**CONVENTIONAL RADIOLOGY AND IMAGING EQUIPMENT**

**Course Code: RAD.501T**

**Credit Hours: 2**

**Semester: I**

**Unit I**

**Production of x-rays:** X-ray tube, gas filled x-ray tube, construction working and limitations; stationary anode x - ray tube; construction, working, methods of cooling the anode, rotating anode x - ray tube: construction, working rating, speed of anode rotation, anode heel effect

**Unit II**

**High tension circuits:** H.T. generator for x-ray machines, three phase rectifier circuits, high and medium frequency circuits; mains voltage compensator, kV compensator, space charge compensation, high tension selector switch, filament circuit

**Unit III**

**Fluoroscopy:** Fluorescence and phosphorescence - description, fluorescent materials used in fluoroscopic screens, tilting table, Image intensifier - Construction and working, advantages over fluoroscopic device, basic principles of closed-circuit television camera and picture tube, Automatic brightness control, automatic exposure control, Manual cassette changer, basic principles of cine fluoroscopy

**Unit IV**

**X-ray Units:** Portable and mobile x-ray units, dental x-ray unit, skull unit. Mammography unit- Technical aspects of Mammography

**Unit V**

**General care:** functional tests; testing the performance of exposure timers, assessing the MA settings, testing the available KV, measurement of focal spot of an x-ray tube, testing the light beam diaphragm, practical precautions pertaining to Brakes and locks, tube stands and tracks as well as accessory equipment.

**CONVENTIONAL RADIOLOGY AND IMAGING EQUIPMENTS**

**Course Code: RAD.501P**

**Credit Hours: 3**

**Semester: I**

Cross sectional diagram of X-ray Film, Cross sectional diagram of Intensifying Screen, Characteristic Curve, X-ray Tube, Fluoroscopy

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| **TOTAL MARKS** | | | | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal ($1^{st}$ ,$2^{nd}$ Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| **TOTAL MARKS** | | **100** |

**RADIATION PHYSICS**

**Course Code: RAD.502T**

**Credit Hours: 3**

**Semester: I**

**Unit I**

Fundamental of Physics - Structure of matter, electricity and magnetism Structure of Matter - Nature of matter, atoms and nuclei, electromagnetic spectrum, quantum theory. Radioactivity, radioactive materials and isotopes. Electricity and Magnetism: Current electricity, alternating current, direct current, electrostatic charge, capacitors, electrical energy, magnetic field and electric charge, EMI, induced current, induced EMF, induced currents in motors, mutual and self-induction.

**Unit II**

Discovery of X-rays production of x-rays and properties of x-rays. X-ray tube its design, various types, advancements and common tube faults. Xray circuits including components and control as well as various indicating devices like KV, MA meters including transformers. Computers - Fundamental and applications, data storage technology and data communication including Internet.

**Unit III**

Absorption of radiation: The exponential attenuation of radiation, linear & mass attenuation co-efficient, half value layer, energy transfer and energy absorption coefficient, total energy absorption co-efficient, relative importance of different types of absorption.

**Unit IV**

interaction of radiation: Introduction, photo electric effect, Compton scattering, Thomson scattering and pair production. Energy distribution and relative importance of the different attenuation processes. Measuring Instruments: Dose build up and electronic equilibrium, Bragg-Gray Cavity theory, determination of dose in an extended medium by ionization chamber measurements, Direct measurement of absorbed dose, Relation among exposure, dose and KERMA

**Unit V**

Measuring instruments; Ionization chamber, propotional counter, GM counter, Scientillation detectors, semiconductor detectors, film dosimeter system, chemical dosimetery system, TLD calibration, measurement techniques and protocols of radiation dosimetric systems.

