

**MRSPTU (B. SC. RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
BATCH 2020 ONWARDS**

SEMESTER 1 st		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BRMIS1-101	Human Anatomy & Physiology-I	3	1	0	40	60	100	4
BRMIS1-102	Applied Biochemistry	3	1	0	40	60	100	4
BRMIS1-103	Communication Skills	3	1	0	40	60	100	4
BRMIS1-104	Human Anatomy & Physiology Lab	0	0	4	60	40	100	2
BRMIS1-105	Applied Biochemistry Lab.	0	0	4	60	40	100	2
BRMIS1-106	Communication Skills-Lab	0	0	4	60	40	100	2
BRMIS1-107	Drug Abuse: Problem, Management and Prevention	3	0	0	40	60	100	3
Total		-	-	-	340	360	700	21

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HUMAN ANATOMY & PHYSIOLOGY-I

Subject Code: BRMIS1 -101

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- Students will be able to learn the terminology of the subject and basic knowledge of cells, tissues, blood and to understand anatomy and physiology of human body.

Course Outcomes:

- Demonstrate knowledge of general overall physiological principles associated with metabolic processes; musculoskeletal system; cardiovascular system; aerobic and anaerobic program design.

Unit-1.

15 Hours

- Introduction:** Definition of anatomy and its divisions, Terms of location, positions and planes, Cell and its organelles, Tissues & its classification, Glands.
- Musculoskeletal system:** Structure of Bone & its types, Joints- Classification of joints with examples; details of synovial joint. Bones & joints of upper limb, lower limb and their movements. Axial skeleton & appendicular skeleton. Skull, spine & its movements, intervertebral disc. Muscles & its types. Muscles of the upper limb, lower limb, trunk and neck. Classification of Muscle, structure of skeletal muscle - Neuromuscular Junction - Excitation Contraction Coupling

Unit-2.

15 Hours

- Cardiovascular System:** Arteries & veins, Capillaries & arterioles, Red Blood Cells- Functions, count, Physiological variations. Erythropoiesis-stages - Hemoglobin- Functions, Physiological variations. - White Blood cells-Functions, count, morphology. - Platelets-count, morphology, functions.
- Hemostasis- Definition:** Mechanism, clotting factors. - Blood groups-ABO system, Rh system, Blood transfusion- Indication, transfusion reactions. - Anaemias- classification, morphological and Etiological, effects of anaemia on body. Heart- size, location, chambers, blood supply of heart, pericardium, Systemic & pulmonary circulation, Major blood vessels of Heart- Aorta, pulmonary artery, common carotid artery, subclavian artery, axillary artery, brachial artery, common iliac artery, femoral artery. Inferior vena cava, portal circulation, great saphenous vein, Heart-Physiological Anatomy, Nerve supply, Properties of cardiac muscle.
- Cardiac Cycle-Events** –systole, diastole - Cardiac Output-Definition and factors affecting it. - Heart sounds-normal heart sounds, its causes, areas of auscultations. - Blood Pressure-Definition, normal value, Physiological variations, its measurement. - ECG- normal waves. - Shock-Definition, Types.

Unit-3.

15 Hours

1. Gastro-intestinal System:

- Parts of GIT, structure of tongue, pharynx, salivary glands, Location & Gross structure of Oesophagus, stomach, intestine (small and large), liver, gall bladder, pancreas,

spleen. Physiological Anatomy, functions of GIT. Salivary Gland-functions of saliva. Stomach- structure and functions, Gastric secretions-composition, functions, Mechanism - Pancreas- structure, functions, composition of Pancreatic juice. Liver- Functions of liver.

- Bile-Composition, functions. - Jaundice-Types and its causes. - Gall Bladder-Functions - Intestine- Movements of small and large intestine. - Digestion and Absorption of Carbohydrates, Proteins, Fats. - Hormones of GIT- Functions of Gastrin, Secretin, CCKPz.

Unit-4.

15 Hours

- **Sensory Organs:** Skin & its appendages. Structure of eye & lacrimal apparatus, name of extraocular muscles. Structure of ear: external, middle & inner ear, functions of different parts, Visual acuity, Refractive errors Ear-structure, functions, General mechanism of hearing.
- **Lymphatic System:** Lymph & Lymph vessels. Structure of lymph node, names of regional lymphatics, axillary and inguinal lymph nodes.

Recommended Text Books / Reference Books:

- 1. Ross and Wilson, 'Anatomy & Physiology.
- 2. Clark, 'Anatomy and Physiology: Understanding the Human Body'.
- 3. Pearce, 'Human Anatomy for Nurses.

APPLIED BIOCHEMISTRY

Subject Code: BRMIS1-102

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

- Students will be able to learn the terminology of the subject and basic knowledge of basic chemistry and biochemistry involved in physiology of human body. They will be able to understand the reports generated by laboratory and shall be able to convey the surgeon about any critical alert.

Course Outcomes:

- Applied Biochemistry is the part of biochemistry where knowledge and methods related to biochemistry are applied to real world problems like to investigate cause of diseases in medicine, to study effect of nutritional deficiencies, to find ways for pest control, improve productivity and storage in agriculture.

Unit- 1.

15 Hours

- **Cell:** Morphology, structure & functions of cell, cell membrane, Nucleus, chromatin, Mitochondria, Endoplasmic Reticulum, Ribosomes.
- **Carbohydrates:** Definition, chemical structure, functions, sources, classifications, Monosaccharide's, Disaccharides, Polysaccharides, muco-polysaccharide and its importance, glycoprotein
- **Lipids:** Definition, function, sources, classification, simple lipid, compound lipid, derived lipid, unsaturated and saturated fatty acid. Essential fatty acids and their importance, Blood lipids and their implications, cholesterol with its importance.
- **Proteins :** Definition, sources, amino acids, structure of protein, their classification, simple protein, conjugated protein, derived proteins and their properties.
- **Enzymes:** Definitions, mechanism of action, factors affecting enzyme action, enzyme of clinical importance.

Unit- 2.

15 Hours

- **Nutrition:** Vitamins types, functions and role, Principal minerals and their functions (Ca, P, Mg, Na, K, Cl). Balanced diet, Diet for Chronically and terminally ill patients, post operative patients
- **Bioenergetics:** Energy rich compounds, Respiratory chain and Biological oxidation.

Unit-3

15 Hours

- **Carbohydrate Metabolism:** Glycolysis, TCA cycle, Glycogen metabolism, Gluconeogenesis, Maintenance of Blood Glucose. Diabetes Mellitus and its complications.
- **Lipid Metabolism:** Beta oxidation, Ketone bodies, Cholesterol and atherosclerosis, obesity.
- **Protein Metabolism:** Transamination, Deamination, Fate of ammonia, urea synthesis and its inborn errors.

Unit-4-

15 Hours

- **Water and Electrolyte, Fluid compartment, daily intake and output sodium and potassium balance**
- **Nerve tissue:** Neuro transmitters and nerve activity.
- **Hormones:** Actions of Hormone Insulin, Glucagon, Thyroid and Parathyroid hormones, Cortical hormones.
- **Biophysics: Concepts of pH and buffers, osmotic pressure and its physiological applications.**
- Acid Base Balance , role of lungs and kidneys,— Regulation of blood pH, acidosis, Alkalosis
- **Physical Chemistry:** Osmosis, Dialysis, Donann membrane equilibrium
- **Organ function Tests:** Renal and Liver Function Tests.

Recommended Text Books / Reference Books:

1. Applied Biochemistry Professional Publications; First Edition
2. Fundamentals Of Applied Biochemistry Auris Publishing

COMMUNICATION SKILLS

Subject Code: BRMIS1-103

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objective:

- The students will be able to appreciate communication skills as these are important to everyone - those are how we give and receive information and convey our ideas and opinions with those around us.
- The topic shall also include the 'Soft skills' which is a term often associated with a person's "EQ" (Emotional Intelligence Quotient) which is an important part of their individual contribution to the success of an organization.

Course Outcomes:

- These skills can include social graces, communication abilities, language skills, personal habits, cognitive or emotional empathy, and leadership traits.
- The organizations with trained soft skill staff are more successful. Hence in addition to standard qualification the students trained with this course will be able to deal with patients, their fellows and seniors, face to face, in a better way.

UNIT-1

(15Hrs)

- Basic Language Skills: Grammar and Usage.
- Business Communication Skills with focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.

UNIT-2

(15 Hrs)

- Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization.
- Basic concepts & principles of good communication

UNIT-3

(15 Hrs)

- Special characteristics of health communication
- Types & process of communication
- Barriers of communication & how to overcome.

UNIT-4

(15 Hrs)

- Soft Skills - with important sub-elements:
 - i. Communication Styles
 - ii. Team work
 - iii. Leadership Skills
 - iv. Effective & Excellent Customer Service
 - v. Decision Making & Problem Solving
 - vi. Managing Time and Pressures
 - vii. Self-Management & Attitude.

Recommended Text Books / Reference Books:

- Effective Communication and Soft Skills by Nitin Bhatnagar Pearson Education India, 2011
- Communication N Soft Skills Paperback – 2013 by Niraj Kumar, Chetan Srivastava

MRSPTU

HUMAN ANATOMY AND PHYSIOLOGY – I (PRACTICAL)

Subject Code: BRMIS1-104

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

Human Anatomy & Physiology – Practical

- Demonstration of various parts of body
- Demonstration of cell and tissues of body
- Demonstration of parts of Digestive system.
- Demonstration of various parts of circulatory system
- Examination of blood film for various blood cells from stained slides
- Blood pressure estimation
- Demonstration of structural differences between skeletal, smooth and cardiac muscles
- Demonstration of various bones and joints.
- To study circulatory system from charts and transverse section (TS) of artery and vein.

APPLIED BIOCHEMISTRY (PRACTICAL)

Subject Code: BRMIS1-105

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

- To visit Clinical biochemistry laboratory observe and learn about various tests are being performed in clinical biochemistry laboratory.
- To practice Blood sample collection as per sample draw pattern.
- Basics of various routine laboratory tests performed e.g. determination of blood sugar levels, Liver function tests, renal function tests, and Urine sugar and protein level.
- To understand briefly the interpretation of various tests report to know about critical alerts.
- To visit Blood Gas Analysis laboratory and learn to analyse blood gases.

COMMUNICATION SKILLS (PRACTICAL)

Subject Code: BRMIS1-106

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

- Précis writing and simple passage from a prescribed text books. Atleast 100 words should be chosen and few questions from the passage may be said to answer.
- Speaking skill testing: Giving as small topic and to speak for at least two minutes on it.
- Group discussion on profession related topics
- To practice all forms communication i.e. drafting report, agenda notes, précis writing, E-mail drafting, circular, representations, press release, telephonic communication, practice of writing resume and Writing application of employment.
- Organising a mock interview.
- Locate a specified book in the library Find out some words in the dictionary Pronunciation, stress and intonation Give abbreviations of particular words and vice-versa Give meaning of some words Spell some words Practice of handling some communication system like telephone and noting down and conveying message.

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DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION

Subject Code: BRMIS1-107

L T P C

Duration: 45 (Hrs.)

3 0 0 3

Course Objectives:

- To make students understand the concept of drug abuse and their impact on public health.
- To make students understand the types of drugs.
- To make them aware of the impact of drugs addiction on families and peers.
- To make students understand the management and prevention of drug abuse.

Course Outcomes:

- Students gain knowledge about detrimental impacts of drug on health and relations.
- Students become aware about the physiological and sociological causes of drug abuse.
- Students acquire knowledge about types of drugs.
- Students acquire knowledge about management and prevention of drug abuse.

