NIMS UNIVERSITY

SYLLABUS

OF

DIPLOMA IN RADIATION TECHNOLOGY - DRT10

VERSION 2.0

DIRECTORATE OF DISTANCE EDUCATION

Shobha Nagar, Jaipur-Delhi Highway (NH-11C), Jaipur- 303121
Rajasthan, India

DIPLOMA IN RADIATION TECHNOLOGY - DRT10

Eligibility	:	10^{th}
Programme Duration	:	3 Years
Programme Objectives	:	Radiography is the art and science of producing medical images using x-radiation. 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 DRT include: Technician in Hospitals, Nursing Homes and Diagnostic Labs

YEAR I

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
ANT12102	Basic Anatomy, Physiology and Pathology	70	30	5
MBL12102	Basic Microbiology	70	30	4
BCH12102	Basic Biochemistry	70	30	4
CSC14105	Fundamentals of Computer Science	70	30	4
ENG14102	Communication for Professional	70	30	4
ANT12102P	Basic Anatomy, Physiology and Pathology (P)	35	15	3
MBL12102P	Basic Microbiology (P)	35	15	3
BCH12102P	Basic Biochemistry (P)	35	15	3
	Total	**650**		**30**

YEAR II

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
ANT12204	Human Anatomy and Physiology	70	30	5
RAD12204	Radiation Physics and Physics of Diagnostic Radiology	70	30	4
RAD12205	Dark Room Techniques	70	30	4
RAD12206	Radio Diagnostic Equipments	70	30	4
HHM12201	General Principle of Hospital Practice and Patient Care	70	30	4
ANT12204P	Human Anatomy and Physiology (P)	35	15	3
RAD12204P	Radiation Physics and Physics of Diagnostic Radiology (P)	35	15	3
RAD12205P	Dark Room Techniques (P)	35	15	3
	TOTAL	**650**		**30**

YEAR III

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
RAD12304	Clinical Radiography Techniques	70	30	5
RAD12305	Contrast and Special Radiographic Procedures	70	30	5
RAD12306	Radiation Safety and Quality Control	70	30	5
RIN12301	Basics of Medical Imaging Informatics	70	30	4
RAD12304P	Clinical Radiography Techniques (P)	35	15	3
RAD12305P	Contrast and Special Radiographic Procedures (P)	35	15	3
RAD12306P	Radiation Safety and Quality Control (P)	35	15	3
TRN12301	Hospital Training	100		2
	TOTAL	**650**		**30**