**RADIATION PHYSICS**
**Course Code: RAD.502P**
**Credit Hours: 3**

Student should prepare a journal which will contain the procedures adopted in Imaging Radiographs-Cross sectional diagram of X-ray Film, Cross sectional diagram of Intensifying Screen, Characteristic Curve, X-ray Tube, CT scan, MRI

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| **TOTAL MARKS** | | | | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal (1st ,2nd Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| **TOTAL MARKS** | | **100** |

**RADIATION PROTECTION AND SAFETY**

**Course Code: RAD.503T**

**Credit Hours: 3**

**Semester: I**

**UNIT 1**

Introduction to Radiation protection
Need for protection
Aim of radiation protection
Basic radiation units and quantities
- Exposure
- Absorbed dose
- Absorbed dose equivalent
- Quality factor
- Tissue weighting factor

**UNIT 2**

Limits for Radiation exposure
Concept of ALARA (or ALARP)
ICRP regulation
Maximum permissible dose
Exposure in pregnancy and children

**UNIT 3**

Protection in Diagnostic Radiology
Protection for primary radiation
Work load, Use factor
Occupancy factor
Protection for scatter radiation and leakage radiation
X-Ray room design
Structural shielding
Protective devices
Radiation signage

**UNIT 4**

Technical protective consideration during Radiography
Evaluation of hazards
Effective communication
Immobilization
Beam limiting devices
Filtration
Exposure factors
Protection in

Fluoroscopy
Mammography
Mobile Radiography
CT SCAN
Angiography room

**UNIT 5**

Radiation measuring instruments
Area monitoring
Personnel dosimeters
Film badge
Thermo luminescent dosimeter
Pocket dosimeter.

**UNIT 6**

Biological aspects of
Radiological protection biological effects of radiation
Direct & Indirect actions of radiation
Concept of detriment
Deterministic & stochastic effect of radiation
Somatic and genetic effects Dose relationship Effects of antenatal exposure

**RADIATION PROTECTION AND SAFETY**

**Course Code: RAD.503P**

**Credit Hours: 3**

- Demonstration of equipment's & their working
- Safety protocol
- Role of different international originations
- Role of dosimetry
- Effects of radiation and its adverse results

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| | | | **TOTAL MARKS** | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal ($1^{st}$ ,$2^{nd}$ Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| | **TOTAL MARKS** | **100** |

**HUMAN VALUES AND ETHICS**
**Course Code: HVE.501T**
**Credit Hours: 2**
**Semester: I**

**UNIT -I**

Introduction to Value Education: Understanding the need, basic guidelines, content and process for Value Education, Self-exploration—its content and process; 'Natural Acceptance' and Experiential Validation—as the mechanism for self-exploration.

**UNIT - II**

Continuous Happiness and Prosperity: A look at basic human aspirations, Right understanding, Relationship and Physical Facilities — the basic requirements for fulfillment of aspirations of every human being, Understanding Happiness and Prosperity come — A critical appraisal of the current scenario, Method to fulfill the above human aspirations: Understanding and living in harmony at various levels.

**UNIT -III**

Harmony in the Human Being: Understanding human being as a coexistence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' Sukh and Suvidha. Body as an instrument of 'I': Being the doer. seer and enjoyer, understanding the characteristics and activities of 'I' and harmony in 'I', understanding the harmony of 'I' with the Body: Sanyam and Svasthya; correct appraisal of physical needs, meaning of prosperity in detail, programs to ensure Sanyam and Svasthya.

**UNIT -IV**

Harmony in the Family and Society: Understanding harmony in the Family — the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhaya —tripti; Trust; vrs-vasa ) and Respect (Sammana) as the foundational values of relationship. Understanding the meaning of VI-S-vasa; Difference between intention and competence, Understanding the meaning of Sammana, Difference between respect and differentiation; the other salient values in relationship.

**UNIT – V**

Harmony in the society: Understanding the harmony in the society (society being an extension of family): Sarnadhana, Samriddhi, Abhaya. Sah-astirva as comprehensive Human Goals, Visualizing a universal harmonious order in society — Undivided Society (Akhand Sarnal), Universal Order (Sarvabhauma Vyavasthal-from family to world family.

**UNIT – VI**

Harmony in the Nature (Existence): Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature—recyclability and self-regulation in nature.