UNIT-1

(13 Hours)

- **Problem of Drug Abuse:** Concept and Overview; Types of Drug Often Abused
- **Concept and Overview**
 - i. What are drugs and what constitutes Drug Abuse?
 - ii. Prevalence of menace of Drug Abuse
 - iii. How drug Abuse is different from Drug Dependence and Drug Addiction?
 - iv. Physical and psychological dependence- concepts of drug tolerance
- **Introduction to drugs of abuse: Short Term, Long term effects & withdrawal symptoms**
- **Stimulants:** Amphetamines, Cocaine, Nicotine
- **Depressants:** Alcohol, Barbiturates- Nembutal, Seconal, Phenobarbital Benzodiazepines Diazepam, Alprazolam, Flunitrazepam
- **Narcotics:** Opium, morphine, heroin
- **Hallucinogens:** Cannabis & derivatives (marijuana, hashish, hash oil), Steroids and inhalants.

UNIT-2

(11 Hours)

- **Nature of the Problem:** Vulnerable Age Groups, Signs and symptoms of Drug Abuse
 - i. Physical indicators.
 - ii. Academic indicators.
 - iii. Behavioral and Psychological indicators.

UNIT-3

(11 Hours)

- **Causes and Consequences of Drug Abuse**
- **Causes**
 - (a) Physiological
 - (b) Psychological
 - (c) Sociological
- **Consequences of Drug Abuse**

- (a) For individuals
- (b) For families
- (c) For society & Nation

UNIT-IV

(10 Hours)

- **Management & Prevention of Drug Abuse**
 - a) Management of Drug Abuse
 - b) Prevention of Drug Abuse
 - c) Role of Family, School, Media, Legislation & Deaddiction Centers

Recommended Text Books / Reference Books:

1. Kapoor. T., Drug Epidemic among Indian Youth, Mittal Pub, New Delhi, 1985.
2. Modi, Ishwar and Modi, Shalini, Drugs: Addiction and Prevention, Rawat Publication, Jaipur, 1997.
3. Ahuja, Ram, Social Problems in India, Rawat Publications, Jaipur, 2003.
4. National Household Survey of Alcohol and Drug Abuse. New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
5. World Drug Report, United Nations Office of Drug and Crime, 2011
6. World Drug Report, United Nations Office of Drug and Crime, 2010.
7. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
8. The Narcotic Drugs and Psychotropic Substances Act, 1985, New Delhi: Universal, 2012.

**MRSPTU (B. SC. RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
BATCH 2020 ONWARDS**

Total Credits = 23

SEMESTER 2 nd		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BRMIS1-201	Human Anatomy & Physiology- II	3	1	0	40	60	100	4
BRMIS1-202	Microbiology	3	1	0	40	60	100	4
BRMIS1-203	Quality Management, Patient Safety & Disaster Management	1	1	0	40	60	100	2
BRMIS1-204	Applied Physics	2	1	0	40	60	100	3
BRMIS1-205	Computer Applications in Pharmacy (Theory)	3	1	0	40	60	100	4
BRMIS1-206	Human Anatomy & Physiology- II Lab	0	0	4	60	40	100	2
BRMIS1-207	Microbiology Lab	0	0	4	60	40	100	2
BRMIS1-208	Computer Applications in Pharmacy (Practical)	0	0	4	60	40	100	2
Total		--	--	--	380	420	800	23

HUMAN ANATOMY & PHYSIOLOGY- II

Subject Code: BRMIS1-201

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

- Students will be able to learn the terminology of the subject and basic knowledge of the cell structure and function of organs, organ systems and body fluids in normal human body.

Course Outcomes:

- Demonstrate knowledge of general overall physiological principles associated with metabolic processes; musculoskeletal system; cardiovascular system; aerobic and anaerobic program design

UNIT-I

(15 Hrs)

1. Respiratory system:

- Parts of Respiratory system structure of nose, nasal cavity, larynx, trachea, lungs, pleura, bronchopulmonary segments, Physiological Anatomy, Functions of the respiratory system.
- Types of respiration, respiratory membrane. - Lung volumes and capacities, vital capacity and factors affecting it.
- Transport of Oxygen-Forms of transportation, Oxy-hemoglobin dissociation curve and factors affecting it. - Transport of Carbon-Dioxide- Forms of transportation.
- Hypoxia-Definition, types, effects of hypoxia.
- Cyanosis-Definition and types.
- Artificial Respiration- CPR

UNIT-II

(15 Hrs)

2. Nervous System.

- Neuron, classification of Nervous System. Meninges, ventricles, CSF, Gross features of cerebrum, midbrain, pons, medulla oblongata, cerebellum, name of basal nuclei. Blood supply of brain, cranial nerves. Spinal cord and spinal nerves. Visual & auditory pathways, Structure of neuron, functions of nervous system.
- Classification and properties of nerve fibres Synapse structure and types Receptors. Definition, classification, properties, Reflex Arc Ascending and Descending tracts names and functions, Functions of Hypothalamus. Functions of Cerebellum and Basal Ganglia Functions of Cerebral Cortex, Autonomic Nervous System, Actions of sympathetic and parasympathetic system and their comparison.

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UNIT-III

(15 Hrs)

3. Urinary System:

- Parts of Urinary system, location and gross structure of kidney, ureter, urinary bladder, urethra. Kidneys structure of nephron, functions of kidney, Glomerular filtration Rate (GFR) and factors affecting it, Counter Current Mechanism, Bladder-its innervation, micturition reflex.

4. Reproductive system:

- Parts of male reproductive system, gross structure of testis, vas deferens, epididymis, prostate. Parts of female reproductive system, gross structure of uterus, ovary, fallopian tube, mammary gland.
- Male Reproductive System-Stages of spermatogenesis, function of Testosterone - Female Reproductive System-Ovulation, menstrual cycle, functions of Estrogen and progesterone

UNIT-IV

(15 Hrs)

4. Endocrine glands:

- Name of all endocrine glands, gross structure & functions of pituitary gland, adrenal gland, thyroid gland and parathyroid gland.
- Classification of Endocrine glands and their hormones. -Thyroid Gland-Physiological Anatomy, hormones secreted, functions, disorders Hypo and hyper secretion of hormone. -Adrenal Gland-Adrenal Cortex-Physiological Anatomy, its hormones and functions. - Adrenal Medulla-Hormones, functions. - Pituitary Gland- Anterior and posterior pituitary hormones and their functions, disorders.-Pancreas- Hormones and their functions, Diabetes Mellitus-types, pathophysiology, signs and symptoms. - Parathyroid Gland-Hormones and their functions.

Recommended Text Books / Reference Books:

1. Ross and Wilson, 'Anatomy & Physiology.
2. Clark, 'Anatomy and Physiology: Understanding the Human Body'.
3. Pearce, 'Human Anatomy for Nurses'.

MICROBIOLOGY

Subject Code: BRMIS1-202

L T P C

Duration: 60 (Hrs.)

3 1 0 4

Course Objectives:

- To introduce to the students regarding various kinds of microbes in terms of their structure, growth etc. & collection of clinical samples their processing and identification.

Course Outcomes:

- Describe/explain the processes used by microorganisms for their replication, survival, and interaction with their environment, hosts, and host population.

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Unit-1

10 Hours

1. Introduction and History of Microbiology

- Classification-Prokaryotes, Eukaryotes, Viruses, Fungi.
- Morphology-size, shape, arrangement
- Special characteristics–spores, capsules, enzymes, mortality, reproduction
- Gram staining, ZN staining (e) Different types of microscopes

Unit-2

20 Hours

1. Sterilization:

- Definition and different methods of sterilization including – Gaseous sterilization Plasma sterilization.
- Advantage and disadvantage of various methods and their controls.
- Sterilization of different instruments used in patients.
- Preparation of materials for Autoclaving: packing, loading, holding time, unloading

2. Disinfection:

- Definition and different type of methods including High level disinfectants
- Disinfection of patient care unit and rooms(O.T., Wards, ICUs & Laboratories)
- Central supply department Areas and floor plan for instrument cleaning high level disinfection & sterilizing area.

3. Asepsis:

- Universal Precautions
- Use of aseptic precautions to prevent infection,
- Safety mechanisms including vaccination in prevention of blood borne infections

Unit-3

20 Hours

- **Culture media-** Liquid and Solid, Collection & transport of specimens for Microbiological Investigations
- **Infection** - Source - Portals of entry - Spread of infection. Antimicrobial agents - Fundamental aspects - Antibiotic sensitivity testing.
- **Immunity** – Non specific - Natural & Acquired - Allergy and Anaphylaxis Outline of common infections, diseases, etiology, treatment and prevention. - Skin and soft tissue infections - Respiratory tract infections - Meningitis - Enteric infections - Urinary tract infections - Ocular infections - Wound infections - PUO Hospital acquired infections - Catheter associated urinary tract infections (CAUTI) - Ventilator associated pneumonia (VAP) - Catheter related blood stream infections (CRBSI) - Surgical Site Infection (SSI)
- 10. Pathogenic yeasts and fungi.

Unit-4

10 Hours

1. Virology.

- With special reference to hepatitis, poliomyelitis, HIV & Influenza.
- Viruses relevant in dialysis patients including their modes of transmission.

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- Diseases communicable to healthcare workers in hospital set up and their prevention.
- Prevention measures to combat spread of these infections by monitoring and control.

2. Microbial surveillance and sampling.

- Bacteriology of air, water and food.
- Hospital infection Control & Influenza.
- Viruses relevant in dialysis patients including their modes of transmission.
- Diseases communicable to healthcare workers in hospital set up and their prevention.
- Prevention measures to combat spread of these infections by monitoring and control.
- Microbial surveillance and sampling.
 - a) Bacteriology of air, water and food
 - b) Hospital infection Control.

Recommended Text Books / Reference Books:

1. M.J. Jr., Pelczar, E.C.S., Chan and R. Krieg, 'Microbiology', McGraw Hill.
2. G.J. Tortora, B.R. Funke and C.L. Case, 'Microbiology-An Introduction', Benjamin Cummings.
3. B.D. Davis, R. Dulbecco, H.N. Eisen and H.S. Ginsber, 'Microbiology', Harper & Row, Publishers.
4. R.Y. Stainer, J.L. Ingraham, M.L. Wheelis and P.R. Palmer, 'General Microbiology', MacMilan Press Ltd.

QUALITY MANAGEMENT, PATIENT SAFETY AND DISASTER MANAGEMENT

Subject Code: BRMIS1-203

L T P C
1 1 0 2

Duration: 30 (Hrs.)

Course Objective:

- The course will help students to understand the basic concepts of quality health Care and develop skills to implement sustainable quality assurance, Quality control and Quality improvement program in the healthcare system particularly in Operation theatre services.
- They shall be prepared to work in healthcare system primarily taking care of patient safety.

Course Outcomes:

- By learning Biomedical Waste management they will help prevent harm to workers, property, the environment and the general public from hazardous and infectious waste.
- While living on this earth humans and all other living creatures may face many types of natural and manmade disasters. Some contents of this subject are focused on preparing the students to deal with healthcare requirement during these disasters and help the life.

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Unit -1 **(10 Hrs)**

1. Quality management system (QMS):

- Understanding Quality and components of QMS i.e. Quality assurance, Quality control and Quality improvement.
- The basic concepts of quality in health Care.
- Standards and Norms.
- Quality Improvement Tools.
- Introduction to NABH guidelines.
- Implementation of QMS in Operation theatres.

