SEMESTER /S7

BIOMEDICAL INSTRUMENTATION

Course Code	OEBMT721	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	OE

Course Objectives:

1. Understand the Fundamentals of biomedical instrumentation
2. Elucidate the measurement of some physiological Parameters
3. Identify the diagnostic and therapeutic instruments.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	Introduction to Biomedical Instrumentation-Definition - Importance in healthcare- Origin of bioelectric potentials – resting and action potentials - propagation of action potentials –Examples of bioelectric potentials - ECG, EEG, EMG, – Electrodes for measurement of biopotentials.	9
2	Cardiovascular System- Electrocardiography (ECG)- Electrical activity of heart, electrocardiogram - lead systems - ECG machine – block diagram- Measurement of heart sounds–phonocardiography. Blood pressure measurement- sphygmomanometer & Oscillo metric methods. Photo plethysmography - for pulse rate measurement - Pulse oximeters.	9

3	Respiratory System-Spirometry and lung volume measurements- measurement of respiratory parameters. Nervous System -Electroencephalography (EEG)- Electrical activity of brain - Electro encephalogram – EEG measurement & waveforms - block diagram. Evoked potential -types & applications. Electromyography (EMG)- Electrical activity of Muscle- Types of electrodes	**9**
4	*Diagnostic Imaging Systems*-X-ray radiography - Principles of x-ray generation – Block diagram of x-ray machine. Computed tomography (CT)- Principle of operation. Magnetic resonance imaging (MRI) -Basic principle- Ultrasound imaging– Basic principles - Ultrasonic transducers. *Therapeutic Devices*-pacemakers – internal and external pacemakers, defibrillators – basic principles.	**9**

Course Assessment Method

(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

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

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 the Fundamentals of biomedical instrumentation.	**K1**
CO2	Elucidate the cardiovascular instrumentation.	**K2**
CO3	Explain measurements of some physiological Parameters.	**K2**
CO4	Identify the diagnostic and therapeutic instruments.	**K2**

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	1	1										2
CO2	2	1										2
CO3	2	1										2
CO4	2	1										2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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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	Medical Instrumentation: Application and Design	John G. Webster	John Wiley	2009
2	Introduction to Biomedical Equipment Technology	Joseph J. Car, John M. Brown	pearson Education (Singapore) Pvt. Ltd.	2012
3	Biomedical Instrumentation and Measurements	Leslie Cromwell	Pearson Education India	2nd edition, 2015
4	Encyclopaedia of Medical Devices and Instrumentation	John G Webster (Ed)	Wiley	2009

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Handbook of Biomedical Instrumentation	R.S Khandpur	Tata McGraw Hill	2004
2	Hand book of Biomedical Engineering	Bronzino	CRC-Press	2000

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/102/105/102105090/
2	https://onlinecourses.nptel.ac.in/noc22_bt56/preview
3	https://archive.nptel.ac.in/courses/102/105/102105090/

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