**UNIT – VII**

Understanding Sah-astitva: Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

**UNIT – VIII**

Implications of the Holistic Understanding — A Look at Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics. Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-

friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems.

**UNIT – IX**

Strategy for transition *frori* the present state to Universal Human Order: (a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, (b) At the level of society as mutually enriching institutions and organizations.

**UNIT -X**

Introduction to Medical Ethics (Deontology): (a) Relationship of health workers with their patients, relatives of patients and their co-workers. (b) History of Deontology (c) Principles and practice of Deontology.

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
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| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| | | **TOTAL MARKS** | | **100** |

**RESEARCH METHODOLOGY AND BIOSTATISTICS**
**Course Code: RMB.501T**
**Credit Hours: 3**
**Semester: I**

**UNIT-I: Research Design**

Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses.

Experimental Design: Concept of Independent & Dependent variables.

**UNIT-II: Qualitative and Quantitative Research:**

Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.

**UNIT-III: Measurement**

Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio.

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

**UNIT-IV: Sampling**

Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

**UNIT-V: Data Analysis**

Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of
association.

**UNIT-VI: Interpretation of Data and Paper Writing**

Layout of a Research Paper, Journals in Medical Lab technology, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| | | **TOTAL MARKS** | | **100** |

**ENVIRONMENTAL STUDIES**
**Course Code: EVS.501T**
**Credit Hours: 2**
**Semester: I**

**UNIT-I**

Introduction to ecology and environment; Definition, scope and importance of environment and environmental science. Structure of Environment – layers of atmosphere, hydrosphere – water budget, groundwater and ocean, lithosphere – soil formation and profile. Concept of ecology and ecosystem; types of ecosystem (Forest, pond, lakes, river, desert and grass land); energy flow of ecosystem; food chain and food web; ecological pyramids and succession

**UNIT- II**

Natural resources; Forest resources–uses and exploitation, deforestation and conservation; Renewable, Nonrenewable and alternate energy resources; Mineral resources - Use and exploitation, environmental effects of extracting and using mineral resources; water resources–uses and exploitation; Human resources and food resources; Bioresources–biodiversity value, threats and conservation, hot spots of biodiversity and endangered species, red data book; soil erosion and desertification.

**UNIT- III**

Environmental pollution; Air, water, soil and noise – sources, effects and consequences; marine and thermal pollution; Greenhouse effect, acid rain, ozone depletion, nuclear winter, photochemical smog, London smog Solid waste management–sources of waste generation, collection, segregation and disposal. Waste hierarchy and Integrated solid waste management Pollution control methods–sewage treatment plant, water treatment plant, air pollution control methods

**UNIT-IV**

Natural disasters; Earthquakes, floods, tsunamis, cyclones, droughts, landslides and tsunamis**.**

**UNIT-V**

Environmental laws, conventions and protocols; Water (Prevention and control of Pollution) act; Air (Prevention and Control of Pollution) Act; Environment Protection Act; Forest Conservation act; Kyoto protocol, Montreal protocol, Stockholm convention, Rio summit 1992 and convention on biodiversity, Cartagena protocol, IPCC.

**UNIT- VI**

Social issues and the environment; Rain water harvesting; wasteland reclamation; environmental ethics; sustainable development; population growth, industrialization, urbanization, family, child and women welfare programmes, human health and environment; Role of Information Technology in Environment; value education; sustainable development

**UNIT- VII**

Field work; Visit to local polluted site, biogas plant, waste management site, wastewater treatment plant, wildlife sanctuary; Study of simple ecosystems-pond, river etc.

