

Semester II

U21PH202	MEDICAL PHYSICS (For BME only)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the basics of atomic physics and non-ionizing radiation
- To inculcate the principles behind senses and radioactive nuclides
- To gain the knowledge of interaction of radiation and its effects in human body

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Interpret the basics of atomic physics and non – ionizing radiation (Understand)

CO2: Classify the types of senses, vision and audition (Understand)

CO3: Utilize the basic concepts of radioactivity and radionuclides in various medical applications (Understand)

CO4: Examine the interaction of radiation with matter and its clinical significance (Understand)

CO5: Identify the radiation exposure, dosage effects and prevention measures (Understand)

CO-PO MAPPING:

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	2	1	-	-	-	-	-	-	-	-	-	1	
CO2	2	1	-	-	-	-	-	-	-	-	-	1		
CO3	3	2	1	-	-	-	-	-	-	-	-	1		
CO4	3	3	2	-	-	-	-	-	-	-	-	1		
CO5	3	2	1	-	-	-	-	-	-	-	-	1		
CO	2.6	1.8	0.8	-	-	-	-	-	-	-	-	1		
Correlation levels:		1: Slight (Low)			2: Moderate (Medium)				3: Substantial (High)					


SYLLABUS:

UNIT I ATOMIC PHYSICS AND NON-IONIZING RADIATION

9

Atomic Physics: Absorption and Emission of light – Spin-orbit coupling – Zeeman effect – Quantum mechanical explanation of Zeeman effect – Anomalous Zeeman effect – Stark effect

Non – ionizing radiation: Non – ionizing electromagnetic radiation: Non – ionizing radiation effects: Low frequency effects and High frequency effects



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UNIT II PHYSICS OF THE SENSES 9

Introduction and objectives – Cutaneous sensation – The chemical senses – Audition – Doppler effect – Vision – Psychophysics (Introduction)

UNIT III PRINCIPLES OF RADIOACTIVE NUCLIDES 9

Radioactive Decay – Spontaneous Emission – Isomeric Transition – Gamma ray emission, alpha, beta, Positron decay – Sources of Radioisotopes: Natural and artificial radioactivity – Radionuclide – Cyclotron and reactor produced Radionuclide – Radionuclide used in Medicine

UNIT IV INTERACTION OF RADIATION WITH MATTER 9

Interaction of charged particles with matter – Specific ionization – Linear energy transfer range, Bremsstrahlung, Annihilation, Interaction of X – ray and gamma radiation with matter – Attenuation of gamma radiation, Interaction of neutron with matter and their clinical significance (Radiation Dosimetry)

UNIT V RADIATION QUANTITIES AND RADIATION EFFECTS 9

Radiation Quantities: Inverse square law – KERMA and absorbed dose – Stopping power – Relationship between the dosimetric quantities – Bragg 's curve – Concept of LD 50

Radiation Effects and Prevention Measures: Stochastic and Non – Stochastic effects – Principles of radiation protection in diagnostic medical exposure – Individual prevention measures

Contact Periods:

Lecture: 45 Periods Tutorial: - 0 Periods Practical: - Periods Project: - Periods
Total: 45 Periods

TEXT BOOKS:

1. Brown B. H., Smallwood R. H., Barber D., Lawford P. V and Hose D. R., "Medical Physics and Biomedical Engineering", 1st edition, CRC Press, 2017
2. Gopal B. Saha., "Physics and Radiobiology of Nuclear Medicine", 4th edition, Springer, 2013

REFERENCES:

1. Meredith W. J. and Massey J. B., "Fundamental Physics of Radiology", Varghese Publishing house, 1992
2. Muhammad Maqbool– "An Introduction to Medical Physics" 2017 edition, Springer, 2018
3. Woodcock J. P., "Ultrasonics Medical Physics Handbook – 1", Adam Hilger Ltd, Bristol, 2002
4. Attix F H, "Introduction to Radiological Physics and Radiation dosimetry", Viley – VCH, Verlog, 2004
5. <https://nptel.ac.in/courses/115103101>



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EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / Mini Project / MCQ	Written Test	Individual Assignment / Seminar / Mini Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	



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