Unit -2. **(5 Hrs)**

1. Basics of emergency care and life support skills:

- Vital signs and primary assessment.
- Basic emergency care – first aid and triage.
- Basic life support (BLS) following cardiac arrest.

Unit -3. **(10 Hrs)**

1. Fundamental aspects of BLS:

- immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system,
- Initial recognition and response to heart attack and stroke.
- Ventilations including use of bag-valve-masks (BVMs) d. Choking, rescue breathing methods e. One- and Two-rescuer CPR.

Unit -4. **(5Hrs)**

1. Fundamental aspects of BLS:

- Early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED).
- Managing an emergency including moving a patient
- Testing student's skills with focus on airways management and chest compressions.

Recommended Text Books / Reference Books:

1. Hospital Emergency Management Dr Robbert D.Mullar
2. Gis In Hospital And Healthcare Emergency Mangement Edited By Ricskinner
- 3.Handbook Of Disaster & Emergencuy Management Aarimkhoram & Mahesh

**MRSPTU (B. SC. RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
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APPLIED PHYSICS

Subject Code: BRMIS1-204

L T P C
2 1 0 3

Duration: 45 (Hrs.)

Objective:

- The subject will make them capable of understanding the physics involved in working of various instruments used in operation theatres.

UNIT-1

(10 Hrs)

- Energy: Potential energy and Kinetic energy, Mechanical efficiency, Energy and mass.
- Density of Gases: Molecular weight, Gram molecular weight. Avogadro number, Molecular agitation, Density.

UNIT-2

(10 Hrs)

- Heat: Thermometry, Thermistor, Thermocouple. Heat capacity of gases. Newton's Law of cooling, Convection, Conduction, Thermal Conductivity and Specific heat capacity.

UNIT-3

(10 Hrs)

- Pressure: Dalton's Law of partial pressure, Pressure gauges vapour pressure and ambient pressure.
- Compressed gases, Gas laws and their applications, filling of compressed gases and Filling ration.

UNIT-4

(15 Hrs)

- Flow of fluids: Viscosity, Law and laminar flow rate. Turbulent flow pressure loss due to abrupt change in bore of tube. Bernoulli's principle and clinical application of Bernoulli theorem,
- Diffusion, Osmosis, Law of diffusion, Isotonic solution. Oxidation, combustion, flames, deflagrations. Prevention of explosions

Recommended Text Books / Reference Books:

1. A Textbook of Fluid Mechanics R.K. Bansal
2. Schaum's Easy Outline of Applied Physics, Revised Edition
3. Optical Propagation in Linear Media.

**MRSPTU (B. SC. RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
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COMPUTER APPLICATIONS IN PHARMACY (Theory)

Subject Code: BRMIS1-205

L T P C

Duration: 60(Hrs.)

3 1 0 4

Course Objectives: Upon completion of the course the student shall be able to

- know the various types of application of computers in pharmacy
- know the various types of databases
- know the various applications of databases in pharmacy.

Course Outcomes:

- This subject deals with the introduction Database, Database Management system,
- computer application in clinical studies and use of databases.

UNIT -1.

(10 hours)

1. Number system:

- Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division.
- Concept of Information Systems and Software : Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the products.

UNIT-2.

(10 hours)

1. Web technologies:

- Introduction to HTML, XML,CSS and Programming languages, introduction to web servers and Server Products

2. Introduction to databases:

- MYSQL, MS ACCESS, Pharmacy Drug Database.

Unit-3.

(15 Hours)

1. Computer networks:

- introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
- Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer
- Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Unit-4.

(25 Hours)

1. Introduction to MS-Word:

- introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

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2. Introduction to Excel:

- introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

3. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

4. Introduction of Operating System:

- introduction, operating system concepts, types of Operating system.

5. Computers as data analysis in Preclinical development.

- Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).

LAB HUMAN ANATOMY & PHYSIOLOGY II

Subject Code: BRMIS1-206

L T P C

Duration: 30 Hrs

0 0 4 2

Objective: Demonstrations can be done with the help of models, charts and histological slides.

1. Demonstration of parts of excretory system
2. Demonstration of various parts of nervous system (brain and spinal cord)
3. Demonstration of reflex action
4. Demonstration of various parts of human reproductive system
5. To study digestive system from charts and TS of liver, spleen and pancreas from permanent slides.
6. Study of Urinary system
7. Study of Genital system (male & female) from charts and TS of testis and ovaries.
8. To study nervous system
9. To study various body fluids.

MICROBIOLOGY PRACTICAL LAB

Subject Code: BRMIS1-207

L T P C

Duration: 30 Hrs

0 0 4 2

EXPERIMENTS

1. To prepare cleaning agents & to study the technique for cleaning & sterilization of glassware.
2. To demonstrate the working & handling of Compound microscope.
3. To demonstrate the method of sterilization by autoclave, hot air oven.
4. To demonstrate the method of sterilization of media/solution by filtration.
5. To prepare working dilution of commonly used disinfectants.
6. To demonstrate the different morphological types of bacteria.

**MRSPTU (B. SC. RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
BATCH 2020 ONWARDS**

7. Preparation of culture media from each type.
8. To demonstrate aerobic culture and anaerobic culture.
9. To demonstrate biomedical waste segregation.
10. To plot growth curve of bacteria.

COMPUTER APPLICATIONS IN PHARMACY (Practical)

Subject Code: BRMIS1-208

L T P C
0 0 4 2

Duration: 30(Hrs.)

1. Design a questionnaire using a word processing package to gather information
2. About a particular disease.
3. Create a HTML web page to show personal information.
4. Retrieve the information of a drug and its adverse effects using online tools.
5. Creating mailing labels Using Label Wizard , generating label in MS WORD.
6. Create a database in MS Access to store the patient information with the required fields Using access.
7. Design a form in MS Access to view, add, delete and modify the patient record in the database.
8. Generating report and printing the report from patient database.
9. Creating invoice table using – MS Access.
10. Drug information storage and retrieval using MS Access.
11. Creating and working with queries in MS Access.
12. Exporting Tables, Queries, Forms and Reports to web pages.
13. Exporting Tables, Queries, Forms and Reports to XML pages.

Recommended books (Latest edition):

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi – 110002.

**MRSPTU B.SC. (RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
BATCH 2020 ONWARDS (3 YEARS COURSE)**

Semester 3rd		Contact Hrs.			Marks			Total Credits = 24
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	Credits
BRMIS1-301	Anatomy, Physiology, Pathology and Pharmacology related to Radiology – Theory	3	1	0	40	60	100	4
BRMIS1-302	Radiological Physics and Dark Room Techniques Theory	3	1	0	40	60	100	4
BRMIS1-303	General Radiology- Positioning Theory	3	1	0	40	60	100	4
BRMIS1-304	Fundamentals of Radio Imaging Technology	3	1	0	40	60	100	4
BRMIS1-305	Biostatistics and Computer Application	1	1	0	40	60	100	2
BRMIS1-306	Basic Principles of Hospital Management	1	1	0	40	60	100	2
BRMIS1-307	Anatomy, Physiology, Pathology and Pharmacology related to Radiology- Practical	0	0	2	60	40	100	1
BRMIS1-308	Radiological Physics and Dark Room Techniques Practical Comprehensive viva	0	0	2	60	40	100	1
BRMIS1-309	General Radiology- Positioning - Practical	0	0	2	60	40	100	1
BRMIS1-310	Fundamentals of Radio Imaging Technology - Practical	0	0	2	60	40	100	1
Total		-	-	-	480	520	1000	24

**MRSPTU B.SC. (RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
BATCH 2020 ONWARDS (3 YEARS COURSE)**

Semester 4th		Contact Hrs.			Marks			Total Credits= 22
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	Credits
BRMIS1-401	Radiology equipment – Theory	3	1	0	40	60	100	4
BRMIS1-402	Non-Contrast Radiography (Soft Tissue) - Theory	3	1	0	40	60	100	4
BRMIS1-403	Radiation Safety and Hazards	3	1	0	40	60	100	4
BRMIS1-404	Community Health	1	1	0	40	60	100	2
BRMIS1-405	Nutrition	1	1	0	40	60	100	2
BRMIS1-406	Radiology equipment – Practical	0	0	4	60	40	100	2
BRMIS1-407	Non-Contrast Radiography(Soft Tissue)- Practical	0	0	4	60	40	100	2
BRMIS1-408	Radiation Safety and Hazards-- Practical	0	0	4	60	40	100	2
Total		-	-	-	380	420	800	22

**MRSPTU B.SC. (RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
BATCH 2020 ONWARDS (3 YEARS COURSE)**

Semester 5th		Contact Hrs.			Marks			Total Credits= 25
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	Credits
BRMIS1-501	Basic and Advanced Ultra Sound Imaging – Theory	3	1	0	40	60	100	4
BRMIS1-502	Nuclear Medicine Imaging	3	1	0	40	60	100	4
BRMIS1-503	Basic and Advanced CT Scan – Theory	3	1	0	40	60	100	4
BRMIS1-504	Hospital Products, Promotion, Sales & Public relations and Physician's Office Management	3	1	0	40	60	100	4
BRMIS1-505	Occupational Safety & Health	1	1	0	40	60	100	2
BRMIS1-506	Healthcare	1	1	0	40	60	100	2
BRMIS1-507	Basic and Advanced Ultra Sound Imaging – Practical.	0	0	4	60	40	100	2
BRMIS1-508	Nuclear Medicine Imaging - Practical	0	0	2	60	40	100	1
BRMIS1-509	Basic and Advanced CT Scan – Practical -Practical.	0	0	4	60	40	100	2
Total		-	-	-	420	480	900	25

Semester 6th		Contact Hrs.			Marks			Credits
Subject Code	Subject Name	L	T	P	Int	Ext.	Total	Credits
BRMIS1-601	Quality Assurance & Radiation Safety (AERB Guidelines) in Diagnostic Radiology	3	1	0	40	60	100	4
BRMIS1-602	Research methodology	3	1	0	40	60	100	4
BRMIS1-603	Hospital Practice & Care of Patients	3	1	0	40	60	100	4
BRMIS1-604	Professionalism, Values and Management	3	1	0	40	60	100	4
BRMIS1-605	Medical Law & Ethics	3	1	0	40	60	100	4
BRMIS1-606	Quality Assurance & Radiation Safety -Practical	0	0	2	60	40	100	1
BRMIS1-607	Hospital Practice & Care of Patients - Practical	0	0	2	60	40	100	1
Total		-	-	-	320	380	700	22

1 Year Internship (Optional)

3years + 1 years internship program (For Nepal, and SAARC) countries only

This internship can be of 6+ 6 months or 4+4+4 months in different hospitals. The college will authenticate the certificates from hospitals after successful training. The university can enter Internship as satisfactory/unsatisfactory for 4th year in the degree, as is done by some universities for courses where there is Project Work for whole of the year.

Overall Marks / Credits

Semester	Marks	Credits
1 st	700	21
2 nd	800	23
3 rd	1000	24
4 th	800	22
5 th	900	25
6 th	700	22
Total	4900	137

**ANATOMY, PHYSIOLOGY, PATHOLOGY AND PHARMACOLOGY RELATED TO
RADIOLOGY – THEORY**

Subject Code: BRMIS1-301

L T P C

Duration: 60 (Hrs.)