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| | | **TOTAL MARKS** | | **100** |

**RADIOGRAPHIC PROCEDURE & PRINCIPLES**

**Course Code: RAD.504T**

**Credit Hours: 2**

**Semester: II**

**UNIT 1**

Basic review of all Radiographic Technique

**UNIT 2**

Contrast Media- Application, types, safety aspects, mode & volume of administration, administration techniques

**UNIT 3**

Digestive System

Anatomy and physiology

Associated pathology and radiographic appearance

Plain radiography

Barium swallow

Barium meal

Barium meal follow through

Enteroclysis

Barium enema

**UNIT 4**

Genito urinary system

Anatomy and physiology

Associated pathology and radiographic appearance

Plain radiography

Intravenous Urogram (IVU)

Micturating Cystourethrogram (MCU)

Ascending Urethrogram (ASU)

Hysterosalpingography (HSG)

Fallopian Tube Recanalisation (FTR)

**UNIT 5**

Cardio –

Respiratory system Anatomy and physiology

Associated pathology and radiographic appearance

Chest radiography

**UNIT 6**

Mammography

Anatomy and physiology

Indications, contraindications and techniques

ICRP guidelines,

BIRADS

**UNIT 7**

Skull

Related anatomy of facial and cranial bones

Associated pathology and radiographic appearance
Radiographic projections

**UNIT 8**

Vertebral Column
Related Anatomy
Associated pathology and radiographic appearance
Radiographic projections

**UNIT 9**

Upper limb
Related anatomy
Associated pathology and radiographic appearance
Radiographic projections

**UNIT 10**

Lower limb
Related anatomy
Associated pathology and radiographic appearance
Radiographic projections

**UNIT 11**

Pelvis Related
anatomy of pelvic bones and hip joint
Associated pathology and radiographic appearance
Radiographic projections Pelvimetry

**UNIT 12**

Hepatobiliary system
Related anatomy
Associated pathology and radiographic appearance
ERCP/ PTBD,
T – tube cholangiography

**UNIT 13**

Dental Radiography
Related anatomy
Associated pathology and radiographic appearance
Intraoral,
Extraoral and Occlusal views
General precautions OPG

**RADIOGRAPHIC PROCEDURE &PRINCIPLES**

**Course Code: RAD.504P**

**Credit Hours: 3**

Radiography in various positions for all the special radiological procedures, using contrast media as per syllabus.

Positioning and treatment of various cases patients by using:

a) Prescribed filters and wedges

b) Protection of various organs

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| **TOTAL MARKS** | | | | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal ($1^{st}$ ,$2^{nd}$ Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| **TOTAL MARKS** | | **100** |

**ADVANCED RADIODIAGNOSTIC TECHNIQUES AND INSTRUMENTATION OF COMPUTED TOMOGRAPHY**

**Course Code: RAD.505T**

**Credit Hours: 2**

**Semester: II**

**UNIT 1**

Imaging principles in computed tomography
Instrumentation of CT scan
Advances in Detector technology Slip ring technology
Helical CT
Single slice and Multi slice
CT Scan system

**UNIT 2**

1st generation, 2nd generation, 3rd generation, Slip ring technology, 4th generation, Electron beam CT, Dual Source CT, Flat Panel Detector CT Single and Multi-slice Technology

**UNIT 3**

Protocols for adult Whole Body CT Protocols for pediatric
Whole Body CT Documentation Common and specific artifacts in Helical CT images

**UNIT 4**

HRCT of Lungs Technical aspects Volumetric
HRCT Expiratory HRCT
HRCT protocols Artifacts

**UNIT 5**

CT angiography
CT fluoroscopy
Multidimensional reformations MPR,
Curved MPR, MIP 3D imaging & 4D CT

**UNIT 6**

CT Perfusion scanning
CT colonoscopy
CT bronchoscopy

**UNIT 7**

CT coronary angiography
CT calcium scoring
Myocardial Imaging

**UNIT 8**

Care, Maintenance and tests
General care Functional tests
Quality assurance program
Acceptable limits of variation
Corrective action

**ADVANCED RADIODIAGNOSTIC TECHNIQUES AND INSTRUMENTATION OF COMPUTED TOMOGRAPHY**

**Course Code: RAD.505P**

**Credit Hours: 3**

- Patient preparation,
- patient positioning
- performing all non-contrast and contrast computed tomography procedures.
- Radiation protection and care of patient during procedures including contrast media management.
- Various post processing techniques and evaluation of image quality and clinical findings.
- Post procedural care of the patient.