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

BASIC ANATOMY, PHYSIOLOGY AND PATHOLOGY – ANT12102

UNITS	CONTENT
SECTION A (BASIC ANATOMY)	
1	**Levels of Organization of Organisms:** Structural levels of Organization; Chemical level; Cellular level; Tissue level; Organ level; System level; Complete organism. The Chemical level : Definition and brief discussion of atom & molecule; The cell - Overview about—Its structure, major cell organelles, plasma membrane & cell division; Tissue -Brief discussion about- Types of tissues in the body; Organ- Brief discussion about- Major organs in the body; Organ system- Meaning and definition; Types of Organ System; Overview of Muscular, skeletal, digestive systems; Whole organism - Brief introduction about- Six recognized kingdoms of living organisms & Classification of humans.
2	**Human Anatomy:** Basic Terminology, introduction to anatomy, anatomical vocabulary, relative location- skull, arm, planes, functional states, regions- land marks, body cavities, body formation, role & functions of cell, tissue and organ in human body formation.
3	**Skin and Connective tissue:** Skin- Definition of Skin; Layers of skin; Types of skin; Functions. Connective tissue- Definition; Brief discussion on – Bone, Cartilage, Embryonic connective tissue-Mesenchyme; Mucous or mucoid.
4	**Skeletal system:** The skeletal system, bone structure, bone cells, bone marrow, bone growth, ossification, epiphyseal plates of bone.
5	**Joints: I**ntroduction to joints, categories of joint, joint movement.
6	**Muscular system:** Overview, muscular system anatomy- origin and insertion, function, muscle tissue types, microanatomy shape of muscle, muscle contractions.
7	**Cardiovascular system:** Definition and meaning of Cardiovascular system; Types of blood vessels- General structure and Functions of- Artery; Vein; and Capillaries & Sinusoids. Anastomosis-- definition and function; Circulation – Brief discussion; Types of Circulation-Systemic and Pulmonary.
8	**Lymphatic system:** Introduction to lymphatic system, lymphatic capillaries, lymphatic vessels, lymph nodes, lymphatic organs.
9	**Surface anatomy:** Definition of Surface Anatomy; Significance of Surface marking; Four techniques for examining body - visual inspection, palpation, percussion and auscultation.
SECTION B (BASIC PHYSIOLOGY)	
10	**Introduction:** Introduction to human Physiology; Definition; Difference between human anatomy and physiology; Structure and functions of cytoplasmic organelles; Reproduction – Meiosis, Mitosis, Endocytosis and Exocytosis, Homeostasis.
11	**Physico-chemical laws:** Diffusion, osmosis, bonding, filtration, dialysis, surface tension, adsorption, colloid.
12	**Fundamentals of different organ systems:** Cardiovascular system; Respiratory system; Digestive system; Excretory system; Reproductive system; Endocrine system; Lymphatic system; Nervous system.

13	**Blood:** Composition of blood; functions of blood; plasma proteins; RBC – Erythropoiesis; pathological and physiological variations of RBC; Hemoglobin – structure, function and metabolism; WBC – structure, types and function, Platelets, coagulation of blood, anticoagulants, bleeding disorders. Blood groups and Rh factor.
14	**Cerebrospinal fluid:** History, Functions, circulation, production, composition, pathology and laboratory diagnosis.
15	**Sense organ:** Physiology of sense organs – taste, olfaction, vision and hearing.
SECTION C (BASIC PATHOLOGY)	
16	**Introduction to Pathology:** Introduction to general pathology, the cell in health and disease, Inflammation- acute and chronic, derangement of body fluids and electrolytes-types of shocks, Ischaemia, Infection, Infectious diseases, Disease of infancy and childhood, Neoplasia- Etiology and Pathogenesis.
17	**Different branches of Pathology:** Introduction to various branches of pathology, overview of systemic pathology, cytopathology, histopathology, hematology, blood banking , clinical pathology and Immunopathology.
18	**Laboratory management:** Collection of sample, labeling, transport, screening, reporting and dispatch of reports, Hb estimation, TLC and DLC, RBC count, Peripheral blood film-staining and study of Malaria parasite.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Marieb, E.N., and S.J. Mitchell. Human Anatomy & Physiology Laboratory Manual: Cat and Fetal Pig Versions. Ninth Edition Updates. Benjamin Cummings, 2009.

B. Tortora, G.J. and Derrickson, B. Principles of Anatomy and Physiology. Wiley 2006 ISBN 01-471-68934-3.

C. Feder, ME; Bennett, AF; WW, Burggren; Huey, RB (1987). New directions in ecological physiology. New York: Cambridge University Press. ISBN 978-0-521-34938-3.

D. Abbas A.B.; Lichtman A.H. (2009). "Ch.2 Innate Immunity". In Saunders (Elsevier). Basic Immunology. Functions and disorders of the immune system (3rd ed.) ISBN 978-1-4160-4688-2.

