

SRM UNIVERSITY
DEPARTMENT OF BIOMEDICAL ENGINEERING

BM0307	BIO MEDICAL INSTRUMENTATION
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Course Code: BM0307
Course Title: BIO MEDICAL INSTRUMENTATION
Semester: V SEM B. Tech – Third Year

STAFF NAME: S. Vijayalakshmi

Course Timings:

DAY	1	2	3	4	5	6	7
Day1		BM0307					
Day2					BM0307		
Day3			BM0307				

Location: Architecture Annexure block 4th Floor – BioMedicalInstrumentationLab-1

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BM0307	BIO MEDICAL INSTRUMENTATION	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to develop knowledge of how instruments work in the various department and laboratories of a hospital and thereby recognize their limitations.

INSTRUCTIONAL OBJECTIVES

The students will be able to

- Interpret technical aspects of medicine
- Solve Engineering Problems related to medical field
- Understand medical diagnosis and therapy

Course outcome	Program outcome
<ol style="list-style-type: none"> 1. To familiarize students with various medical equipments and their technical aspects 2. To introduce students to the measurements involved in some medical equipments. 	<ol style="list-style-type: none"> 1. Ability to understand diagnosis and therapy related equipments 2. Understanding the problem and ability to identify the necessity of an equipment to a specific problem

UNIT-1 PHYSIOLOGY OF SYSTEMS AND ELECTRODES

Man Instrument system-Physiology systems of the body. Bioelectric potential - Resting and action potential - Biopotential electrodes - different types of electrodes - Equivalent circuits for electrodes-Biochemical Transducers.

UNIT-2 CARDIOVASCULAR AND RESPIRATORY SYSTEM AND ITS MEASUREMENTS

Cardiovascular system - Blood pressure - characteristics of blood flow - Heart sounds - ECG - Measurement of blood pressure, blood flow, heart sounds and cardiac output Plethysmography. Elements of ICU. Physiology of Respiratory

system - Tests and Instrumentation for the mechanics of breathing-Gas Exchange and distribution-Respiratory therapy Equipment.

UNIT-3 NERVOUS SYSTEM AND ITS MEASUREMENTS

Nervous system - Neuronal communication organisation of the brain - Neuronal receptors - somatic nervous system - spinal reflexes - Autonomic nervous system - Neuronal firing measurements - EEG - EMG - Psychophysiological measurements - Instruments for testing Motor Responses - Instruments for sensory measurements - Instrumentation for the Experimental Analysis of Behavior - Bio feed back instrumentation .

UNIT-4 ASSISTING DEVICES, THERAPEUTIC DEVICES AND BIO TELEMETRY

Pacemaker - Defibrillators - Heart lung machine - Ventilator - Diathermy - Dialysing Unit. Bio telemetry - Introduction - Physiological parameters - Components - Implantable units - Applications.

UNIT-5 CHEMICAL TRANSDUCERS

Introduction - Blood gases - Dalton's law - Henry's law - The pO2 of blood - Reference electrodes - the pO2 electrode - membrane Electrodes - Blood gas analysis - Acid base balance - Transcutaneous pO2 and pCo2 transducers - fiber optic chemical transducers - Ion - specific Electrodes - Ionic content of blood - FET chemosensors - Glucose electrodes - Calorimeters and spectrophotometers flame photometer - Respiratory gases - oxygen uptake and concentration - Gaseous carbon Dioxide Analysis - Nitrogen analyzer - Mass spectrometer - Velocity of sound Analyzer.

TEXT BOOK

- Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, PHI, 2nd Edition, 2004

REFERENCE BOOKS

- Khandpur R.S., *Hand book of Biomedical Instrumentation*, Tata McGraw Hill, 2004
- L.A. Geddes and L.E. Baker, *Principles of Applied Biomedical Instrumentation*, John Wiley & Sons, Inc, 1989
- Richard Aston, *Principles of Biomedical Instrumentation and Measurement*, Merrill Publishing Company, 1990
- Jacobson B. and Webster J.G., *Medical Clinical Engineers*, Prentice Hall Inc., 1979
- John .G Webster, Editor, *Medical Instrumentation, Application and Design*, John Wiley and Sons Inc 1998

S.NO	Day Order	Hours	Topics to be covered	Reference books	Teaching method
			UNIT-I		
1.	Day 1	2	Introduction about physiology System and electrode	T1	BB
2.	Day 2	5	Man Instrument system-Physiology systems of the body	T1	BB
3.	Day 3	3	Introduction about action potential	T1	BB
4.	Day 1	2	Resting and action potential	R1	BB