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| **TOTAL MARKS** | | | | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal ($1^{st}$ ,$2^{nd}$ Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| **TOTAL MARKS** | | **100** |

**ADVANCED RADIODIAGNOSTIC TECHNIQUES AND INSTRUMENTATION OF ULTRASONOGRAPHY**

**Course Code: RAD.506T**

**Credit Hours: 3**

**Semester: II**

**UNIT 1**

Ultrasound Properties of ultrasound

Interaction of ultrasound with matter

**UNIT 2**

Transducers

Types of transducers

Advances in the design of modern ultrasound transducers

**UNIT 3**

Image display

Display modes

Real time ultrasound

Pulse echo ultrasound instrumentation

Beam former Pulse transmitter – receiver

Controls CRT displays – television monitors

Image storage

Scan converter memory

Photographic film

Multiformat camera Laser imager

Color & video thermal printers

Computer storage

Pre and post processing techniques

**UNIT 4**

Doppler Imaging

Doppler principles Continuous wave

Doppler and Pulsed Doppler

Duplex scanning

Doppler spectral analysis & display

Color flow imaging

Power Doppler

Harmonic imaging

Real time compounding

Extended field of view

Doppler Instrumentation

**UNIT 5**

Ultrasound contrast agents

**UNIT 6**

Image characteristics and artifacts

Ultrasound tissue characterization and organ dynamics

Vascular, interventional, intra operative and ophthalmic Ultrasonography

3D & 4D ultrasound imaging

Acquisition, visualization and display methods

**UNIT 7**

Bio-effects and safety considerations in ultrasound

US system performance measurements

US equipment quality assurance –

Conventional & Doppler system testing & documentation

**UNIT 8**

Ultrasound whole body Protocols

## ADVANCED RADIODIAGNOSTIC TECHNIQUES AND INSTRUMENTATION OF ULTRASONOGRAPHY

**Course Code: PMS.506P**

**Credit Hours: 3**

-Demonstration of equipment's & their working

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| | | **TOTAL MARKS** | | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal ($1^{st}$ ,$2^{nd}$ Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| | **TOTAL MARKS** | **100** |

**PATIENT CARE IN DIAGNOSTIC RADIOLOGY**

**Course Code: RAD.507T**

**Credit Hours: 3**

**Semester: II**

**UNIT 1**

Introduction to Patient Care Responsibilities of the Healthcare facility

Responsibilities of the Imaging Technologist

**UNIT 2**

General Patient Care Patient transfer technique

Restraint techniques

Aspects of patient comfort

Specific patient conditions

Security of patient property

Obtaining vital signs

Laying up a sterile trolley

IV injection administration

**UNIT 3**

Nursing procedure in Radiology

General abdominal preparation

Clothing of the patient

Giving an enema

Handling the emergencies in Radiology

First aid in the X-Ray department

**UNIT 4**

Patient care during Investigation G.I. Tract

Biliary tract

Respiratory tract

Gynecology

Cardiovascular

Lymphatic system

C.N.S. etc

**UNIT 5**

Infection Control

Isolation Technique

Infection sources –

Transmission modes

Procedures

Psychological considerations

Sterilization & sterile techniques.

**UNIT 6**

Patient Education

Communication

Patient communication problems
Explanation of examinations
Radiation Safety / Protection
Interacting with terminally ill patient
Informed Consent

**PATIENT CARE IN DIAGNOSTIC RADIOLOGY**
**Course Code: RAD.507P**
**Credit Hours: 2**

-Demonstration care of patients during radiographic procedures

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| | | | **TOTAL MARKS** | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal ($1^{st}$ ,$2^{nd}$ Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| | **TOTAL MARKS** | **100** |

**OCCUPATIONAL THERAPY**

**Course Code: PMS.501T**

**Credit Hours: 2**

**Semester: IV**

**UNIT - I: 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

**UNIT - II: 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

Different air pollutants in industries, Effect of different gases and particulate matter ,acid fumes , smoke, fog on human health. Industrial Hygiene.