WEB LINKS:

A. http://medical-dictionary.thefreedictionary.com

B. http://fee-ed.net/free-ed/Resource/Sci/Biol/AnatomyPhysiol/Human01.asp

C. http://units.handbooks.uwa.edu.au/units/phy1/phy12001

D. https://medicine.tcd.ie/histopathology/undergraduate/sys-path.php.

BASIC ANATOMY, PHYSIOLOGY AND PATHOLOGY (P) – ANT12102P

1. Demonstration on Histology
2. Demonstration on skull and skeleton
3. Demonstration on different models
4. Identify compound microscope and its components
5. Blood sample collection: Requirements
6. Demonstration on Hemocytometer
7. Requirements for ESR and PCV estimation

8. Hemoglobinometer: Identify its components
9. Demonstration on requirements for BP measurement.
10. Requirements to prepare a blood film and DLC
11. Blood group determination: Different anti-sera requirements
12. Requirements to determine bleeding time and clotting time

BASIC MICROBIOLOGY – MBL12102

UNIT	CONTENT
1	**Introduction to microbiology:** Meaning & definition of microbiology; Brief history of microbiology & contribution by Antony Van Leeuwenhoek, Robert Koch & Louis Pasteur in the field of microbiology; Organism included in the study of microbiology; Meaning & definition of microorganism and its types; Brief overview of diseases caused by microorganism and its preventive measures.
2	**Cell structure & function:** Definition, structure and function of cell; Types of cells-prokaryotic & eukaryotic cells; Structure and function of eukaryotic & prokaryotic cell; Distinguishing features between; Eukaryotic cell & prokaryotic cell.
3	**Structure of bacteria:** Definition & structure of bacteria; Types of bacteria; Classification of bacteria on the basis of shapes; Structure of Gram positive and Gram negative bacteria with special reference to cell wall.
4	**Common equipments used in microbiology laboratory:** Introduction to common equipments; Types of equipments used in microbiology laboratory; Principle and uses of Incubators, Hot air Oven, Water Bath, Anaerobic Jar, Centrifuge, Autoclave, Microscope; Glassware-description of glassware, its use, handling and care; Safety measures in handling microbiology equipments.
5	**Concept of sterilization:** Meaning, definition & role of sterilization; Classification & uses of sterilization; General principle of sterilization.
6	**Antiseptics and Disinfectants:** Meaning, definition & uses of antiseptics & disinfectants; Types & mode of action.
7	**Laboratory management and planning:** Introduction to Laboratory management & planning; Basic definition of management and planning; Concept of laboratory management; Recording of specimen and maintenance of laboratory records, care & maintenance of glassware; Safety measures in microbiology laboratory with universal safety precaution.
8	**Collection & transportation of specimen for microbiological investigation:** Introduction of collection & transportation of specimen; Rules for collection & transportation of specimen; Methods of collecting different samples- blood, urine, faeces, sputum, pus, body fluids, swab; Methods of preservation, types of container & criteria for rejection of specimens.
9	**Disposable of laboratory/Hospital waste:** Definition of hospital waste; Identification of all types of waste treatment; Non infectious waste; Infected sharp waste disposal; Infected non sharp waste disposal.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Gerard J. Tortora, Berdell R. Funke, Christine L. Case, Microbiology: An Introduction, Eight Edition, Hardcover : 944 pages, Publisher: Benjamin Cummings.

B. Prescott, Harley and Klein's Microbiology 7th Ed. Author: Joanne M Wiley, Christopher J Woolverton, Linda M Sherwood.

C. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J. Ryan, C. George Ray, Hardcover : 992 pages Publisher: McGraw-Hill Medical.

D. Koneman's Color Atlas and Textbook of Diagnostic Microbiology Edited by Elmer W. Koneman.

WEB LINKS:

A. http://www.microbeworld.org/history-of-microbiology

B. http://www.britannica.com/EBchecked/topic/48203/bacteria/39334/Diversity-of-structure-of-bacteria.

C. http://www.textbookofbacteriology.net/themicrobialworld/control.html.

BASIC MICROBIOLOGY (P) – MBL12102P

1. Demonstration of common equipments
2. Demonstration of containers and glassware
3. Identification of Culture Media with Growth
4. Recording of specimen and maintenance of laboratory records
5. Methods of collecting different samples
6. Demonstration of various equipments used in microbiology laboratory

