SRM UNIVERSITY
DEPARTMENT OF BIOMEDICAL ENGINEERING
ODD Semester-2014-2015

BM0307	BIO MEDICAL INSTRUMENTATION

Course Code: BM0307 **STAFF NAME: D. ASHOK KUMAR**
Course Title: BIO MEDICAL INSTRUMENTATION
Semester: V SEM B. Tech – Third Year

Course Timings:

DAY	1	2	3	4	5	6	7
Day1		**BM0307**					
Day2					**BM0307**		
Day5						**BM0307**	

Location:
Class Room: B602, School of Bio engineering,5th floor
Staff Room: MA401, Architecture Annexure block 4th Floor

Faculty Name: Ms. D. ASHOK KUMAR

Faculty email ID: ashok.d@ktr.srmuniv.ac.in

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BM0307	**BIO MEDICAL INSTRUMANTATION**	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To enable the students to develop knowledge on Medical instruments and the technology behind the instruments 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
1. To familiarize students with various medical equipments and their technical aspects 2. To introduce students to the measurements involved in some medical equipments.	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 – Bio potential 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 Respiratorysystem - 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 Inc1998

S.NO	Day Order	Hours	Topics to be covered	Reference books	Teaching method
			UNIT-I		
1	1	2	Introduction about physiology System and electrode	T1	BB
2	2	5	Man Instrument system-Physiology systems of the body	T1	BB
3	5	6	Bioelectric potential	T1	BB
4	1	2	Resting and action potential	R1	BB
5	2	5	Bio potential electrodes	R1	PPT
6	5	6	Different types of electrodes	R1	PPT
7	1	2	Equivalent circuits for electrodes	R2	BB
8	2	5	Biochemical Transducers	R2	BB
9	5	6	**Activities and Revision**		
			UNIT-II		
10	1	2	Introduction to Cardiovascular system	T1	BB
11	2	5	Blood pressure , characteristics of blood flow, heart sounds , ECG	T1	BB
12	5	6	Measurement of blood pressure blood flow, heart sounds	T1	PPT
13	1	2	Measurement of blood pressure blood flow, heart sounds	T1	PPT
14	2	5	Cardiac output Plethysmography	T1	BB
15	5	6	Elements of ICU, Physiology of respiratory system	T1	BB
16	1	2	Tests and Instrumentation for the mechanics of breathing	T1	BB
17	2	5	Gas Exchange and distribution	T1	BB
18	5	6	Respiratory therapy Equipment.	T1	BB
19	1	2	**Activities and Revision**		

			UNIT-III		
20	2	5	Nervous system – Neuronal communication organization of the brain	T1	BB
21	5	6	Neuronal receptors - somatic nervous system - spinal reflexes - Autonomic nervous system	R2	BB
22	1	2	Neuronal firing measurements - EEG	R2	BB
23	2	5	EMG Equipments	R2	BB
24	5	6	Psycho physiological measurements – Instruments for testing Motor Responses	R4	BB
25	1	2	Instruments for sensory measurements	R4	BB
26	2	5	Instrumentation for the Experimental Analysis of Behavior	R4	BB
27	5	6	Bio feedback instrumentation.	R4	BB
28	1	2	**Activities and Revision**		
			UNIT-IV		
29	2	5	Introduction about assisting device, therapeutic device and biotelemetry	R3	PPT
30	5	6	Pacemaker and application	R3	PPT
31	1	2	Defibrillator internal defibrillator and external defibrillator	R3	PPT
32	2	5	Heart lung machine	R3	PPT
33	5	6	Ventilator introduction and principle	R3	PPT
34	1	2	Ventilator function and neonatal ventilator, diathermy,Dialysing unit	R3	BB
35	2	5	Bio telemetry - Introduction - Physiological parameters	R3	BB
36	5	6	Components - Implantable units - Applications	R3	BB
37	1	2	**Activities and Revision**		
			UNIT-V		
38	2	5	Chemical transducer, Introduction - Blood gases, Dalton's law - Henry's law - The pO2 of blood	R5	BB

39	5	6	Reference electrodes - the pO2 electrode	R5	BB
40	1	2	Membrane Electrodes, Blood gas analysis - Acid base balance	R5	BB
41	2	5	Transcutaneous pO2 and pCo2 transducers, fiber optic chemical transducers	R5	BB
42	5	6	Ion - specific Electrodes - Ionic content of blood	CM	BB
43	1	2	FET chemo sensors – Glucose electrodes	T1	BB
44	2	5	Calorimeters and spectrophotometers, flame photometer - Respiratory gases, Velocity of sound Analyzer	T1	BB
45	5	6	oxygen uptake and concentration, Gaseous carbon Dioxide Analysis	T1	BB
46	1	2	Nitrogen analyzer - Mass spectrometer	T1	BB
47	2	5	**Activities and Revision**		

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

Total hours: 47

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