**UNIT –III: Electrical Hazards**

Safe limits of voltages, distance from lines, etc., Joints and connections, Overload and Short circuit protection, Earthing standards and earth fault protect Effects of shock on human body. Electrical equipment in hazardous atmosphere, Control of hazards due to static electricity,

**UNIT – IV: Fire and Other Hazards**

General causes and classification of fire, Detection of fire, extinguishing methods, fire fighting installations with and without water.

Machine guards and its types, automation. High pressure hazards, safety, emptying, inspecting, and repairing.

**UNIT –V: Vibration and Noise**

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-VI: 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,

Incident, accident, injury, dangerous occurrences, unsafe acts, unsafe conditions, hazards, oversight, mistakes, etc.

*Accident Prevention:* Principles of accident prevention, Accident and Financial implications.

**UNIT-VII: 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.

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
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| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| | | **TOTAL MARKS** | | **100** |

**HEALTH CARE EDUCATION MANAGEMENT**
**Course Code: PMS.502T**
**Credit Hours: 2**
**Semester: II**

**Unit- I Educational Technology**

- Define educational technology
- Recognize the scope of educational technology
- Explain the functions of educational technology
- Appreciate the division and sources of educational technology
- Appreciate the contribution of educational technology
- Interpersonal Relations
- Define therapeutic communication
- Describe the development of interpersonal relationship
- Phases of therapeutic relationship
- Appreciate cultural influences in therapeutic relationship

**Unit- II Educational Objectives**

- Define educational objectives
- State the purposes of educational objectives
- Appreciate the data sources for formulation of educational objectives
- List the characteristics of educational objectives
- Health care careers
- Health Care Systems
- Careers in Health Care
- Personal and Professional Qualities of a Health Care Worker
- Basics of health care
- Promotion of Safety
- Infection Control
- Vital Signs
- First Aid

**Unit- III: Methods of Clinical Teaching**

- Realize the outcomes of clinical teaching
- Describe clinical teaching models
- Identify factors influencing clinical teaching
- State the purposes of clinical teaching
- Information, Education and Communication for Health
- Define health education.
- Recognize the scope of health education.
- Narrate the aims and objectives of health education.
- Describe the models of health education.
- Explain the principles of health education.

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| **TOTAL MARKS** | | | | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | **Particulars** | **Marks** |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal (1st ,2nd Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| **TOTAL MARKS** | | **100** |

**INTERVENTIONAL RADIOLOGY TECHNIQUES**

**Course Code: MMIT.302T**

**Credit Hours: 2**

**Semester: III**

**UNIT 1**

Introduction
Need for interventional procedures
Informed consent
DSA Basic
Principle
Types
Equipment's
Basics of Angiographic equipment's
Single and biplane angiographic equipment
Angiographic
Table
Image intensifier
Flat panel detector
Recording systems
Pulse oximetry
Cardiac resuscitation measures –
ECG Pressure injector
Catheters, needles and other tools 3-D rotational angiography
Image processing
Patient monitor
ACT equipment
$CO_2$ angiography

**UNIT 2**

Patient care
Preparation for procedure
Post procedure care
Role of radiographer in interventional procedure
Crash trolley-
Emergency drugs

**UNIT 3**

Procedures Diagnostic & Therapeutic interventional procedures
PTC,
PTBD,
Stenting Nephrostomy, ureteric stenting
Guided biopsies of different organs

Drainage of collections/abscesses
Angiograms, angioplasty, embolization
Venus access
Radiofrequency ablation
Image guided nerve blocks

**UNIT 4**

Neuro interventional procedures
Embolization of extra or intracranial tumors, vascular malformations
Vertebroplasty – direct puncture
Laser guided procedure

**UNIT 5**

Basics of cardiac catheterization

**UNIT 6**

Safety considerations in angiography room
Room design
Protective devices
Radiation monitoring

**UNIT 7**

Care, Maintenance and tests
General care
Functional tests
Quality assurance program
Acceptable limits of variation Corrective action

