasound +Guided procedures General preparation, Care CT scan+guided procedures Safety measures MRI.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Care of patient in diagnostic Radiography Chesney & Chesney (Blackwell Scientific)

B. Chesney's Care of the patent in Diagnostic Radiography Pauline J Clumer (Black well Scientific)

C. Aid to Tray and Trolley Setting Marjorie Hougton (Bacilliere)

D. First Aid Haugher & Gardner (Hamlyn)

RADIOGRAPHY AND DARK ROOM TECHNIQUES- 104T

UNIT	CONTENTS
1	**X-ray Materials:** Types of emulsion-characteristic and control Screen and non-screen films Dental films X-ray paper Under and Over exposure speed contrast.
2	**Intensifying Screens:** Fluorescence Application of fluorescence in Radiography Types of Intensifying screens and Intensifying factors Cleaning and general care of screen-after glow.
3	**X-ray Cassettes** Testing and proving good screen Contract, General care.
4	**X-ray Developers:** Characteristics, Details and contrast Freedom from chemical fog and staining Function and constituent of developer Standardization by time and temperature Exhaustion of developer
5	**Replenishes:** Powder and liquid solution - Radium and high contrast developer Ultra rapid development methods Automatic processing.
6	**X-ray Fixers and Fixing:** Fixing agent's Acid and preservative in fixer Inclusion of hardener Time of fixation Silver recovery.
7	**Rinsing, Washing and Drying:** Objects Methods employed Methods of drying films
8	**Processing:** Preparation of solution Suitable water supply Nature of mixing vessels Order mixing solutions Filtrations Making of stock solutions Storage of dry chemical Storage of solution.
9	**Processing Apparatus:** Processing units Hanger's, Care of hanger's, Refrigeration and use of ice.

10	**OT Processing:** Operation theatre processing, Dish units.
11	**Technical and Processing faults:** Chemical reduction Chemistry and characteristics of Farmer's reducer Local and general application.
12	**X-Ray Dark Room:** Size, Light proof entrance, Hatches, Construction of walls of protection against chemical and Radiation, Ceiling, Colour Schemes, Waterproofing of floors, Loading bench design, Disposition of processing and accessory, Equipment for efficient working, Arrangement of drying cabinets in Dark Room or in adjacent room, Dark Room illumination and testing for safety, Ventilation.
13	**The Radiographic Image:** Radiographic factors affecting image contrast and sharpness Variation in exposure time in accordance with quality of Radiation filters, Distance, Intensifying screens, Grids, Film Speed, Developer and Development.
14	**Presentation of Radiograph:** Identification of films Aspect for direct and stereo (univeraprimatic) viewing Mounting dental films Accessories- Viewing boxes, Spot light illuminator, Projectors and viewing screens for miniature and cine radiography, magnifiers, Film identification, Lead letters and numbers, Actinic marker embossing machine, Film trimmers, Corner cutters, Dental mounts and cutter, Filling units.
15	**Dark Room Procedures and Techniques:** Dark room adaptation techniques Safe light test, Preparation of developer Fixer And its chemistry Design and planning of dark room, processing of exposed films, care of intensifying screens, storage of unexposed films Accessories of dark room- AFP tech. Dry camera and presentation of films etc. Manual and automatic processing, AFP tech. and presentation of films etc.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Physics for Radiographer-Hay & Hughes.