BASIC BIOCHEMISTRY – BCH12102

UNIT	CONTENT
1	**Introduction to biochemistry:** General introduction and role of biochemist, ethics, responsibility, safety measures and first aid. Cleaning and care of general laboratory glassware and equipment, Distilled water-types of distilled water plants, preparation & storage.
2	**The Cell**: introduction of cell, prokaryotes and eukaryotes, the cell membrane, cytoplasm, fluid mosaic model of cell membranes, membrane proteins, the nucleus (nuclei), mitochondria, ribosomes, endoplasmic reticulum (er), golgi apparatus, centriole, plant cell structures, Multicellular organization.
3	**Carbohydrates:** Chemical structure, function, classification- monosaccharides-disaccharides-polysaccharides-homopolysaccharides-heteropolysaccharides-glycoproteins
4	**Proteins: Amin**o acids-classification-structure of protein-determination of protein structure-properties of proteins- denaturation- classification of proteins-antigen, antibody types of plasma proteins- blood clotting.
5	**Lipids:** Chemical structure, functions, classification-fatty acids, triacylglycerols, phospholipids, glycoproteins, lipoproteins, steroids, amphipathic lipids.
6	**Vitamins and minerals:** Fat soluble vitamins (A, D, E, and K) – water soluble vitamins – B-complex vitamins – principal elements (Calcium, phosphorus, magnesium, potassium, chlorine and sulphur) - trace elements- calorific value of foods- basal metabolic rate (BMR), respiratory quotient (RQ) specific dynamic action (SDA) - balanced diet – Marasmus – Kwashiorkor.
7	**Nucleic acids & Enzymes:** Definition of DNA, Nucleic acids- structure of DNA- Watson & Crick model of DNA- Types of RNA. Enzyme definition-nomenclature-classification-Factors affecting enzyme activity-active site- co-enzyme- mechanism of enzyme action-enzyme pattern in diseases.
8	**Analytical balance & standard solutions:** Introduction to analytical chemistry, definition and principle of analytical balance, working and maintenance, preparation of

	reagents, formulation and preparation, vented balanced safety enclosure, various standard solutions used their preparation, storage of chemicals.
9	**Units of measurements:** S.I units – definitions, conversions, measurement of volume strength, normality, molarity, molality, - volumetric apparatus, calibration of volumetric apparatus. Definition – mole, molar and normal solutions (preparation, standardization), pH (definition, PKa value, example, derivation of Henderson – Hasselbach equation); Buffer solutions (definition, preparation of important solutions), pH indicators (pH papers, universal & other indicators), pH measurement – different methods (ph paper, pH meter, principle of pH meter, structure, working and maintenance.
10	**Radio isotopes:** Introduction to isotopes and radio isotopes, uses of isotopes and radio isotopes in biochemistry, radio isotopes properties, isotope v/s nuclide, radioactive displacement law, alpha decay and beta decay.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Voet & Voet : Text Book of Biochemistry: Wiley 3rd ed.

B. Lehninger, Principles of Biochemistry: Nelson and Cox 4th ed.

C. Harper Illustrated Biochemistry, Mc-Graw Hill: Lange: 28th ed.

WEB LINKS:

A. http://www.aceglass.com/dpro/kb_article.php?ref=8386-IPSF-3037

B. http://www.ilo.org/legacy/english/protection/safework/ghs/ghsfinal/ghsc10.pdf.

BASIC BIOCHEMISTRY (P) – BCH12102P

1. Cleaning of Glassware
2. Preparation of distilled water
3. Standardization of distilled water
4. General tests of carbohydrates
5. General test of protein
6. General test of lipids
7. Demonstration of analytical balances
8. Calibration of volumetric pipette
9. Identify the acids and bases