**INTERVENTIONAL RADIOLOGY TECHNIQUES**
**Course Code: MMIT.302P**

**Credit Hours: 3**

Techniques should be taught.
Demonstration of equipment's and their use

***SCHEME OF EXAMINATION - THEORY***

| Types of Questions | Total No. of Questions | No. of Questions to be attempted | Marks Assigned | Subtotal |
|---|---|---|---|---|
| **SEC -A**: MCQ'S | 20 | 20 | 1 | 20 |
| **SEC -B**: Short Answer Questions | 7 | 5 | 6 | 30 |
| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| **TOTAL MARKS** | | | | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal ($1^{st}$ ,$2^{nd}$ Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| **TOTAL MARKS** | | **100** |

**ADVANCED RADIODIAGNOSTIC TECHNIQUES AND INSTRUMENTATION OF MRI**

**Course Code: MMIT.303T**

**Credit Hours: 2**

**Semester: III**

**UNIT 1**

Basic Principles
Spin Precession
Relaxation time
Pulse cycle
T1 weighted image
T2 weighted image
Proton density image

**UNIT 2**

MR Instrumentation
Types of magnets
RF transmitter &receiver coils
Gradient coils
Shim coils
RF shielding
Computers

**UNIT 3**

Pulse sequences
Spin echo pulse sequence
turbo spin echo pulse sequence
Gradient echo sequence
Turbo gradient echo pulse sequence
Inversion recovery sequence
STIR sequence
SPIR sequence
FLAIR sequence
Echo planar imaging and Fast imaging sequences
Advanced pulse sequences.

**UNIT 4**

Image formation
2D Fourier transformation method
K-space representation
3D Fourier imaging
MIP

**UNIT 5**

MR contrast media
MR angiography – TOF & PCA MR

Spectroscopy

**UNIT 6**

Protocols in MRI for whole body

MRI artifacts

Safety aspects in MRI

**UNIT 7**

Cardiac MRI

**UNIT 8**

Musculoskeletal imaging protocols

Abdominal imaging protocols

**UNIT 9**

Functional MRI

BOLD Imaging

**UNIT 10**

Care, Maintenance and tests

General care

Functional tests

Quality assurance program

Acceptable limits of variation

Corrective action

**ADVANCED RADIODIAGNOSTIC TECHNIQUES AND INSTRUMENTATION OF MRI**

**Course Code: MMIT.303P**

**Credit Hours: 3**

Patient preparation, patient positioning, performing all non-contrast and contrast MRI procedures.

Planning of different scanning planes, parameters and their trade offs & patient monitoring during the procedures.

Various post processing techniques and evaluation of image quality and clinical findings. 4-Post procedural care of the patient.

***SCHEME OF EXAMINATION - THEORY***

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| **SEC -C**: Long Answer Questions | 7 | 5 | 10 | 50 |
| | | **TOTAL MARKS** | | **100** |

***SCHEME OF EXAMINATION - PRACTICALS***

| | **Particulars** | **Marks** |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
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**NUCLEAR MEDICINE IMAGING TECHNIQUES**

**Course Code: MMIT.304P**

**Credit Hours: 2**

**Semester: III**

**UNIT 1**

Basic atomic & nuclear physics

Quantities and Units

Atom composition and structure

Nucleus composition

Radioactivity

Exponential decay

Specific activity Parent / Daughter decay

Modes of Radioactive decay.

**UNIT 2**

Radiation detectors

Gas filled detectors - Basic principles Ionization chambers

Proportional counters

Geiger Muller counters

Semiconductor detectors

Scintillation detectors – basic principles

**UNIT 3**

Production of Radio nuclides

Reactor produced radionuclide

Reactor principles

Accelerator produced radionuclide

Radionuclide generators

**UNIT 4**

Instrumentation

The Anger Camera

Basic principle

System components

Detector system and electronics

Collimators

Image display and recording systems

Scanning camera

**UNIT 5**

Radio pharmacy

Radiopharmaceuticals

General principle of tracer technique

Preparation of different labeled compounds with technetium-99m isotope

Cold kit

**UNIT 6**

In vivo technique
Static and dynamic studies
Thyroid imaging
Imaging of bone
Respiratory system
Urinary system
G.I. system
Cardiovascular system
Iodine131 uptake studies
Iodine 131 therapy for thyrotoxicosis and thyroid ablation
Image quality in nuclear medicine
Spatial resolution
Contrast Noise
Types of noise
Quality assurance of imaging equipment's
Variation in Image perception – with physician, within technologist & technical parameter

