Course code	Course Name	L-T-P-Credits	Year of Introduction
BM202	BIOPHYSICS	3-1-0-4	2016

Prerequisite : Nil

Course Objectives

- Understand the mechanism of cell potentials, generation & propagation of neuronal impulses.
- Understand the generation & characteristics of various bio potentials and their principles of acquisition.
- Helps to gain knowledge about the different types of radiation as well as their useful and harmful effects in human beings.
- Introduction to x-rays, their production & physical properties.

Syllabus

Cell membrane, Excitable cells & excitability, Cell potentials. Synapses & Neuronal integration. Electrocardiogram – generation - lead systems - waveforms and their significance – arrhythmia – ECG machine. Electroencephalograph – waveforms - block diagram – evoked potentials - applications. Electrical activity of muscles - Principles of EMG – applications. Electrodes – skin impedance. Other biopotentials. Radioactivity – X-rays.

Expected Outcome

The student will get a basic knowledge about cell potential & generation of bio potentials, different bio potentials in human body, electrodes used, radio activity and production of x rays.

Text Books:

1. Arthur C. Guyton : Textbook of Medical Physiology, Prism Books (Pvt) Ltd & W.B. Saunders Company.1991
2. Khandpur R S: Handbook of Medical Instrumentation, Tata McGraw Hill, New Delhi.2005.

Reference Books:

1. W.J. Meredith & J.B. Massey, Fundamental Physics of radiology, Varghese Publishing House, Bombay, 1992
2. John G. Webster: Medical Instrumentation -Application and Design ; Houghton Mifflin Co., Boston.1992
3. Geddes & Baker, Principles of Applied Biomedical Instrumentation, John Wiley 3 rd edition 1989
4. D.J. Aidley: The Physiology of Excitable cells, 3rd Ed., Cambridge University Press. 1998
5. Webb, S. (ed) The Physics of Medical Imaging, Institute of Physics Publishing, Bristol, 1992.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Cell membrane: Structure, Excitable cells, Polarized state, Nernst potential, Goldman Hodgkin Katz equation - Resting	5	15%

	membrane potential. Action potentials – ionic basis of generation & propagation of nerve impulses, refractory period – absolute & relative. Auto rhythmic cells - cardiac action potentials.		
	Synapses & Neuronal Integration: Synapses – electrical & chemical synapses, excitatory & inhibitory synapses. Synaptic potentials – EPSP & IPSP. Neurotransmitters – types. Post synaptic integration – types.	5	
II	Electrocardiogram: Generation of ECG, pacemakers – natural & ectopic, waveforms and their significance. Recording of bio potentials – monophasic & biphasic recording - Lead systems in ECG.	5	**15%**
	Arrhythmias – rate abnormalities, AV conduction block, premature contractions, flutter, fibrillation.	3	
	ECG machine – Block diagram - Artifacts in ECG recording.	2	
FIRST INTERNAL EXAM			
III	Electroencephalogram - brain waves, sleep stages, Abnormal EEGs – epilepsy. Measurement of EEG - 10-20 electrode system, block diagram of EEG machine. Applications of EEG.	6	**15%**
	Evoked potentials – visual, auditory & somatosensory - applications.	3	
IV	Electrical activity of muscles- neuromuscular junction, synaptic potentials, motor unit – motor unit action potential – EMG.	4	**15%**
	Measurement of EMG - block diagram of EMG machine. Applications of EMG - myoelectric control system.	4	
SECOND INTERNAL EXAM			
V	Electrodes - polarizable and non-polarizable electrodes - Silver-silver chloride. Recording & Stimulating electrodes.	4	**20%**
	Electrode-tissue interfaces - electrode-electrolyte and electrolyte-skin interfaces. Skin contact impedance.	2	
	Electrodes for measurement of bio potentials– ECG, EEG & EMG electrodes. Basics of other bio potentials – ENG, ERG, EOG, EGG.	4	
VI	Radioactivity -units -radio emission - law of radioactive decay, half life period - interaction of radiation with matter.	5	**20%**
	X rays – Production – discharge tube and Coolidge tube methods, x-ray spectra –continuous and line spectra, factors determining the x-ray emission	4	
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100 Exam Duration: 3 Hours

There shall be three parts for the question paper.

Part A includes Modules 1 & 2 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part B includes Modules 3 & 4 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part C includes Modules 5 & 6 and shall have three questions of twenty marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Note: Each part shall have questions uniformly covering both the modules in it.