FUNDAMENTALS OF COMPUTER SCIENCE – CSC14105

UNIT	CONTENT
1.	**Computers Organization & Applications:** Central Processing Unit, Control Unit, Arithmetic Unit, Instruction Set, Register, Processor Speed; Characteristic of computers, Input, output, storage units, Computers system.
2.	**Memory:** Main Memory, Storage Evaluation Criteria, Memory Organization, Memory Capacity, Random Access Memories, Read Only Memory, Secondary Storage Devices, Magnetic Disk, Floppy and Hard Disk, Optical Disks CD-ROM, Mass Storages Devices.
3.	**Input Devices:** Keyboard, Mouse, Trackball, Joystick, Scanner, Optical Mark Reader, Bar-code reader, Magnetic ink character reader, Digitizer, Card reader, Voice recognition, Web cam, Video Cameras.

4.	**Output Devices:** Monitors, Printers, Dot Matrix Printers, Inkjet Printers, Laser Printers, Plotters, Computers Output Micro Files (Com), Multimedia Projector.
5.	**Operating System:** Microsoft Windows, An overview of different version of windows, Basic windows elements, File managements through windows, Using essential accessories: System tools Disk cleanup Disk defragmenter, Entertainments, Games, Calculator, Imagine-Fax, Notepad, paint, Word Pad, Recycle bin, windows Explorer, Creating folders icons.
6.	**Word Processing:** Word processing concepts, Saving, closing opening and existing documents, Selecting text, edition text, Finding and replacing text, Printing documents, Creating and printing merged documents, Mail merge, Character and paragraph formatting, Page designs and Layout, Editing and proofing tools checking and correcting spelling, Handling graphics, Creating tables and charts, Documents templates and wizards.
7.	**Presentation Package:** Creating opening and saving presentations, Creating the look of your presentation, Working in different views working with slides, Adding and formatting text, formatting paragraphs, Checking spelling and correcting typing mistakes, Making notes pages and handouts, Drawing and working with objectives, Adding clip art and other pictures, Designing slides shows, Running and controlling a slid show, Printing Presentations.
8.	**Internet and Email:** Definition about the World Wide Web & brief history, Use of Internet and Email, Internet, Websites (Internet Sites), The Mail protocol suite. Using search engine and beginning Google search - Exploring the next using Internet Explorer and Navigator - Uploading and Download of files and images - E-mail ID creation - Sending messages - Attaching files in Email.
9.	**Hospital Information System:** Definition of Hospital Information system, Architecture of a HIS, aim and uses of HIS, types of HIS, Benefits of using a hospital information system, Advanced Hospital Management System, XO Hospital Management System, LCS Hospital Management Information System, NVISH Hospital Management System.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Sunny Handa, "Fundamentals of Information Technology", LexisNexis Butterworths.

B. Graeme G. Wilkinson, " Fundamentals of Information Technology", Wiley.

C. Ramesh Bangia, "Computer Fundamentals and Information Technology", Firewall Media.

D. Alexis Leon & Mathews Leon, "Fundamentals of Information Technology, 2nd ed.", Vikas Publishing House Pvt. Limited.

WEB LINKS:

A. http://oer.nios.ac.in/wiki/index.php/COMPUTER_ANT_ITS_COMPONENTS

B. http://http://homepage.cs.uri.edu/book/cpu_memory/cpu_memory.htm.

C. http://uwf.edu/clemley/cgs1570w/notes/concepts-7.htm

COMMUNICATION FOR PROFESSIONAL – ENG14102

UNIT	CONTENT
1	**Essentials of Grammar:** Parts of Speech; Vocabulary building; Sentence; Articles; Pronouns; Quantity; Adjectives; Adverbs; Prepositions, Adverb particles and phrasal verbs, Verb; Verb tenses; Imperatives; Active and passive voice; Direct and indirect speech; The infinitive; Conditional sentences; Synonyms and antonyms; Singular and Plural; Figures of Speech; Punctuation and Phonetics.