3 1 0 4

Course Objectives:

- Anatomy provides information about structure, location, and organization of different parts of the body that is needed to truly understand physiology. Together, anatomy and physiology explain the structure and function of the different components of the human body to describe what it is and how it works

Course Outcomes:

- This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms

Unit-1 (15 Hrs)

- **Pathology:** Definition, important terminology, different branches
- **Cell Injury and Cellular Adaptations:** Normal Cell, *Cell Injury*: types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling. *Cell Death*: types- Autolysis, Necrosis, Apoptosis & Gangrene. *Cellular Adaptations*: Atrophy, Hypertrophy, Hyperplasia & Dysplasia.

Unit-2 (15 Hrs)

- **Inflammation:** Acute inflammation - vascular event, cellular event, inflammatory cells. Chronic Inflammation - general features, granulomatous inflammation, tuberculoma.
- **Hemodynamic Disorders:** Edema, hyperemia, congestion, hemorrhage, circulatory disturbances, thrombosis, ischemia & infarction.

Unit-3 (10 Hrs)

- **Healing:** Definition, different phases of healing, factors influencing wound healing.
- **Neoplasia:** Definition, , difference between benign tumor and malignant tumor

Unit-4 (20 Hrs)

- Surface anatomy, Plain film / conventional radiographs, Mammograph, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound, Nuclear medicine, Digitally Reconstructed Radiographs (DRR) , Portal imaging
- **Recommended Text Books / Reference Books:**
 1. Anatomy and Physiology for Radiographers- C.A. Werrick
 2. Imaging Atlas of Human Anatomy – Jamie Weir et al (Mosby-Elsevier)
 3. An Atlas of Normal Radiographic Anatomy – Richard and Alwin.
 4. Anatomy and Physiology for Nurses
 5. Comprehensive Radiographic Pathology. Ronald L. Eisenberg, NancyM. Johnson
 6. Surface and Radiological Anatomy – Hamilton et al (Heffer)
 7. An Atlas of normal radiographic Anatomy – Ross and Wilson.
 8. Dean : Basic Anatomy and Physiology for Radiographers (Blackwell)
 9. Fitzgerald : Anatomy 1600 multiple choice question (Butterworth)
 10. Hamilton et al : Surface and Radiological Anatomy (Heffer)
 11. X-Ray Equipment Maintenance and Repairs Workbook for Radiographers and Radiological Technologists Produced by the WHO Dept. of Essential Health Technology Series. Ian R. McClelland, Publisher- WHO, 2004.
 12. Quality Assurance Workbook for Radiographers & Radiologic Technologists, Peter J. Lloyd, Nonserial Publication, WHO

RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES THEORY

Subject Code: BRMIS1 -302

L T P C

Duration: 60 (Hrs.)

3 1 0 4

Course Objectives:

- To understand the mechanisms describing radioactive decay and the production of ionizing radiation; the interactions of ionizing radiation with matter; describe the imaging and treatment equipment used for the clinical care of cancer patients; discuss the use of devices and protocols for the accurate measurement of ionizing radiation and calibration of clinical equipment; understand the role of the physicist in radiation medicine

Course Outcomes:

- Basic principles of radiation physics: radioactivity, the physics of ionizing radiation, radiation dosimetry, imaging equipment, radiation therapy equipment and radiation detectors

Unit-1

(15 Hrs)

- **Dark Room: The processing area:** Dark room design: construction & illumination. Entrance safe lighting: types. Storage, Shelving of films, Cleaning and maintenance
- **X-Ray film:** Composition of single and double coated radiographic films, Structure of emulsion, film characteristics (speed, base + fog, gamma, latitude). Latent image formation, Image intensifiers and cassettes (structure and function), types of image intensifiers and relative advantage, loading and unloading of cassettes and their care/maintenance, Effects of kV and mA on variation of emitted radiation intensity, Determination of relative speeds, Film contrast, Film screen contact, Film storage, handling.

Unit-2

(15 Hrs)

- **Film Processing:** Principles: Acidity, Alkalinity, pH, The processing cycle, development, developer solution, Fixing, fixer solution, washing, drying replenishment, checking and adjusting. Replenishment rates, manual and automatic processing, Silver recovery, Auto and manual chemicals

Unit-3

(10 Hrs)

- **Equipment for Film Processing:** Functions of various components, Film roller transport - transport time, film feed system, Importance and relation to temp, fixed and variable time cycles. Care and maintenance (cleaning routine and methods of cleaning).

Unit-4

(20 Hrs)

- **Factors affecting Image Quality:** Meaning of radiographic image contrast, density, resolution, sharpness, magnification and distortion of image, noise and blur. Radiographic illuminators and viewing conditions, visual acuity and resolution. Quality assurance of the related equipment and its benefits w.r.t visual assessment.

Recommended Text Books / Reference Books:

1. Physics for Radiography - Hay and Hughes
2. Ball and mores essential physics radiographers, IV edition, Blackwell publishing.
3. Basic Medical Radiation physics – Stanton. 4. Christensen's Physics of Diagnostic Radiology – Christensen.
4. X-Ray Equipment Maintenance and Repairs Workbook for Radiographers and Radiological Technologists Produced by the WHO Dept. of Essential Health Technology Series. Ian R. McClelland, Publisher- WHO, 2004.
5. Quality Assurance Workbook for Radiographers & Radiologic Technologists, Peter J. Lloyd, Nonserial Publication, WHO

GENERAL RADIOLOGY POSITIONING THEORY

Subject Code: BRMIS1-303

L T P C

Duration: 60 (Hrs.)

3 1 0 4

Course Objectives:

- It is used to diagnose or treat patients by recording images of the internal structure of the body to assess the presence or absence of disease, foreign objects, and structural damage or anomaly. During a radiographic procedure, an x-ray beam is passed through the body

Course Outcomes: Students will demonstrate competency in image evaluation.

- Students will apply knowledge and skills to practical situations.
- Students will adapt to patient's condition when performing non-routine procedures.
- Students will position patients with accuracy.
- Students will select appropriate technical factors.
- Students will apply principles of radiation protection.

Unit-1

(15 Hrs)

- Upper extremity - basic views
- Lower extremity (including pelvis) - basic views
- Spine - Cervical, dorsal, lumbar, lumbo-sacral (including functional views).

Unit-2

(15 Hrs)

- Skull – including trauma cases
- Facial bones (nasal bones, zygomatic, orbits, maxilla)
- Mandible, Temporo- Mandibular Joints, Mastoids, petrous temporal bones

Unit-3

(15 Hrs)

- Chest including thoracic cage and sternum
- Abdomen - erect, supine, lateral decubitus
- Soft tissue radiography : Larynx, pharynx, nasopharynx, thoracic inlet

Unit-4

(15 Hrs)

- Dental radiography
- General Pediatric Radiography
- High kV technique
- Macro radiography

Recommended Books:

1. Diagnostic Radiography" Glenda. J. Bryan (ELBS)
2. "Positioning in Radiography" Clarks (CBS Publishers, New Delhi.) Reference books "Radiographic positions and Radiological procedures" Vinita Merrill (Jaypee Brothers, New Delhi)
3. "Manual of Radiographic Technique" T. Holn& P.E.S. Palmer (World Health Organisation)
4. " Text book of Radiologic -Technology" Jacoby and Paris (Mosby
5. "Contrast Radiography" Scarrow (Schering Chemical)
6. " A manual of Radiographic positioning" Greenfield and Cooper (Lipincott)
7. "Illustrated guide to X-ray Techniques" Culliman (Blackwell)
8. A Guide to Radiological Procedures" Stephen Chapman & Richard Nakielny. (A Prism books (P) Ltd., Bangalore) 8. Applied angiography for Radiographers Paul & Douglas (W.B. Saunder company

FUNDAMENTALS OF RADIO IMAGING TECHNOLOGY

Subject Code: BRMIS1-304

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

- Imaging is a range of tests used to create images of parts of the body. These can help: screen for possible health conditions before symptoms appear. diagnose the likely cause of existing symptoms.

Course Outcomes:

- Demonstrate knowledge of radiology and imaging techniques for efficient diagnosis of the diseased or un-diseased state.
- Identify and solve complex problems arising during the procedure of radio diagnostic procedure of the patients.
- Utilize modern tools and modalities in the arena of medical imaging technology for better outcomes

Unit-1

(10 Hrs)

- Properties of Light,
- Uses of Light in Medicine, Lasers and Holography,
- Doppler's effect, Use of principle of Doppler's effect in Diagnostic radiology (e.g. Echo, blood flow measurement).
- Ultrasonic wave, production of ultrasonic wave (piezo-electric effect) in ultrasonography.

Unit-2

(25 Hrs)

- Introduction to X-Rays, Properties of X- Rays, X-Ray production, Bremstrahlung phenomenon, factors affecting X-Ray emission spectra, X-Ray quality and quantity, HVL measurements, filtration, reflection and transmission targets, requirements for X-Ray production (electron source, target and anode material), tube voltage, current, space charge, early X-Ray tubes (coolidge tubes, tube envelop and housing) cathode assembly, X-Ray production efficiency
- **Interaction with matter** grids & bucky tables etc (except biological interactions)
- **X-Ray Tubes**- Historical aspects ,Construction of various types of X-Ray Tubes & their functioning (The stationary anode X-Ray tube, rotating anode X-Ray tube , Heavy duty X-Ray tube, The grid controlled X-Ray tube, Mammography X-Ray tube, Micro focus X-Ray tube, Super rotalix ceramic X-Ray tube etc) The insert/filament/anode rotation/anode/anode speed, X-Ray tube inherent and added filtration

Unit-3

(10 Hrs)

- Physical quantity, its unit and measurement- Fundamental and derived quantity, SI unit, various physical/radiation quantity used in diagnostic radiology and its unit (for example, KvP, mA, mAS, Heat unit (HU), Radiation exposure, Absorbed dose, Equivalent dose, etc.).

Unit-4

(15 Hrs)

- **Radioactivity** : Structure and property of nucleus, Nuclear forces, Binding energy, Radioactive decay, law of radioactive decay (decay equation, half-life, mean life), excitation & ionization, characteristic X-Ray, charts of radionuclides: alpha, beta, positron, gamma emissions, Modes of decay, isomeric transitions, internal conversion, Naturally occurring radio-nuclides.
- **Recommended Text Books / Reference Books:**
 1. "Christensen's Physics of diagnostic Radiology" (Lea & Febiger) Reference books
 2. " First year Physics for Radiographers Hay & Hughes (ELBS)
 3. "Basic Medical Radiation Physics Stantor (Appleton- Century & Crofts)

**MRSPTU B.SC. (RADIO MEDICAL IMAGING TECHNOLOGY) SYLLABUS
BATCH 2020 ONWARDS (3 YEARS COURSE)**

4. X- ray Equipment for student Radiographers" By: Chesney & Chesney (Blackwell)
5. A Manual of Radiographic equipment. By: Sybil M. Stockley (Churchill Livingstone)
6. "Principles of Diagnostic X-ray apparatus" by : Hill (Macmillan.)
7. "Radiologic science for Technologist" Stewart C. Bushong , (M Mosby.)

BIostatISTICS AND COMPUTER APPLICATION

Subject Code: BRMIS1 -305

L T P C
1 1 0 2

Duration: 30 (Hrs.)

Course Objectives:

- Defining the type and quantity of data need to be collected. Organizing and summarizing the data. Analyzing the data and drawing conclusions from it. Assessing the strengths of the conclusions and evaluating their uncertainty

Course Outcomes:

- In this course we'll learn how to effectively collect data, describe data, and use data to make inferences and conclusions about real world .

Unit -1.

