SEMESTER S8

BIOMECHATRONICS

Course Code	PEBRT864	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	-	Course Type	Theory

Course Objectives:

1. Understand types of sensors used in biomedical applications.
2. To be familiar with various equipment in bio-medical applications and the techniques of diagnosis.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	Bio potential and Bio electrodes Cell structure – electrode – electrolyte interface- electrode potential- resting and action potential – electrodes for their measurement- Propagation of nerve impulses, Refractory period- Electrode electrolyte interface, Half-cell potential, Polarisable and Non-polarisable electrodes - Skin electrode interface – Bio- electrodes: Surface- Micro-. Needle electrodes - Equivalent circuits of electrodes	9
2	Electrical Activity of the heart Cardiac muscle, Action potentials in cardiac muscle, SA node, Origin and propagation of rhythmical excitation & contraction, refractoriness, regular and ectopic pace makers, Electrocardiogram - Einthoven triangle, Standard 12-lead configurations - ECG Machine, Arrhythmias.	9
3	Electrical Activity of the brain Electrical activity of brain – Sleep stages, Brain waves, waveforms & measurements, Evoked potentials, 10-20 electrodes placement system for EEG - EEG machine.	9

4	Measurement of Physiological Parameters Electrocardiograph measurements – blood pressure measurement: by ultrasonic method – plethysmography – blood flow measurement by electromagnetic flow meter - cardiac output measurement by dilution method Biomedical Equipment's Heart lung machine – artificial ventilator — Basic ideas of CT scanner – MRI and ultrasonic scanner – cardiac pacemaker – DC – defibrillator patient safety - electrical shock hazards- Centralized patient monitoring system	**9**

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand types of sensors	**K2**
CO2	Study the electrical activity of heart	**K1**
CO3	Study the electrical activity of brain	**K1**
CO4	Explore the various medical equipment and measurement of Physiological Parameters	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									
CO2	3	3	2									
CO3	3	3	2									
CO4	3	3	2									

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Textbook of Medical Physiology	Arthur C. Guyton	Prism Books (Pvt) Ltd &W.B.Saunders Company	12th edition, 2012
2	Handbook of Medical Instrumentation	Khandpur R S	Tata McGraw Hill	2004
3	Bio Medical Instrumentation	Arumugam M	Anuradha agencies	2002

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Electronics in Medicine and Biomedical Instrumentation	Nandini K. Jog	PHI	Second Edition 2013
2	Instrument Transducer – An Introduction to their performance and design	Hermann K P. Neubert	Clarendon Press	1975
3	Principles of applied Biomedical Instrumentation	L.A. Geddes, L.E. Baker	Pearson	1989

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://onlinecourses.swayam2.ac.in/nou23_bt05/preview
2	https://onlinecourses.swayam2.ac.in/nou23_bt05/preview
3	https://onlinecourses.swayam2.ac.in/nou23_bt05/preview
4	https://onlinecourses.swayam2.ac.in/nou23_bt05/preview

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