Course Code	Course Title	L	T	P	C
1152EC108	BIOMEDICAL INSTRUMENTATION AND IMAGING	3	0	0	3

a) Course Category

Program Elective

b) Preamble

This course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The fundamental principles of equipment that are actually in use at the present day are introduced

c) Prerequisite

Biology for Engineers, Basic Electronics Engineering

d) Related Courses

Digital Image Processing

e) Course Outcomes

On successful completion of this course the student will be able to

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the Nervous system and physiology of the heart, lung, circulation & respiration and transducers for Bio Medical applications.	K2
CO2	Describe the various electrical and non-electrical physiological measurements such as ECG, EEG, pH of blood.	K2
CO3	Describe Medical Imaging Systems such as X-Ray Imaging, computed tomography, CT scan, MRI Imaging, Ultrasound scanner.	K3
CO4	Illustrate various special Imaging techniques such as neutron radiography, Cine angiogram, LASER Imaging.	K2
CO5	Discuss on safety measures and various therapeutic & assisting equipment such as Microwave diathermy, Defibrillators and patient safety measures.	K2

d) Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	M	M	L	-	-	-	-	-	L	-	L	-	-
CO2	M	M	M	M	M	-	-	-	-	L	-	L	L	-
CO3	M	M	H	H	M	-	M	-	-	L	-	L	L	-
CO4	M	M	H	H	M	-	M	-	-	L	-	L	L	-
CO5	L	L	H	L	L	-	L	-	-	L	-	L	L	-

e) Course Content

UNIT I PHYSIOLOGY AND COMPONENTS 9

Cell and its structure - sources of bioelectric potentials – resting and action potentials – propagation of action potentials nervous system – CNS – PNS – nerve cell – synapse – cardio pulmonary system – physiology of heart and lungs – circulation and respiration- block diagram of biomedical Instrumentation system - transducers for bio medical applications - electrodes - selection criteria.

UNIT II ELECTRICAL AND NON-ELECTRICAL PHYSIOLOGICAL MEASUREMENTS 9

ECG – EEG – EMG – ERG – lead systems and recording methods – typical waveforms. Measurement of blood pressure – cardiac output – cardiac rate – heart sound –respiratory rate - plethysmography – pH of blood, ESR - GSR measurements

UNIT III MEDICAL IMAGING SYSTEMS 9

Picture archiving and communication system (PACS) - Principles of sectional imaging, scanner configuration, detectors - 2D image reconstruction technique, X-Ray imaging- computer Tomography- Ultrasound scanner – PET scan – MRI Imaging.

UNIT IV SPECIAL IMAGING TECHNIQUES 9

Cineradiography, cine fluorography, stereoscopic radiography, magnification radiography, microradiography, tomography, neutron radiography. Cine angiogram – LASER imaging – endoscopy.

UNIT V ASSISTING &THERAPEUTIC EQUIPMENT AND SAFETY MEASURES 9

Physiotherapy and electrotherapy - short ware, microwave diathermy –defibrillators – cardio vector – hearing aid – dialysis machine, pace makers. patient safety & monitoring – electrical safety, patient electrical safety, types of hazards, natural protective mechanism, leakage current, patient isolation, hazards in operation rooms, grounding conditions in hospital environment.

Total 45 Hrs

h) Learning Resources

Text Books

1. Leshie Cromwell, Fred. J. Weibell and Erich. A. Pfeiffer, “Biomedical Instrumentation and Measurements”, 2nd Edition, PHI, 2003.
2. R.S. Khandpar, “Hand Book of Biomedical Instrumentation and measurement”, McGraw Hill publishing Co., 1990
3. 3. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 2006

Reference Books

1. Arumugam, “Biomedical Instrumentation”, Anuradha Agencies Publishers, VidayalKaruppar, 612 606, Kumbakonam, R.M.S: 1992
2. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, Pearson Education, 2004.
3. R. Anandanatarajan, “Biomedical Instrumentaion”, PHI Learning, 2009.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc18_ec02/preview
2. https://www.lecturio.com/
3. www.globalspec.com