(10 Hrs)

- Definition & Calculations of mean(by both direct and shortcut method and step deviation method) mode and Median(individual observation, discrete observation and continuous observation .
- Probability

Unit-2.

(10 Hrs)

- Tabulation of Data Graphical Presentation of Frequency Distribution :Line frequency, Histogram(for equal and unequal class interval, inclusive data and for Midvale)
- Frequency polygon
- Frequency curve
- Cumulative frequency curve

Unit-3.

(10 Hrs)

- **Computer** : Input/ output, memory, data representation and number system, software, Abbreviation related to computer

Reference Book

- Mausner & bahn : Epidemiology-An Introductory text, 2nd Ed., W.B. Saunders Co.
- Richard f. Morton & j. Richard hebd : A study guide to Epidemiology and Biostatistics, 2 nd Ed., University Park Press, Baltimore.
- Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

BASIC PRINCIPLES OF HOSPITAL MANAGEMENT

Subject Code: BRMIS1 -306

L T P C
1 1 0 2

Duration: 30 (Hrs.)

Course Objectives:

- The project “Hospital management system” is aimed to develop to maintain the day –to-day state of admission/discharge of patients, list of doctors, reports generation, and etc

Course Outcomes:

- Hospital Management course trains the students for managerial and administrative roles at a hospital or a healthcare institute

Unit-1

(10 Hrs)

- Quality assurance and management: Concepts of Quality of Care, Quality Improvement Approaches, . Standards and Norms, Quality Improvement Tools, Introduction to NABH guidelines.

Unit-2

(10 Hrs)

- Basics of emergency care and life support skills - Basic life support (BLS), cardiopulmonary resuscitation (CPR), Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs) , Choking, rescue breathing methods , One- and Two-rescuer CPR. Using an AED (Automated external defibrillator). Managing an emergency including moving a patient

Unit-3

(10 Hrs)

- Definition of Biomedical Waste, Waste minimization, BMW – Segregation, collection, transportation, treatment and disposal (including color coding), Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste , BMW Management & methods of disinfection , Modern technology for handling BMW g. Use of Personal protective equipment (PPE), Monitoring & controlling of cross infection (Protective devices)

Recommended Text Books / Reference Books:

1. National Health Programs Of India National Policies and Legislations Related to Health: 1 J. Kishore (Author)
2. A Dictionary of Public Health Paperback by J Kishor
3. Health System in India: Crisis & Alternatives , National Coordination Committee, Jan SwasthyaAbhiyan
4. In search In Search of the Perfect Health System
5. Central Bureau of Health Intelligence (1998). Health Information of India, Ministry of Health and Family Welfare, New Delhi.
6. Goyal R. C. (1993). Handbook of Hospital Personal Management, Prentice Hall of India, New Delhi, 17–41. Ministry of Health and Family Welfare (1984). National Health Policy, Annual Report (1983–4), Government of India, New Delhi
7. Historical Development of Health Care in India, Dr. Syed Amin Tabish,
8. cultural Competence in Health Care by Wen-Shing Tseng (Author), Jon Streltzer (Author)

**ANATOMY, PHYSIOLOGY, PATHOLOGY AND PHARMACOLOGY RELATED TO
RADIOLOGY-PRACTICAL**

Subject Code: BRMIS1-307

L T P C

Duration: 30(Hrs.)

0 0 2 1

Objective: Anatomy provides information about structure, location, and organization of different parts of the body that is needed to truly understand physiology. Together, anatomy and physiology explain the structure and function of the different components of the human body to describe what it is and how it works

Experiments:

- Study of human skeleton.
- Study with the help of charts and models of the following systems and organs. a) Digestive system e) Reproductive system b) Respiratory system f) Nervous system c) Cardio-vascular system g) Eye d) Urinary system h) Ear
- Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle, connective tissue and nervous tissue.
- Examination of blood films for TLC, DLC and malarial parasite.
- Determination of clotting time of blood, erythrocyte sedimentation rate and hemoglobin value.
- Recording of body temperature, pulse, heart rate, blood pressure and ECG.
- Demonstration of basic procedures with all radiographic equipments
- Computer tomography
- Mammograph
- Magnetic resonance imaging (MRI)
- Ultrasound
- Digitally reconstructed radiographs (DRR)
- Portal imaging

**RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES PRACTICAL
COMPREHENSIVE VIVA**

Subject Code: BRMIS1-308

L T P C
0 0 2 1

Duration: 30(Hrs.)

Objective: To understand the mechanisms describing radioactive decay and the production of ionizing radiation; the interactions of ionizing radiation with matter; describe the imaging and treatment equipment used for the clinical care of cancer patients; discuss the use of devices and protocols for the accurate measurement of ionizing radiation and calibration of clinical equipment; understand the role of the physicist in radiation medicine

Experiments:

- Study of dark room: Day light processing-location of the dark room
- dark room illumination equipment and layout-x-ray viewing room.
- Daylight handling-daylight systems with cassettes-without cassettes.
- X-ray film materials: Structure of film emulsion-Grain technology-Geletine-Basic film types- Film formats and packing-Direct exposure duplitised films-Single coated emulsions Films for specialised use-manufacturing process.
- Sensitometry :Photographic density—characteristic curve –information from the characteristic curve-speed Vs definition
- Storage of x-ray film-unprocessed film-radiographs
- x-ray cassette-design-types- Identification of cassettes- General care of cassettes and storage.
- .To study different equipment of film processing
- to study different factors effecting film quality

GENERAL RADIOLOGY POSITIONING-PRACTICAL

Subject Code: BRMIS1-309

L T P C
0 0 2 1

Duration: 30(Hrs.)

Objective: It is used to diagnose or treat patients by recording images of the internal structure of the body to assess the presence or absence of disease, foreign objects, and structural damage or anomaly. During a radiographic procedure, an x-ray beam is passed through the body

Experiments

- Spine- vertebra and disc, spinal cord and meninges
- X ray study of bones of skull (troma cases), facial bones
- Dental radiography
- General pediatric radiography
- High kv technique
- Table top exposure rate measurement in fluoroscopy.
- demonstration of basic procedures with all radiographic equipments. Examples- demonstration of ctscan, mri, c.r.D.r.
- demonstration of basic radiotherapy units.

FUNDAMENTALS OF RADIO IMAGING TECHNOLOGY - PRACTICAL

Subject Code: BRMIS1-310

L T P C
0 0 2 1

Duration: 30(Hrs.)

Objective: Imaging is a range of tests used to create images of parts of the body. These can help: screen for possible health conditions before symptoms appear. diagnose the likely cause of existing symptoms.

Experiments:

- Quality assurance and Radiation safety survey in diagnostic X-ray installations.
- Community orientation and clinical visit: Visit will include visit to the entire chain of healthcare delivery system - sub centre, PHC, CHC, SDH, DH and Medical College, private hospitals, dispensaries and clinics. .
- Perform and execute the patient care techniques.
- plan and perform the radiation protection using the monitoring devices
- Clinical visit to their respective professional department within the hospital
- Table top exposure rate measurement in fluoroscopy.
- .Demonstration of basic procedures with all radiographic equipments. Examples- demonstration of CT scan , MRI, C.R. D.R.
- Demonstration of basic Radiotherapy units
- Port film, processing and development
- techniques of Radiotherapy such as SRS, SRT, IMRT, IGRT and Tomotherapy
- INTERVENTIONAL RADIOLOGY : Indication , Clinical Application , Name of different type of procedure

4TH SEMESTER

RADIOLOGY EQUIPMENT- THEORY

Subject Code: BRMIS1 -401

L T P C

Duration: 60 (Hrs.)

3 1 0 4

Course Objectives:

- This course has been designed to provide the knowledge and foundation to efficiently process radiographic images from a variety of different types of radiographic recording media including: x-ray film, computed radiography (CR), and direct-capture radiography (DR)

Course Outcomes:

- This course prepares students to practice as a radiographer. Students have the opportunity to simulate in a laboratory setting the skills needed to efficiently process diagnostic radiographic images utilizing x-ray film and computed radiography (CR)

Unit-1

(15 Hrs)

- **X-ray machines – X-Ray tube:** historical aspects - early X-Ray tubes (coolidge tubes) - construction of X-Ray tubes, requirements for X-Ray production (electron source, target and anode material), anode angulation and rotating tubes- tube voltage, current - space charge - tube envelop and housing - cathode assembly, XRay production efficiency, advances in X-Ray tubes, Common factors affecting thermionic emission -specialized types- grid controlled and high speed tubes. Inherent filtration, radiation leakage and scattered radiation. Heat dissipation methods- Interlocking and X-Ray tube overload protection -tube rating, heat units - operating conditions, maintenance and Q.A procedures.
- **Portable/Mobile X-ray units-** Equipment for mobile radiography-principleuses- mobile image intensifiers– Capacitor discharge unit- advantages and limitations -positioning differences-skill in using mobile units - - radiation protection.- mobile units types- differences-Cordless mobiles-selection of equipment..

Unit-2

(15 Hrs)

- **Fluoroscopy:** Fluoroscopic equipment-Direct fluoroscopy – The serial changer (spot film device) - Fluoroscopic screen -fluoroscopic image -factors affecting the Fluoroscopic image. Image intensifier tubes – principle construction and function regarding intensified image- cine flurography-mode of operation - Types of day light film handling system-optical coupling and methods of viewing- Automatic brightness control- tilting tables - over and under couch tubes-safety features. The television process – television camera tube– the Cathode ray tube – ielevision image-CCTV. Quality assurance tests for fluoroscopic equipment.
- **Computed Radiography (C.R)** –equipment parts –advances- principle of imaging – applications- advantages & disadvantages.
- **Digital Radiography**– principle - photostimulable phosphors-image acquisition-digital spot imaging - equipment parts –advances-imaging– advantages & disadvantages. Picture characteristics - archiving possibilities-transfer system and designs- Image recording devices-laser imager and multiformatter-Future developments.

Unit-3

(10 Hrs)

- **Mammography** -basic principle, equipment & image acquisition-conventional & digital mammo studies- Mammotomogram.

