SEMESTER S7

BIOMEDICAL INSTRUMENTATION

Course Code	OEERT 722	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)	NIL	Course Type	Theory

Course Objectives:

1. To understand various bio potentials and its recording
2. To illustrate the working of various diagnostic equipment
3. To illustrate the working of various therapeutic equipment
4. To describe the imaging techniques used in clinical applications

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	**Introduction to human physiological system** Physiological systems of the body (brief discussion on Heart and cardio vascular system, Anatomy of nervous system, Physiology of respiratory systems) Problems encountered in biomedical measurements. Sources of bioelectric potentials – resting and action potentials -propagation of action potentials – bioelectric potentials example (ECG, EEG, EMG, ERG, EOG, EGG etc.)	9
2	**Bio potential electrodes, ECG and BP Measurement** Bio potential electrodes –basic theory – microelectrodes – skin surface electrodes – needle electrodes Instrumentation for clinical laboratory: Bio Potential amplifiers instrumentation amplifiers, isolation amplifiers, chopper amplifier Electro conduction system of the heart, Electro cardiograph –electrodes and	9

	leads – Einthoven triangle, ECG readout devices ECG machine – block diagram Measurement of blood pressure – direct and indirect measurement– oscillometric measurement –ultrasonic method.	
3	**Measurement EEG, EMG Respiratory Parametersand Therapeutic devices** Electro encephalogram –EEG measurement Electromyogram (EMG) – Nerve conduction velocity measurements- Respiratory parameters – Spiro meter, pneumograph. Therapeutic devices- Pacemakers – defibrillators-heart lung machine, haemodialysis -Surgical diathermy.	**9**
4	**Advances in Radiological Imaging and Electrical safety** X-rays- principles of generation, uses of X-rays- Basic principle of computed tomography, magnetic resonance imaging system and nuclear medicine system. Ultrasonic imaging system Electrical safety– physiological effects of electric current –shock hazards from electrical equipment –method of accident prevention, introduction to telemedicine	**9**

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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**

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	To understand the physiology of major systems of human body	**K2**
CO2	To understand various bio potentials and its recording	**K1**
CO3	To illustrate the working of various diagnostic equipment	**K2**
CO4	To illustrate the working of various therapeutic equipment	**K2**
CO5	To describe the imaging techniques used in clinical applications	**K2**

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

CO-PO Mapping Table (Mapping od Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3										
CO3	3	3										
CO4	3	3										
CO5	3	3										

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	Biomedical Instrumentation Measurements	L. Cromwell, F. J. Weibell and L. A. Pfeiffer	Pearson education	2nd Edton1990
2	Handbook of Biomedical Instrumentation	R. S. Khandpur	Tata McGraw Hill	
3	Introduction to Biomedical Equipment Technology	J. J. Carr and J. M. Brown	Pearson Education	

Reference 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	J. G. Webster	John Wiley and Sons	
2	John Enderele , Susan Blanchard, Joseph Bronzino	Introduction to Biomedical Engg	Academic Press	
3	Welkovitz	Biomedical Instruments, Theory and Design	Elselvier	
4	Jerry L Prince, Jonathan M Links	Medical Imaging Signals & Systems	Pearson Education	

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