

MEDICAL PHYSICS

POST GRADUATE DEGREE STANDARD

PAPER - I CODE:077

UNIT I

INTRODUCTION TO MEDICAL PHYSICS:-

Cell Structure and functions - Elements of tissue and muscular systems, skeletal system, digestive, respiratory, circulatory, endocrine and Nervous systems - Hormones and transmitters - single and multicell organisms - Nucleic acid and protein structure and their functions - Bio-materials for dental and orthopaedic applications.

UNIT II

BASICS OF RADIATION PHYSICS:-

Review of atomic and nuclear structure - Properties of α , β , and γ radiations - Natural and artificial radioactivity - Medical isotopes production and uses- Particle therapy machines (Co-60)- Linear accelerator, cyclotron and betatron - Radio Therapeutic machines - Loading techniques for teletherapy - phantoms - Radio Therapy Gadgets -Tissue Compensators.

UNIT III

X RAYS IN MEDICINE:-

Different x-ray generators - Basic requirements for Medical diagnostic and therapeutic x rays - Determination of half value length - Inherent filters - shielding materials and safety devices .

UNIT IV

RADIATION EFFECTS ON LIVING CELLS:-

Thomson, Compton and Photoelectric - effects - pair production - Range energy relation - Specific ionisation - Chromosomal damage and point mutations - Somatic effects of radiation - Radio sensitivity Protocol - LD 50/30 concepts - Radiation dosages and their effects - Anoxie - Carcinogenesis -Genetic effects - Threshold- Recessive and dominant mutation - Doubling dose.

UNIT V

RADIATION DETECTORS AND DOSIMETRY:-

Ionisation Chambers - G.M. Counter - Scintillation Counters - Thermoluminescent, Chemical, film dosimeters - Depth - dose distribution curves - Free radical ion production - G value - computer aided treatment planning in radio therapy.

UNIT VI

RADIATION HAZARD EVALUATION AND CONTROL:-

Radiation Hazard by natural and man made sources - International Commission on Radiation Protection (ICRP) recommendations - planning of radio nuclei laboratories in Hospitals- Atomic Energy Regulatory Board (AERB) Safety requirements - Evaluation of radiation hazard by fluoroscopy and radiography effect of time, distance; Shielding materials - personnel and area monitoring-survey of radiological installations - Disposal of radioactive wastes.

PAPER -II

UNIT I

ULTRASONOGRAPHY:-

Acoustic impedance Acoustical characteristics of human body - Ultrasonics - Production and Properties- propagation of ultrasonics through body tissues - Ultrasonic dosimetry - Piezoelectric receivers - scanning

techniques - Echocardiography - Ultrasonic tomography - Ultrasonics in Ophthalmology-obstetrics and gynecology-Lithostropy- Echocardiography - Ultrasonic diathermy.

UNIT II

THERMOGRAPHY:-

Various types of electromagnetic radiations - UV, Visible and IR- sources and detectors- Optical properties of tissues-Applications of optical radiations in detection and treatment of skin disorders.

UNIT III

RADIOTHERAPY:-

Radio and Microwaves - production and properties - intervention mechanism with biological systems - Hyperthermia - Tissue characterisation - Thermal and non thermal effects on whole body.

UNIT IV

LASERS IN MEDICINE:-

Theory and mechanism of medical lasers. Tissue interaction mechanism dermatology oncology - lasers in biology - Application of ultrafast pulsed lasers in Medicine - laser blood flowmeter. Hazards of lasers and their safety measures - Fibre optics in medicine.

UNIT V

NUCLEAR MEDICINE:-

Radio isotopes in Medical diagnostics - Scintillation counters - Gamma Cameras - single head - dual head scanners - Scanning of different parts of human body-Radio Pharmaceuticals for scanning.

UNIT VI

IMAGING SYSTEMS AND DIAGNOSTIC INSTRUMENTS:-

Magnetic Resonance Imaging system - positron Emission tomography-Basic principles and applications - ECG, EEG and EMG recording and analysis.