- **Dental Radiography** – Equipment Basics –types of equipments- Intra oral radiography unit-orthopantomograph unit -imaging techniques- Dental films-film types and processing.
- **Angiography Equipments**- Basic physics and principle of image acquisition convention alangio- DSA-Cardiac Cath lab. Equipments- advantages-limitations – Dosimetry – Maintenance

Unit-4

(20 Hrs)

- **Tomography:** Theory of tomography – multi section radiography- Tomography equipment- Basic requirements and controls, attachments. Computed tomography – Scanning principle – Reconstruction of image – storing the image – viewing the image – evaluation of the image. Types of movements and applications-Effect on image of variation in focus object distance- Object film distance, exposure angle, and tube movement pattern.
- **Computed Tomography**- Basic physics – Tomography principle - detectors technology-digital fundamentals- Basic data acquisition concepts -Scanning principle - basics of plain studies- Image reconstruction- artifacts- contrast studies,-special procedures – image quality- storing the image – viewing the image – evaluation of the image- Equipment for computed tomography – Table, scanning gantry X-Ray generator – CT control console. Scanner types - technologic considerations of sequential /spiral volume zoom -computer hard wire of software– CT computer and image processing system- Options and accessories for CT systems.-Tools for use in CT guided Interventional procedures- Dosimetry- Future developments.
- **Recommended Books:**
 1. "Diagnostic Radiography" Glenda.J. Bryan (ELBS)
 2. "Positioning in Radiography" Clarks (CBS Publishers, New Delhi.)
 3. "Radiographic positions and Radiological procedures" Vinita Merrill (Jaypee Brothers, New Delhi) 2."Manual of Radiographic Technique" T. Holn& P.E.S. Palmer (World Health - 12 - 12 Organisation)
 4. " Text book of Radiologic -Technology" Jacoby and Paris (Mosby)
 5. "Contrast Radiography" Scarrow (Schering Chemical)
 6. " A manual of Radiographic positioning" Greenfield and Cooper (Lipincott)
 7. "Illustrated guide to X-ray Techniques" Culliman (Blackwell)
 8. " A Guide to Radiological Procedures" Stephen Chapman & Richard Nakielny. (A Prism books (P) Ltd., Bangalore)
 9. Applied angiography for Radiographers " Paul & Douglas (W.B. Saunder Company)

NON-CONTRAST RADIOGRAPHY (SOFT TISSUE)-THEORY

Subject Code: BRMIS1 -402

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- To Introduce concept of Non contrast radiology

Course Outcomes:

- Students will have knowledge of concept of soft tissue radiology and their procedure

* For all units: Radiographic and technical considerations, equipment requirement, conditions essential for optimal image quality

Unit-1 **(15 Hrs)**

- Clinical indications and contraindications - patient preparation
- Radiographic projections - abdomen – soft tissue radiography

Unit-2 **(15 Hrs)**

- Dental Radiography
- Radiation (projection and timing)

Unit-3 **(15 Hrs)**

- Normal anatomy on films, foreign body localization , additional techniques,
- Identification & differentiation of various Images

Unit-4 **(15 Hrs)**

- Radiation protection, patient management, care of patients during and after examination.
- Radiographer's role in the team.

Recommended Books:

1. Textbook of Dental radiology by Pramod John R
2. Textbook of Radiology handbook by J.S. Benseller, D.O.
3. Quantitative ultrasounds in soft tissues by Jonathan Mamou and Michael L. Oelze
4. A Textbook of Radiology and imaging by David Sutton

RADIATION SAFETY AND HAZARDS

Subject Code: BRMIS1 -403

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- A primary goal of the radiation protection program is to reduce radiation doses wherever and whenever reasonably achievable, thereby reducing the health risk that is assumed to be proportional to the radiation dose

Course Outcomes:

- Identify the parts of the x-ray machine and explain their purpose and function. Explain how x-rays are produced and how they travel without harm to patient. Demonstrate use of the controls on a x-ray machine and explain how they influence the x-ray beam. Compare the effects that x-radiation has on a variety of biological and non-biological materials.

Unit-1 (15 Hrs)

- **Radiation protection:** Natural and background radiation (cosmic, terrestrial).
- Principles of radiation protection.
- Time - distance and shielding, shielding calculation and radiation survey, Personnel dosimeters (TLD and film batches), occupational exposure, radiation protection of self and patient,

Unit-2 (15 Hrs)

- **Radiation protection:** ICRP, NRPB, NCRP and WHO guidelines for radiation protection, pregnancy and radiation protection.
- Revision of Somatic & Genetic Radiation effects, Units Detection & measurements Radiation protection Standards, radiation surveys & regulations. Patient Protection

Unit-3 (15 Hrs)

- **Biological effects of Ionizing Radiation:** Ionization, excitation and free radical formation, hydrolysis of water,
- Action of radiation on cell, DNA, RNA, chromosome, tissue and organ, cytoplasm, cellular membranes, effects of whole body and acute irradiation.
- Dose fractionation. Effects of ionizing radiation on each of major organ system including fetus stochastic and non-stochastic effects.

Unit-4 (15 Hrs)

- **Biological effects of Ionizing Radiation:** Mean and lethal dose, direct and indirect effects, multi target and multi hit theory.
- Radio sensitivity factors affecting radio sensitivity, RBE, Survival curves.
- **Biological effects of non-ionizing radiation:** Ultrasound, Sound lasers, IR, UV, Magnetic fields

Recommended Text Books / Reference Books:

1. Text book 1." Care of patient in diagnostic Radiography" Chesney & Chesney (Blackwell Scientific) Reference books
2. " Chesney's Care of the patient in Diagnostic Radiography" Pauline J . Culmer. (Blackwell Scientific)
3. " Aid to Tray and Trolley Setting" Marjorie Houghton (Bacilliere)
4. "First Aid' Haugher& Gardner (Hamlyn.)
5. "Practical nursing and first- aid" Ross and Wilson (Livingstone)

COMMUNITY HEALTH

Subject Code: BRMIS1 -404

L T P C
1 1 0 2

Duration: 30 (Hrs.)

Course Objectives:

- The aim of community health practice is to promote health and efficiency, prevent and control diseases and disabilities and prolong life by providing need based, well balanced comprehensive health care services to community at large through organized community efforts.

Course Outcomes:

- Community health is a medical specialty that focuses on the physical and mental well-being of the people in a specific geographic region

Unit-1

(10 Hrs)

- General concepts of health and diseases with reference to natural history of disease with pre-pathogenic and pathogenic phase.
- The role of socio-economic and cultural environment in health and diseases-Epidemiology and scope.
- Public health administration-An overall view of the health Administration set up at .
- centre and state levelThe National Health Programmes- National Health programmes including tuberculosis, malaria, MCH and HIV/AIDS.

Unit-2

(10 Hrs)

- Health problems in vulnerable groups-Pregnant and lactating women and infants and school going children-occupational groups, geriatrics.
- Occupational Health- Definition, scope-Occupational diseases, prevention of occupational diseases and hazards.
- Social security and other measures for the protection of occupational hazards, accidents and disease. Details of compensation acts.

Unit-3

(10 Hrs)

- Family planning objectives of National family planning methods. A general idea of advantages and disadvantages of the method.
- Mental Health- community aspects of mental health; role of physiotherapists, therapists in mental health problems such as mental retardation etc.
- Communicable disease-An overall view of the communicable disease. Classification according to the principal mode of transmission. Role of insects and their vectors.
- International health agencies

Recommended Text Books / Reference Books:

1. Textbook of Preventive and Social medicine by k. Park, 21st edition, published by BanarsidasBhanot

NUTRITION

Subject Code: BRMIS1 -405

L T P C
1 1 0 2

Duration: 30 (Hrs.)

Course Objectives:

- Helping people lose weight, maintain a healthy weight, and prevent chronic disease by improving dietary habits requires providing education about food and nutrition, assuring access to healthier food options, and promoting the desire and ability to become physically active.

Course Outcomes:

- Nutrition also focuses on how people can use dietary choices to reduce the risk of disease, what happens if a person has too much or too little of a nutrient, and how allergies work. Nutrients provide nourishment. Proteins, carbohydrates, fat, vitamins, minerals, fiber, and water are all nutrients.

Unit-1

(5 Hrs)

- Introduction to science of nutrition
- Food pattern and its relation to health
- Factors influencing food habits, selection and food stuffs

Unit-2

(12 Hrs)

- Food selection, storage & preservation
- Classification of nutrients – macronutrients and micronutrients
- Proteins – types, sources requirements and deficiencies of proteins
- Carbohydrates sources, requirements & efficiency

Unit-3

(13 Hrs)

- Fats – types, sources, requirements, deficiency and excess of fats
- Water – sources of drinking water, requirements, preservation of water
- Minerals – types, sources, requirements deficiencies of minerals
- Vitamins – types, sources, requirements deficiencies of vitamins
- Planning diets including renal diets

Recommended Text Books / Reference Books:

1. Biochemistry Ed. Lubert Stryer. W.H. Freeman and Company, New York.
2. Principles of Biochemistry. Ed. Lehinger, Nelson and Cox. CBS Publishers and distributors.
3. Harper's Biochemistry, Ed. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell. Appleton and Lange, Stamford, Connecticut.
4. Textbook of Biochemistry with Clinical Correlations. Ed. Thomas M. Devlin, Wiley-Liss Publishers.
5. Tietz Textbook of Clinical Chemistry. Ed. Burtis and Ashwood. W.B. Saunders Company.
6. Biochemistry. Ed. Donald Voet and Judith G. Voet. John Wiley & Sons, Inc.

RADIOLOGY EQUIPMENT – PRACTICAL

Subject Code: BRMIS1-406

L T P C
0 0 4 2

Duration: 30(Hrs.)

Objective: This course has been designed to provide the knowledge and foundation to efficiently process radiographic images from a variety of different types of radiographic recording media including: x-ray film, computed radiography (CR), and direct-capture radiography (DR)

Experiment

- Study with charts, models & power point presentations Atomic structure, X-ray tubes, X-ray circuits involving students to present and discuss.
- Congruence of Radiation and Optical field and beam.
- Determination of focal spot size of diagnostic X-ray tube.
- K.V. and Exposure time testing.
- Linearity testing of the Timer.
- Consistency of M.A. loading.
- Consistency of Radiation Output.
- Evaluation of Total filtration of the tube.

NON-CONTRAST RADIOGRAPHY SOFT TISSUE – PRACTICAL

Subject Code: BRMIS1-407

L T P C
0 0 4 2

Duration: 30(Hrs.)

Objective: Course Objectives: To Introduce concept of Non contrast radiology

Experiments

- Non-contrast CT chest
- Dental Radiographs
- Mammography
- Radiography of soft tissue of the foot and ankle with diffraction enhanced imaging

RADIATION SAFETY AND HAZARDS -PRACTICAL

Subject Code: BRMIS1-408

L T P C
0 0 4 2

Duration: 30(Hrs.)

Objective: A primary goal of the radiation protection program is to reduce radiation doses wherever and whenever reasonably achievable, thereby reducing the health risk that is assumed to be proportional to the radiation dose

Experiment

- Film screen contact testing.
- Table top Exposure rate measurement in fluoroscopy.
- C.R (principle, equipment & imaging)
- Digital Radiography (principle, equipment & imaging)
- Mammography (basic principle, equipment & image acquisition)
- CT (Basic physics –Tomography principle - basics of plain studies, contrast studies, Special procedures)
- MRI (basic principle – imaging methods - slice section- plain & contrast studies – image contrast – factors affecting image quality)
- USG (Basic acoustics - ultrasound terminologies – Interaction of US with matter – Ultrasound display modes etc)

5TH SEMESTER

BASIC AND ADVANCED ULTRA SOUND IMAGING – THEORY

Subject Code: BRMIS1 -501

L T P C

Duration: 60 (Hrs.)

3 1 0 4

- **Course Objectives:** Medical ultrasound (also known as diagnostic sonography or ultrasonography) is a diagnostic imaging technique, or therapeutic application of ultrasound. It is used to create an image of internal body structures such as tendons, muscles, joints, blood vessels, and internal organs. Its aim is often to find a source of a disease or to exclude pathology.
- **Course Outcomes:** Helpful to understand what types of sonography courses you might be required to take and analyses the report produced by ultrasounds.