5.	Day 2	5	Different types of electrode	R1	PPT
6.	Day 3	3	Suction cub and electrode used for EEG and ECG	R1	PPT
7.	Day 1	2	Equivalent circuits for electrode	R2	BB
8.	Day 2	5	Biochemical transducer	R2	BB
			UNIT-II		
9.	Day 3	3	Introduction about Cardiovascular respiratory system and its measurements		
10.	Day 1	2	Blood pressure Measurements	T1	BB
11.	Day 2	5	Characteristics of blood flow heart sound	T1	BB
12.	Day 3	3	ECG equipment and ECG electrode	T1	PPT
13.	Day 1	2	Measurement of blood pressure, blood flow, heart sounds	T1	BB
14.	Day 2	5	Cardiac output Plethysmography	T1	BB
15.	Day 3	3	ICU equipments	T1	BB
16.	Day 1	2	Physiology of Respiratory system, Tests and Instrumentation for the mechanics of breathing.	T1	BB
17.	Day 2	5	Exchange and distribution-Respiratory therapy Equipment.	T1	BB
			UNIT -III		
18.	Day 3	3	Nervous system - Neuronal communication organization of the brain	T1	BB
19.	Day 1	2	Neuronal receptors - somatic nervous system - spinal reflexes - Autonomic nervous system	T2	BB
20.	Day 2	5	Neuronal firing measurements - EEG	T2	BB
21.	Day 3	3	EMG Equipments	T2	BB
22.	Day 1	2	Psycho physiological measurements - Instruments for testing Motor Responses	R4	BB

23.	Day 2	5	Instruments for sensory measurements	R4	BB
24.	Day 3	3	Instrumentation for the Experimental Analysis of Behavior	R4	BB
25.	Day 1	2	Bio feedback instrumentation.	R4	BB
			UNIT-IV		
26.	Day 2	5	Introduction about assisting device, therapeutic device and biotelemetry	R3	PPT
27.	Day 3	3	Pacemaker and application	R3	PPT
28.	Day 1	2	Defibrillator internal defibrillator and external defibrillator	R3	PPT
29.	Day 2	5	Heart lung machine	R3	PPT
30.	Day 3	3	Ventilator introduction and principle	R3	PPT
31.	Day 1	2	Ventilator function and neonatal ventilator, diathermy, Dialysing unit	R3	BB
32.	Day 2	5	Bio telemetry - Introduction - Physiological parameters	R3	BB
33.	Day 3	3	Components - Implantable units - Applications	R3	BB
			UNIT-V		
34.	Day 1	2	Chemical transducer Introduction - Blood gases, Dalton's law - Henry's law - The pO ₂ of blood	R5	BB
35.	Day 2	5	Reference electrodes - the pO ₂ electrode	R5	BB
36.	Day 3	3	membrane Electrodes, Blood gas analysis - Acid base balance	R5	BB
37.	Day 1	2	Transcutaneous pO ₂ and pCO ₂ transducers, fiber optic chemical transducers	R5	BB
38.	Day 2	5	Ion - specific Electrodes - Ionic content of blood	CM	BB
39.	Day 3	3	FET chemo sensors - Glucose electrodes	T1	BB
40.	Day 1	2	Calorimeters and spectrophotometers flame photometer - Respiratory gases, Velocity of sound Analyzer	T1	BB
41.	Day 2	5	oxygen uptake and concentration, Gaseous carbon Dioxide Analysis	T1	BB
42.	Day 3	3	Nitrogen analyzer - Mass spectrometer	T1	BB
43.	Day 1	2	Activities and Revision (Objective tests) on Unit-1	-	-
44.	Day 2	5	Activities and Revision (Objective tests) on Unit-2	-	-
45.	Day 3	3	Activities and Revision (Objective tests) on Unit-3	-	-
46.	Day 1	2	Activities and Revision (Objective tests) on Unit-4	-	-
47.	Day 2	5	Activities and Revision (Objective tests) on Unit-5	-	-

Total hours: 47

Test Portions:

Cycle test I: Unit 1 & Unit 2

Cycle test II: Unit 3 & Unit 4

Model Exam: All 5 units

Assessment details:

Cycle Test 1 – 10 marks

Surprise Test 1 - 5 marks

Cycle Test 2 – 10 marks

Attendance- 5 marks

Model Exam -20marks

Staff's Signature

HOD/BME