PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Paper - 10 MEDICALPHYSICS

Offered to : M.Sc.(PHYSICS)	Course Code : 22PH4S3
Course Type : SEC	Course : Medical physics
Year of Introduction : 2022	Year of offering : 2022
Year of Revision : 2022	Percentage of Revision : Nil
Semester : IV	Credits : 3
Hours Taught : 60 hrs. per Semester	Max.Time : 3 Hours

CourseDescription:

Medical Physics course will provide an introduction to the rich field of medical physics. Thecourse will begin by outlining the mechanisms of particle interactions in matter and biological tissue, aswellasmethodsemployedtomonitorandmeasureradiation.

Course Objectives:

1. To understand the detailed interactions of radiationwithmatter.
2. Tounderstandthegeneralconceptsinradiationanditsinteractionanddosemeasurement.
3. Toapplythephysicsconceptsinclinicaltrials.
4. Toemphasizethesignificanceofvariousmedicaltechniquesandtherapy
5. To learn the phenomena of different techniques used in medicine

CourseOutcomes:Attheendofthiscoursethestudentsshouldbeableto

CO1:Acquireknowledge about themajoraspectsofnaturesubjectSofmedicalphysics

CO2: Acquire knowledge on applicationofphysicstomedicine

CO3:Outline the principles of physics of different medical radiation devices and their modern advances

CO4:Recognize the nature, properties,dosimetery of radiation and basics of radiation protection and also medical effects

CO5:Apply phenomena of different techniques used in medicine to develop new methods

CO-POMATRIX								
22PH4S3	**CO-PO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
	CO1	L						M
	CO2	M						M
	CO3	M						M
	CO4	H					L	M
	CO5	H					H	M

Syllabus		
Unit	**Learning Units**	**Lecture Hours**
I	**IonisingRadiationandDosimetry** Generation of radiation, Interaction of charged particles with matter, interaction of high energy photonswith matter, radiation depth of interaction, range, attenuation curves, dose and exposure measurement,maximum permissible levels, overview of measurement methods: film dosimeters, thermos luminescentdosimetry(TLD),dose measurementduringradiography	12
II	**RadioisotopesandNuclearMedicine** Diagnosis with radioisotopes, isotopes, half-life, nuclear radiations, energy of nuclear radiations, units ofactivity,isotopegenerators,principlesofmeasurement:countingstatistics,samplecounting,liquidscintillation counting, non-imaging investigations examples: haematological measurements, Glomerularfiltrationrate,radionuclideimaging,boneimaging,dynamicrenalfunction.	12
III	**ImageProduction-I** Radionuclide imaging: the gamma camera, energy discrimination, collimation, image display, single-photon emission tomography (SPET), positron emission tomography (PET), ultrasonic imaging: pulse–echo techniques, tissue interaction with ultrasound, transducer arrays, applications: Doppler imaging, CTimaging:absorptionofX-rays,datacollection,imagereconstruction,beamhardening,spiralCT.	12
IV	**ImageProduction-II** Electrical impedance tomography (EIT): image reconstruction, data collection, multi-frequency and 3Dimaging,magnetic resonance imaging (MRI): the nuclearmagneticmoment, precession in the presenceof a magnetic field, T1 and T2 relaxations, the saturation recovery pulse sequence, the spin–echo pulsesequence,localization:gradientsandsliceselection,frequencyandphaseencoding,theFIDandresolution,imagingandmultipleslicing.	12
V	**Electrophysiology** Sources of biological potentials, the nervous system, neural communication, the interface between ionicconductors:Nernstequation,membranesandnerveconduction,muscleactionpotentials,volumeconductor effects, the ECG/EKG and its detection and	12

	analysis, characteristics of the ECG/EKG, theelectrocardiographicplanes,recordingtheECG/EKG,ambulatoryECG/EKG monitoring.	

TextBooks:

1. B.H.Brown,R.H.Smallwood,D.C.Barber,P.V.Lawford,andD.R.Hose,*MedicalPhysicsandBiomedicalEngineering*,InstituteofPhysicsPublishing,1999.
2. S.A. Kane,*IntroductiontoPhysicsinModernMedicine*,CRCPress,2009.

ReferenceBooks:

1. F.M.Khan,andJ.P.Gibbons,*Khan'sthephysicsofradiationtherapy*.LippincottWilliamsandWilkins,2014.
2. P.Suetens,*Fundamentals ofMedicalImaging*.Cambridgeuniversitypress,2017.
3. W.J.Meredith,andJ.B.Massey,*FundamentalPhysicsofRadiology*.Butterworth-Heinemann,2013.
4. F.A.Smith,*APrimerinAppliedRadiationPhysics*,WorldScientificPublishingCo.Inc,2000.