Unit-1 (15 Hrs)

- Basic acoustics principle- Basic physics of sound propagation in different media, production of Ultrasound (piezoelectric effect)
- Terminology - physical principle.
- Different types of machines –Portable etc.
- U/S generators, different modes, doppler U/S. clinical applications.
- Image display & recording systems

Unit-2 (15 Hrs)

- ultrasound properties propagation in tissue, absorption, scattering, reflection and refraction- acoustic impedance – piezo electric effect – transducer – Pulsar – receiver – beam/sensitivity and gain - generators- A, B and M scanning & echo modes- transducers-techniques of sonography-equipment selection- display methods
- Transducers (scanning probes) - construction types and uses
- Types and shapes/choice/care and maintenance
- Recording devices/orientation of the image
- Focus of the beam/sensitivity and gain

Unit-3 (15 Hrs)

- Artifacts/quality control
- Acoustic coupling agents - Ingredients/preparation
- Interventional – accessories + Colour Doppler /portable systems

Unit-4 (15 Hrs)

- ultrasound image formation
- Data storage and display
- Image and artifacts, doppler instrumentation, doppler equation, transducer
- Quality assurance and performance tests
- Bio effects and safety considerations.
- Types of machines –portable systems- acoustic coupling agents-ingredients/preparation

Recommended Text Books / Reference Books:

1. "Christensen's Physics of diagnostic Radiology" (Lea &Febiger) Reference books
2. " First year Physics for Radiographers Hay & Hughes (ELBS)
3. 'Basic Medical Radiation Physics Stantor (Appleton- Century & Crofts)
4. Processing and Quality Control – William
5. "Radiologic science for Technologist" Stewart C. Bushong, (M Mosby.)
6. "Recent advances in Radiology and Medical Imaging" Lodge & Steiner (Churchill Livingstone)

NUCLEAR MEDICINE IMAGING

Subject Code: BRMIS1 -502

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

- **Course Objectives:** Nuclear medicine imaging provides unique information that often cannot be obtained using other imaging procedures and offers the potential to identify disease in its earliest stages.
- **Course Outcomes:** After studying this graduates are able to acquire, comprehend, apply and evaluate patient information at genetic level sufficiently well to offer appropriate patient care

Unit -1 (15 hrs)

- History of nuclear medicine imaging.
- Isotopes And Radionuclides
- Production Of Radionuclides
- Radio Activity
- Radioactive Transformations

Unit-2 (15 hrs)

- Specific Activity
- Radiopharmaceuticals And Their Preparation
- Precautions While Handling Radiopharmaceuticals
- Principles Of Tracer Techniques
- Instrumentation- Multihole Collimator, Crystal, Photomultiplier, Computer, Monitor.
- Scanning Technique

Unit-3 (10 Hrs)

- Resolution- Spatial Temporal
- Gamma Camera
- Rectilinear Scanner

Unit-4 (20 Hrs)

POSITION EMISSION TOMOGRAPHY (PET)

- Single Photon Emission Computed Tomography (SPECT)
- Radio Immuno Assay (RIA)
- Documentation
- Safety Considerations- Radiation Dose
- Quality Assurance.

Reference Book

1. Essentials of Nuclear Medicine Imaging by Fred A. Mettler Jr. MD MPH (Author), Milton J. Guiberteau MD FACR FACNM (Author).
2. Essentials of Nuclear Medicine Imaging: Expert Consult - Online and Print by Fred A. Mettler.
3. Nuclear Medicine Technology: Procedures and Quick Reference by Pete Shackett Paperback.
4. Mosbey's manual of Nuclear Medicine Procedures Bruce Sodde, Paul J. Early

BASIC AND ADVANCED CT SCAN – THEORY

Subject Code: BRMIS1 -503

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

- **Course Objectives:** CT-scans provide detailed cross-sectional images of various internal structures for example internal organs, blood vessels, bones, soft tissue etc, and can be used for: Diagnostic purposes-Guidance for specific treatment or further tests-surgeries, biopsies and radiation therapy.
- **Course Outcomes:** Learner get knowledge of real-time imaging, making it a good tool for guiding minimally invasive procedures such as needle biopsies and needle aspirations of many areas of the body,

Unit-1 (15 Hrs)

- **Advanced Computerized Tomography (CT)**
- Introduction to historical background, Various generations of scanners
- Advancement in CT technology (helical/spiral and multi slice)
- Ultra fast scanners System components
- CT performance parameters
- Image quality and methods of image reconstruction,
- Image display, storage, recording system CT control console, Options and accessories for CT systems

Unit-2 (15 Hrs)

- **Advanced Computerized Tomography (CT)**
- Tools for use in CT guided Interventional procedures.
- Dosimeter
- Image quality in CT
- Future developments
- CT systems (operation) – care/basic troubleshooting Present/Past/Future radiation dose measurements and technical aspects of Q.A. (quality assurance).

Unit-3 (15 Hrs)

- CT
- Head and neck
- Thorax
- Abdomen
- Pelvis
- Musculo-skeletal system
- Spine

Unit-4 (15 Hrs)

- PNS
- Clinical indications and contraindications
- Patient preparation technique
- Contrast media- types, dose, injection technique; timing, sequence - image display – patient care – function of image processing facilities,
- CT anatomy and pathology of different organ systems.

Recommended Text Books / Reference Books:

1. "MRI for Technologists" Peggy Woodward & Roger F. Freimark (McGraw Hill)
2. "Imaging for Students" David A. Lisle (Arnold)
3. "Digital subtraction ateriography" Charles, Andrew, Joseph (Year book Medical Publishers)
4. Computed Tomography by Euclid Seeram W.B. Saunder's Company

**HOSPITAL PRODUCTS, PROMOTION, SALES & PUBLIC RELATIONS AND
PHYSICIAN'S OFFICE MANAGEMENT**

Subject Code: BRMIS1 -504

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- Marketing communication in the health sector is the communication of the products or services produced by health organizations to the potential users and convincing them about the benefits to be provided.

Course Outcomes:

- Healthcare marketing allows students to increase their patient connections and nurture those relationships to form long-term, loyal patients and its management.

Unit -1 (15 Hrs)

- An introduction to Marketing Role of marketing in Business management – Evolution and definition of marketing – Concepts of Marketing – Service vs. Products – Management of Service Management process. Services Marketing
- Classification of services – Characteristics of services and their marketing implication – Selecting appropriate tools for marketing.

Unit-2 (15 Hrs)

- **Component of Service Marketing Product Planning, Market research system** – Market segmentation – Targeting – Positioning – Launching new service – Concept of product life cycle, Pricing, Setting the price – Economic Theory – Responding to price change, Physical Distribution, Major Aspects – Channels of distribution – Selection of channel, Promotion, Role of communication – Promotion mix – advertising (Media – budget – Cost effectiveness – (attributing to hospitals a human face – Good will – image building among major public) Sales promotion (techniques – Evaluation), Direct selling (Sales force – Evaluation), Physical Environment, Process, People

Unit-3 (20 Hrs)

- Analysing Markets and Buyer Behaviour Model of consumer behavior – Factors influencing buyer behavior – Buying decision process Branding of a Hospital Facility
- Brand name and concept – Positioning hospitals – Developing and USP – Brand image – Image building – long term and short term activities.
- Other Marketing routes for Health Care Units Interpersonal communication – Print materials institutional marketing – seminars – conference

Unit-4 (10 Hrs)

- Marketing Strategies for Hospital
- Managing Differentiation – Service Quality – Productivity – Product support service. Unit V: Evaluating and Controlling Market Performance
- Annual plan control (sales analysis – market share analysis – Marketing expense to sales analysis – Financial analysis), Profitability control, Efficiency control, Strategic control.

Recommended Book

1. Essentials of Hospital Management and Administration by D L Ramachandra.
2. Hospital Administration and Management: A Comprehensive Guide by Gupta Joydeep Das.
3. Financial Management Hospital Administration by GR Kolkarni P Satyashankar.

OCCUPATIONAL SAFETY & HEALTH

Subject Code: BRMIS1 -505

L T P C
1 1 0 2

Duration: 30 (Hrs.)

- **Course Objectives:** The aim of an occupational safety and health program is to foster a safe and healthy occupational environment OSH also protects all the general public who may be affected by the occupational environment
- **Course Outcomes:** Workplace safety training is as vital as workplace safety itself. It enables the management to ensure a safe and healthy work environment. It also helps the employees to recognize safety hazards and correct them. It enables them to understand best safety practices and expectations.

Unit -1.

(7 Hrs)

- **Safety and Health Management:** Occupational Health Hazards, Promoting Safety, Safety and Health training, Stress and Safety. Ergonomics - Introduction, Definition, Objectives, Advantages. Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders. Organizing for safety, Health and Environment.
- **Organization:** Structure, Function and responsibilities **Safety Committee:** Structure and function
- **Electrical Hazards:** Safe limits of amperages, voltages, distance from lines, etc., Joints and connections, Overload and Short circuit protection, Earthing standards and earth fault protection, Protection against voltage fluctuations,
- **Vibration and Noise:** Activities related to vibrations, its impact on human health, abatement Sources, effects of noise on man, Measurement and evaluation of noise, Silencers, Practical aspects of control of noise

Unit-2.

(8 Hrs)

- **Radiation and Industrial Hazards:** Types and effects of radiation on human body, Measurement and detection of radiation intensity. Effects of radiation on human body, Measurement – disposal of radioactive waste, Control of radiation, Industrial noise -Sources, and its control
- **Fire and Other Hazards:** General causes and classification of fire, Detection of fire, extinguishing methods, fire fighting installations with and without water

Unit-3.

(7 Hrs)

- **Theories & Principles of Accident Causation & Prevention:** The effect of accident, unsafe act, unsafe condition, unpredictable performance, Human factors contributing to accidents - causes for unsafe acts,
- **Safety and psychology** -Theories of motivation and their application to safety. Consequences of accident, accident prevention programmes, Role of safety Incident, accident, injury, dangerous occurrences, unsafe acts, unsafe conditions, hazards, error, oversight, mistakes, etc.
- **Accident Prevention:** Theories / Models of accident occurrences, Principles of accident prevention, Accident and Financial implications.

Unit-4.

(8 Hrs)

- **First Aid:** Body structure and Functions, Position of causality, the unconscious casualty, fracture and dislocation, Injuries in muscles and joints, Bleeding, Burns, Scalds and accidents caused by electricity, Respiratory problems, Rescue and Transport of Casualty. Cardiac massage, poisoning, wounds.
- **Personal Protective Equipments:** Need, selection, supply, use, care and maintenance, Personal protective devices for head, ear, face, eye, foot, knee and body protection, Respiratory personal protective devices.

● **Recommended Book:**

1. Basic radiological physics. Jaypee brothers pvt ltd, New delhi
2. An Introduction to Radiation Protection. Allen Martin & Samuel
3. Radiation safety in Medical practice. M.M. Rchami.
4. Radiation Protection. Ronald L. Kathren
5. AERB safety code and manuals,
6. " Aid to Tray and Trolley Setting" Marjorie Houghton (Bacilliere)
7. "First Aid' Haugher& Gardner (Hamlyn.)

HEALTHCARE

Subject Code: BRMIS1-506

L T P C

Duration: 30(Hrs.)

1 1 0 2

Course Objectives: The main objective to ensure adequate, qualitative, preventive & curative health care to people of the State and to provide affordable quality healthcare to the people.

Course Outcomes: learning of patient care during critical conditions and examination of Specimens and first Aid treatments in emergency cases.

Unit -1 (7 Hrs)

- **Introduction to Health:** Definition of health, determinants of health, health indicators of India, health team concept.
- National health policy
- National health programmes (Briefly objectives and scope)
- Population of India and family welfare programme in India

Unit-2 (8 Hrs)

- **Introduction to Nursing:** nursing, Nursing principles, inter-personnel relationships.
- Bandaging: basic turns, bandaging extremities, triangular bandages and their application.
- Nursing position, prone, lateral, dorsal, dorsal recumbent, Fowler's positions, comfort measures, bed making, rest and sleep.
- Lifting and transporting patients: lifting patients up in the bed, transferring from bed to wheel chair, transferring from bed to stretcher.
- Bed side management: giving and taking bed pan, urinal.