2	**Nature, Scope and Process of Communication:** Defining Communication; Nature of Communication; Objectives/Purpose of Communication; Functions of Communication; Process of Communication; Elements of Communication Process; Process of Communication: Models; Working of the Process of Communication; Forms of Communication.
3	**Channels and Networks of Communication:** Channels of Communication; Communication Flow in Organizations: Directions/Dimensions of Communication; Patterns of Flow of Communication or Networks; Factors Influencing Organizational Communication.
4	**Principles of Effective Communication:** Communication Effectiveness: Criteria of Evaluation; Seven Cs of Effective Communication; Four Ss of Communication.
5	**Barriers in Communication:** Categorisation of Barriers; Semantic Barriers; Organizational Barriers Interpersonal Barriers (Relating to Superior-subordinate); Individual or Psycho-sociological Barriers; Cross-cultural/Geographic Barriers; Physical Barriers/Channel and Media Barriers; Technical Aspects in Communication Barriers; Overcoming the Barriers in Communication; Measures to Overcome Barriers in Communication.
6	**Non-verbal Communication:** Characteristics of Non-verbal Communication; Relationship of Non-verbal Message with Verbal Message; Classification of Non-verbal Communication.
7	**Oral Communication: Informal Conversation:** Oral Communication; Informal Conversation; Learning Informal Conversation; How to Go About Learning Other Tricks?; Learning Conversational Skills; Internet Chat.
8	**Communication in Business Organizations:** Meaning of Business Communication; Types of Information Exchanged in Business Organizations; Role of Communication in Business Organizations; Importance of Communication in Management of Business Organizations; Scope of Communication in Organizational Setting; Characteristics of Effective Business Communication; New Communication Environment; Ethical challenges and Traps in Business Communication; Role of Communication in Three Managerial Roles Defined by Henry Mintzberg.
9	**Formal Conversations: Meetings, Interviews and Group Discussions:** Meetings; Duties of Participants; Interviews; Group Discussions.
10	**Greetings and Introduction:** Basics of greetings and introduction; formal and informal introduction; Reading comprehension, Vocabulary; Pronunciation: Falling and rising tone; Speaking: Body language; Listening: body language.
11	**Listening Skills:** Importance of Listening; Listening versus the Sense of Hearing; Listening as Behaviour; Payoffs for Effective Listening; Actions Required for an Effective Listener; Approaches to Listening; Misconceptions and Barriers that Impair Listening; Planning for Effective Listening; How to be a Good Listener?; What Speakers can do to Ensure Better Listening?.
12	**Formal and Informal Letters:** Distinction between Formal and Informal Letters; Writing Formal Letters; Informal Letters.
13	**Communication on the Net:** E-Mail; Netiquettes; Blog Writing; Web Writing.
14	**Report Writing: Business Reports:** Significance; Types of Reports; Five Ws and one H; Report Planning; Report Writing Process; Outline of a Report; Guidelines for Writing Report; Technicalities of Report Writing; Visual Aids in Reports; Criteria used for Judging the Effectiveness of a Report; Illustrations.
15	**Job Applications and Resume Writing:** Job Application/Covering Letter; Resume/CV Writing.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Harvard Business School Press (2003), Business Communication: Harvard Business Essentials, Boston, Massachusetts.

B. Krizan, A.C. Buddy, Merrier, Patricia, Logan, Joyce and Williams, Karen (2008), Business Communication, Thomson South-Western.
C. Guffey,m Mary E. (2000), Business Communication: Process and Product, South-Western College Publishing.;

WEB LINKS:

A. http://www.commissionedwriting.com/GRAMMAR%20ESSENTIALS.pdf.
B. http://www.esf.edu/fnrm/documents/FNRM_Communications_Handbook2008.pdf.
C. Http://books.google.co.in/books?id=RETE15K43qsC&printsec=frontcover&dq=essentials+of+english+grammer+pdf&hl=en&sa=X&ei=XlpSU6PEKY2HrgfyqoDoAQ&ved=0CDIQ6AEwAQ#v=onepage&q&f=false.