**UNIT 8**

SPECT imaging

**UNIT 9**

PET imaging

**UNIT 10**

Radiation safety in nuclear medicine
Radiation units and quantities
MPD Safe handling of Radioactive materials
Storage of radioactive materials
Procedures for handling spills
Disposal of Radioactive waste
Radiation monitoring Survey meters
Personnel dosimeters
Wipe testing
Contamination monitor
Isotope calibrator
Area monitor
Inventory of isotopes

**NUCLEAR MEDICINE IMAGING TECHNIQUES**

**Course Code: MMIT.304P**

**Credit Hours: 3**

- Demonstration of various techniques as per theory syllabus

***SCHEME OF EXAMINATION - THEORY***

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***SCHEME OF EXAMINATION - PRACTICALS***

| | Particulars | Marks |
|---|---|---|
| **INTERNAL** | Log Book | 10 |
| | Clinical Posting(attendance) | 20 |
| | Internal (1st ,2nd Hourly & mid-term) | 20 |
| **EXTERNAL** | Viva-voce | 50 |
| | **TOTAL MARKS** | **100** |

**DISASTER MANAGEMENT**

**Course Code: PMS.504T**

**Credit Hours: 2**

**Semester: III**

**Unit- I Hospital disaster preparedness and response**

- Scope
- Coordination and management
- Planning, training
- Information, communication and documentation
- Safety and security
- Human resources
- Triage
- Post disaster recovery
- Patient handling
- Volunteer involvement and management

**Unit-II**

- First aid for unconsciousness
  - Aims, principles & rules of first aid
  - First aid box
- Trauma management
  - Guidelines, protocols, initial assessment
  - Trauma management in emergency department
- Wound management in emergency practice
  - Management of internal and external bleeding
- Chemical injury
- Management of drowning
- Burn care
  - Prehospital treatment
  - Initial emergency department treatment
  - Airway and respiratory care
  - Fluid resuscitation
- Electrical injury management
  - Pre hospital management
  - Basic life support
  - Further treatment and transfer

**Unit-III Cardio pulmonary resuscitation**

- Basic life support
  - Algorithm
  - Mouth to mouth ventilation
  - External cardiac compression
- ACLS
  - Defibrillation
  - Vascular access
  - Definitive airway
  - Foreign body obstruction
  - Drugs
- CPR in infants and children

***SCHEME OF EXAMINATION - THEORY***

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| **TOTAL MARKS** | | | | **100** |

**HEALTH CARE MANAGEMENT**

**Course Code: PMS.505T**

**Credit Hours: 2**

**Semester: III**

**Unit-I Management concepts and theories**

- Management and organizations
- Management role
- Levels of managers and management skills
- Classical school
- Behaviour school

➢ **Management functions and process**

- Planning
- Organizing
- Staffing
- Directing
- Controlling

**Unit- II**

➢ **Basics of HRM and sourcing**

- Introduction and relationship between HRM and HRD
- Objectives of HRM
- HR planning: short term and long term
- Productivity analysis in healthcare
- HR policy and procedure
- Recruitment
- Selection
- Placement
- Induction / Orientation

➢ **Training and development**

- Staff training and development
- Career growth and development
- Management development

**Unit- III Materials management**

- Introduction
- Definition and function
- Goals and objectives of materials management
- Problems and issues in hospitals

➢ **Equipment purchase and maintenance**

**Unit- IV Scientific inventory management**

- Codification and standardization
- Value analysis
- Inventory control
- Lead time, safety stock and reorder level
- Selective controls
- The biomedical waste (management and handling) rules

***SCHEME OF EXAMINATION - THEORY***

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