Unit-3 (7 Hrs)

- Observation of stools, urine, sputum
- Use and care of catheters, enema giving.
- Methods of giving nourishment: feeding, tube feeding, drips, transfusion.
- Recording of body temperature, respiration and pulse.
- Simple aseptic techniques, sterilization and disinfection.
- Surgical dressing: observation of dressing procedures.

Unit-4 (8 Hrs)

- **First Aid :** Physical Exam and SAMPLE History
- Documentation and Legal Considerations & Sudden Illness, Bleeding
- Caring for Shock, Burns, Injuries to muscles, bones, and joints, Splints, Bites and Stings
- Administering Epinephrine
- Assisting with bronchodilators (inhalers)&Heat/Cold Related Emergencies
- In-line stabilization forehead, neck and back injuries
- First Aid Kits, Fire & safety

Recommended Book

1. Clint & Geraldine, 2011, Potter and Perry's fundamentals of Nursing, Elsevier publications
2. Textbook of Pathology, Harsh Mohan, 3rd edition
3. First Aid – Haugher and Gardner.
4. Practical Nursing and First Aid – Ross and Wilson.

BASIC AND ADVANCED ULTRA SOUND IMAGING – PRACTICAL

Subject Code: BRMIS1-507

L T P C
0 0 4 2

Duration: 60(Hrs.)

Objective: Imaging is a range of tests used to create images of parts of the body. These can help: screen for possible health conditions before symptoms appear. Diagnose the likely cause of existing symptoms.

Experiment

- USG abdominal imaging.
- USG Neck imaging
- Doppler evaluation
- Advanced Ultrasound Imaging
- Spotter / Image discussion

NUCLEAR MEDICINE IMAGING - PRACTICAL

Subject Code: BRMIS1-508

L T P C
0 0 2 1

Duration: 30(Hrs.)

Objective: Nuclear Imaging is a range of tests used to create images of parts of the body. These can help: screen for possible health conditions before symptoms appear. Diagnose the likely cause of existing symptoms.

Experiment

- Radiotherapy and nuclear medicine instruments handling
- Teletherapy instruments
- Simulator
- Linear accelerator
- Brachytherapy instruments
- Positron Emission Tomography (PET)

Single photo emission computed tomography (SPECT)

BASIC AND ADVANCED CT SCAN - PRACTICAL

Subject Code: BRMIS1-509

L T P C
0 0 4 2

Duration: 60(Hrs.)

Objective: Imaging is a range of tests used to create images of parts of the body. These can help: screen for possible health conditions before symptoms appear. Diagnose the likely cause of existing symptoms.

Experiment

- Brain scanning Protocol
- CT Chest scanning Protocol
- CT Abdomen scanning Protocol
- CT Angiography Protocol
- Image processing in workstation
- CT Biopsy Protocol

6TH SEMESTER

**QUALITY ASSURANCE & RADIATION SAFETY (AERB GUIDELINES) IN
DIAGNOSTIC RADIOLOGY PART 2**

Subject Code: BRMIS1 -601

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- The aim of radiation protection is to prevent reliably the deterministic effects of radiation and to reduce the risk of stochastic effects to a reasonably achievable level. The dose limit values are set so that deterministic effects are ruled out.

Course Outcomes:

- Students will learn about how to operate radiations instruments and protection from them in healthcare.

Unit -1 (15 hrs)

- Safety of critical organs in planning methods, Role of treatment shell immobilization devices and laser in patients set up and positioning Acceptance tests on therapy simulator telescope megavoltage X-ray and electron beam machines
- Quality Assurance and quality control of Modern Radiological and Imaging Equipment which includes Digital Radiography.

Unit -2 (15 hrs)

- Evaluating research and its potential for informing practice. Developing research questions and devising methods for their investigation.
- Newer Radiation safety protocols and recent advances in radiation safety including AERB guideline

Unit -3 (15 hrs)

- Analysis: Analysis of qualitative and quantitative data.
- Planning procedure in general with special emphasis on turnout localization and target volume measurement by conventional radiographic method and simulator imaging.

Unit -4 (15 hrs)

- Clinical audit: Distinctiveness of research and audit processes and their function
- Requirement and practice of organ shielding single multiple fields, and rotational field therapy, planning procedures

Recommended Book

1. Ethics and Values in Healthcare Management (Professional Ethics) by Souzy Dracopolou
2. Radiation Safeties and Quality Control 3 Methodology of Educational Research Lokesh Koul by A.P. Saxena.
3. Quality assurance and control in diagnostic radiology and imaging By Satish Kumar Bhargava

RESEARCH METHODOLOGY

Subject Code: BRMIS1 -602

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objective

- To enable students to present, analyze and interpret data.
- To enable students to use concepts of probability in business situations.
- To enable students to make inferences from samples drawn from large datasets.
- To enable students to apply univariate and multivariate statistical techniques.

Course Outcomes

- To understand the importance & Methodology for research
- To learn in detail about sampling, probability and sampling distribution, significance tests correlation and regression, sample size determination, study design and multivariate analysis.

Unit -1 (15 Hrs)

- Accessing research literature: Use of databases and other sources.
- Understanding research design: Qualitative and quantitative methodologies - their differences and potential integration.

Unit -2 (15 Hrs)

- Evaluating research and its potential for informing practice.
- Developing research questions and devising methods for their investigation. Ethical issues in research.

Unit -3 (15 Hrs)

- Analysis: Analysis of qualitative and quantitative data.
- Utilization of appropriate software to assist in the retrieval of information and data analysis.

Unit -4 (15 Hrs)

- Clinical audit: Distinctiveness of research and audit processes and their function. Research Skills and Management: The role of evidence based practice within health and welfare.

• **Recommended Book**

1. Research in Education, 10th Editio by Best & Kahn
2. Research Methodology by C.R.KOTHAR
3. Methodology of Educational Research Lokesh Koul
4. Case Study Research John Mcleod

HOSPITAL PRACTICE AND CARE OF PATIENT

Subject Code: BRMIS1 -603

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- Goals of Patient Care is a clinical care planning process used during an admission to hospital or other care facility. It helps to determine which treatments would be useful for you, if there was deterioration in your condition.

Course Outcome:

- Learning outcomes for patient care and clinical practices with hygiene safety and maintenance and aseptic treatments during operations.

Unit -1 (15 Hrs)

- Hospital staffing and administration, records, professional, ethics, co-operation with other staff and departments, Departmental organizations.
- Handling of the patients, seriously ill and traumatized patients, visually impaired, speech and hearing impaired, mentally impaired, drug addicts and non-English speaking patients. Understanding patient needs - patient dignity of inpatient and out patients.

Unit -2 (15 Hrs)

- Interaction with the patient's relatives and visitors. Methods of effective communication - verbal skills, body language, professional appearance, visual contact etc.
- Elementary personal and departmental hygiene, dealing with receptacles, bedpans and urinal etc.
- General preliminaries to the exam. Moving chair and stretcher, patient.

Unit -3 (15 Hrs)

- Unconscious patient, general comfort and reassurance for the patient. Vital signs and oxygen - patient's Haemeatasis status. Body temp, respiratory rate, pulse, blood pressure, oxygen therapy, oxygen devices, Chest tubes and lines.
- First aid - shock, electrical shock, haemorrhage, burns, Asphyxia, fractures, loss of consciousness. Emergency treatment to the collapsed patient. Artificial respiration and resuscitation.

Unit -4 (15 Hrs)

- Preparation of patient for general and special radiological examinations. Supervision of patients undergoing special examination. Administration of drugs and contrast media.
 - Aseptic and sterile procedures. Handling of infections patients in the department or in the ward.
 - Regulation of dangerous drugs. Trolley set up for special x-ray examinations, Radiation hazardous and protective measures.
- **Recommended Book:**
 1. Notes on Radiological Emergencies – Ansell and Churchill
 2. Care of patient in diagnostic Radiography – Chesney & Chesney.
 3. First Aid – Haugher and Gardner.
 4. Steward c. Bushong: radiological science for technologists, physics , biology , protection

PROFESSIONALISM, VALUES AND MANAGEMENT

Subject Code: BRMIS1 -604

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- The module on professionalism will deliver the concept of what it means to be a professional and how a specialized profession is different from a usual vocation. It also explains how relevant professionalism is in terms of the healthcare system and how it affects the overall patient environment.

Course Outcomes:

- Offering professional development and management allows students to perform better and prepares them for positions of greater responsibility.

Unit -1 (15 Hrs)

- Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
- Personal values- ethical or moral values

Unit -2 (15 Hrs)

- Attitude and behavior- professional behavior, treating people equally
- Code of conduct, professional accountability and responsibility, misconduct.

Unit -3 (15 Hrs)

- Differences between professions and importance of team efforts.
- Cultural issues in the healthcare environment.
- Principles of Management Strategic Management Foundations of Planning.

Unit -4 (15 Hrs)

- Tools and Techniques Decision Making, conflict and stress management
- Managing Change and Innovation Understanding Groups and Teams Leadership Time Management Cost and efficiency.

Recommended Books:

1. Ethics and Values in Healthcare Management (Professional Ethics) by Souzy Dracopolou
2. **Professionalism in Medicine By Jill Thistlethwaite, Dr John Spencer.**

MEDICAL LAW & ETHICS

Subject Code: BRMIS1 -605

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice".

Outcomes:

- Student get learning knowledge of medical related laws and ethics used in healthcare to provide insurance policy during emergency.

Unit -1 (15 Hrs)

- Medical ethics - Definition - Goal – Scope
- Introduction to Code of conduct
- Basic principles of medical ethics – Confidentiality

Unit -2 (15 Hrs)

- Malpractice and negligence - Rational and irrational drug therapy
- Autonomy and informed consent - Right of patients
- Care of the terminally ill- Euthanasia

Unit -3 (15 Hrs)

- Medico legal aspects of medical records
- Medico legal case and type Records and document related to MLC
- ownership of medical records - Confidentiality Privilege communication
- Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.

Unit -4 (15 hours)

- Professional Indemnity insurance policy
- Development of standardized protocol to avoid near miss or sentinel events.
- Organ transplantation

• **Recommended Books:**

1. Medical Law and Ethics by Bonnie F. Fremgen.
2. Medical Law and Ethics: Routledge CRC Press.

QUALITY ASSURANCE & RADIATION SAFETY -PRACTICAL

Subject Code: BRMIS1-606

L T P C
0 0 2 1

Duration: 30(Hrs.)

Objective: It is used to diagnose or treat patients by providing the best healthcare facility and set up of instruments in hospitals before operating any procedure.

- Familiarization of Radiation Survey meters and their functional performance checks
- Radiological Protection Survey of Diagnostic X-Ray installation
- Diagnostic Imaging: Quality Assurance – M. M Rehani
- AERB safety requirements- Atomic Energy Act, Radiation protection rules.

HOSPITAL PRACTICE & CARE OF PATIENTS -PRACTICAL

Subject Code: BRMIS1-607

L T P C
0 0 2 1

Duration: 30(Hrs.)

Objective: A primary goal of the radiation protection program is to reduce radiation doses wherever and whenever reasonably achievable, thereby reducing the health risk that is assumed to be proportional to the radiation dose

Experiment:

- Perform and execute the patient care techniques.
- Plan and perform the radiation protection using the monitoring devices.
- Preparation of patient for general and special radiological examinations.
- Trolley set up for special x-ray examinations