B. Fundamental of X-ray and Radium Physics-Joseph Selman

C. Basic Medical Radiation Physics-Stanton

RADIATION PHYSICS AND MODERN IMAGING TECHNIQUES- 105T

UNIT	CONTENTS
1	**Radiography:** Primary radiological image produced by Contrast Media Attenuation Linear and Mass Attenuation Coefficient factors affecting attenuation Application in radiology Filters- Inherent and Added Filters, Heavy metal filters X-ray beam restrictor aperture diaphragm cones and cylinder collimators Function of restrictors.
2	**Scattered Radiation:** Significance of Scatter Grid principle- design and type Evaluation of grid performance lead content Grid cut off Moving grids Grid selection Air gap technique.
3	**Fluoroscopy Equipment:** Direct fluoroscope Image intensifier design Brightness gain Imaging characteristics Multi field image intensifiers Close circuit television scanning- Television image quality Fluoroscopic image recorder TV image records.
4	**Radiographic Image:** Image clarity contract Factors affecting contrast Image quality Mottle sharpness and resolution Line spread function, Modulation transfer function Noise and wiener spectrum Magnification Distortion penumbra unsharpness Inverse square law Evaluation of resolution Quantum mottle patient exposure.
5	**Body Section Radiography:** Basic methods of Tomography, Terminology, Blurring section thickness, Narrow and Wide angle Tomography, Circular Tomography. Topographic motions Phantom Image Tomography Angel Determination.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Physics for Radiographer-Hay & Hughes.

B. Fundamental of X-ray and Radium Physics-Joseph Selman

C. Basic Medical Radiation Physics-Stanton

D. rsstudents.files.wordpress.com/2008/03/fluoroscopy.ppt

BASIC ANATOMY & PHYSIOLOGY- 106P

UNIT	CONTENTS
1	**Practical Anatomy:** Practical's related to anatomy & physiology such as knowledge of surface anatomy of human body, Identification of bones and parts on x-ray film as radiological anatomy.
2	**Charts and Identification:** Preparing charts of human anatomy systems & structures of human body, Identification and knowledge of pathological specimens, Visit of Anatomy & Pathology museum.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Text books of Anatomy. Author: Guyton (Arthor C). Prism publishers Bangalore.

B. Human Physiology. Author: Chaterjee (cc). Medical allied agency

PATIENT CARE RELEVANT TO DIAGNOSTIC RADIOLOGY- 107P

UNIT	CONTENTS
1	Practical I- Practical knowledge of patient care Measuring of pulse, Measuring of BP Preparation for radiological investigations, Contrast media application, reaction management, allergy test Care of Anaesthetic patient Knowledge of catheterization Oxygen administration, Biopsy Method, Sympathetic and behavioral treatment Care of ambulatory patients Care of pregnant patient Non cooperating child Dignity of patient etc.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Care of patient in diagnostic Radiography Chesney & Chesney (Blackwell Scientific)

B. Chesney's Care of the patent in Diagnostic Radiography Pauline J clumer (Black well Scientific)

C. Aid to Tray and Trolley Setting Marjorie Hougton (Bacilliere)

RADIOGRAPHY AND DARK ROOM TECHNIQUES – 108P

UNIT	CONTENTS
1	Practical I- Dark room adaptation techniques Safe light test, Preparation of developer Fixer And its chemistry Design and planning of dark room, processing of exposed films, care of intensifying screens, storage of unexposed films Accessories of dark room- AFP tech. Dry camera and presentation of films etc. Manual and automatic processing, AFP tech. and presentation of films etc.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Physics for Radiographer-Hay & Hughes.

B. Fundamental of X-ray and Radium Physics-Joseph Selman

C. Basic Medical Radiation Physics-Stanton

RADIATION PHYSICS AND MODERN IMAGING TECHNIQUES–109P

UNIT	CONTENTS
1	Practical I-
	Practical of measuring instruments Ionisation chamber TLD measuring technique-Focal spot measurement, KV measurement Linearity of mA station Tube centering Radiographic tech. of whole body, all sp. Investigations imaging, etc. Table top dose measurement in fluoroscopy Image distortion of IITV Leakage of radiation through lead flaps Radiation level measurement during tube, Above table and Below table Removal of grids.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Physics for Radiographer-Hay & Hughes.

B. Fundamental of X-ray and Radium Physics-Joseph Selman

C. Basic Medical Radiation Physics-Stanton

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