

DIPLOMA IN MEDICAL RADIO IMAGING TECHNOLOGY – PART ONE

PART ONE			
S. No.	Name of Module	Credits	Total Marks
1	Fundamental of Environmental Science	2	100
2	Human Physiology	6	100
3	Radiation Physics Including Radiation Protection	6	100
4	Patient Care and Medical Ethics	6	100
5	Fundamentals of Imaging Technology	4	100
Total		24	

Module Name: FUNDAMENTAL OF ENVIRONMENTAL SCIENCE

Unit 1: The Multidisciplinary nature of environmental studies Definition; Scope and importance, Need for public awareness.

Natural Resources: Renewable and non-renewable resources:

Natural resources and associated problems

- a) Forest resources: Use and Over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
- c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.
- f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources.

Equitable use of resources for sustainable lifestyles.

Unit 2: Ecosystems:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession. - Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:
 - a. Forest ecosystem
 - b. Grassland ecosystem
 - c. Desert ecosystem
 - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity and its Conservation

- a. Introduction-Definition: genetic, species and ecosystem diversity.
- b. Biogeographical classification of India.
- c. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- d. Biodiversity at global, National and local levels.
- e. India as a mega-diversity nation.
- f. Hot-spots of biodiversity.
- g. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- h. Endangered and endemic species of India.
- i. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 3: Environmental Pollution:

- Causes, effects and control measures of:
 - a. Air pollution
 - b. Water pollution

- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Social Issues and the Environment

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act. - Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit 4: Human Population and the Environment

- Population growth, variation among nations.
- Population explosion-Family welfare Programme.

- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of information Technology in Environment and human health.
- Case Studies.

Unit 5: Field Work (Practical)

- Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

Module Name: HUMAN PHYSIOLOGY

Unit 1: Study Of Cellular System: Cell: Structure and organelles - Functions of each component in the cell. Cell membrane – transport across membrane – origin of cell membrane potential (Nernst and Goldman and Katz equations) – Action potential.

Unit 2: Hematological System: Blood composition - functions of blood – functions of RBC. WBC types and their functions. Blood groups –importance of blood groups –identification of blood groups. blood flow factors regulating blood flow such as viscosity, radius, density etc (Fahreus lindqvist effect, Poiseuille’s Law).

Unit 3: Renal and Respiratory System: Structure of Kidney and nephron. Mechanism of Urine formation and acid base regulation. Dialysis. Components in of respiratory system. Oxygen and carbon dioxide transport and acid base regulation.

Unit 4: Cardiac System: Structure of heart – Properties of Cardiac muscle – Cardiac muscle and pacemaker potential - Cardiac cycle – ECG - Heart sound - volume and pressure changes and regulation of heart rate.

Unit 5: Sensory System: Structure of a Neuron. Synaptic conduction. Conduction of action potential in neuron Parts of brain cortical localization of functions. EEG. Simple reflexes,

withdrawal reflexes. Autonomic nervous system and its functions, Structure of eye, ear and auditory and visual pathways.

Module Name: RADIATION PHYSICS INCLUDING RADIATION PROTECTION

Atomic structure as applied to generation of X-Rays and radioactivity spectrum of diagnostic imaging and therapy X-Rays Effects of variation of tube voltage, current, filtration, III waveform and target material on X-Ray Production. Laws of radioactivity and decay schemes of different alpha, Beta, Gama ray, Artificial radio nuclide generators employed in medicine in general and radiotherapy sources in particulars, Interaction of radiation with matter attenuation absorption and scattering phenomena, Photoelectric absorption, Compton scattering, pair production and annihilation process, ionization effects of geometry absorber and on radiation quality. Transmission of x-ray through body tissues, Linear energy transfer. Range of secondary electrons and electron build up relative amounts of scatter from homogeneous and heterogeneous beam during the cones, diaphragm, collimators etc, units of radiation measurements specification of quality and half-value thickness (HVT) and its measurements, filters and filtration Measurement of radiation and dosimetric procedures. Radiation detectors and their principles of working. Definitions of Bragg-Peak, Percentage depth dose, Peak scatter, factor, tissue air-ratio, tissue maximum ratio, scaller air wedge angle, hinge angle, compensators, beams flattering filters, scottering foils. Physical properties of phantoms, phantom materials, bolus and bolus substitutes. Factors used for treatment dose calculations, Daily treatment time and monitor units calculation method Physical aspects of electron and neutron therapy.

Module Name: PATIENT CARE AND MEDICAL ETHICS

1. Ethical principles in health care, Ethical principles related to physiotherapy, Scope of practice, Enforcing standards in health profession-promoting quality care, Professional ethics in research, education and patient care delivery, Informed consent issues, Medical ethics and Economics in clinical decision-making.
2. Rules of professional conduct:
Physiotherapy as a profession, Relationship with patients, Relationship with health care institutions, Relationship with colleagues and peers, Relationship with medical and other professional.
3. Confidentiality and Responsibility, Malpractice and negligence, Provision of services and, advertising, Legal aspects: Consumer protection act, Legal responsibility of physiotherapist for their action in professional context and understanding liability and obligations in case of medico-legal action

Module Name: FUNDAMENTALS OF IMAGING TECHNOLOGY

1. X-ray Production, Emission & Interactions with Matter.

2. Radiographic Film, latent Image, Intensifying Screens, Grids.
3. Radiographic Exposure, Film Developing & Processing, Radiographic Quality.
4. Physical Principles of Diagnostic Ultrasound Piezoelectric Effect.
5. Acoustic Intensity, Reflection, Impedance & Absorption.
6. Ultra Sound Transducer, Beam, Operational Modes & Biological Effects.
7. Compound Tomography Principles of Operation System Components & Image Reconstruction.
8. Physical Principles of Magnetic Resonance Imaging: Basic concept, System Components, Biological Hazards, Advantage over CT.