

SRM UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF EEE
COURSE PLAN

Course Code: EE0463
Course Title: BIOMEDICAL INSTRUMENTATION
Semester: VII
Course Time: June-Nov 2013
Location: Main campus

Faculty details:

Name of the staff	Office	Office hour	Mail id
A.Lavanya	ESB Block first floor Room No-ESB207	12.30-1.30 P.M	lavanya.a@ktr.srmuniv.ac.in
A.Anandha christy	ESB Block (EEE Dept. Library)	12.30-1.30 P.M	Jencychristy@yahoo.com

Required text books

1. John. G. Webster, Editor, *Medical Instrumentation, Application and Design*, John Wiley & Sons.1989.
2. Prof.Venkataram.S.K., *Bio-Medical Electronics & Instrumentation*, Galgotia Publications.2000
- 3.Khandpur.R.S., *Hand book of Bio-Medical Instrumentation* Tate McGraw –Hill1987
4. Dr.Arumugam , *Bio-Medical Instrumentation* ,Anuradha Agencies,1994.
5. Cromwell, *Bio-Medical Instruments and Measurements*, Prentice Hall of India,1990.

Web Resources :

1. <http://nptel.iitm.ac.in/courses/>

Instructional objective:

At the end of the course, the students will be able to:

1. Learn the basic human physiology.
2. Understand the applications of measuring, recording and monitoring instruments.
3. Understand the concepts of various medical instruments and supporting systems.

Assessment Details:

Cycle test-I: 10 Marks
Cycle test-II: 10 Marks
Surprise test: 5 Marks
Attendance: 5 Marks
Model exam: 20 Marks

Test Schedule

Test	Date	Portions	Duration
Cycle test-I	Last week of July	Unit-I &II	90mins
Cycle test-II	Last week of August	Unit-II&IV	90mins
Model exam	Last week of October	All five units	3 hrs

Detailed Session plan:

HUMAN PHYSIOLOGY: Introduction, generalized medical instrumentation system, components of instrumentation system, physiological systems of the body, cardiovascular system. Respiratory system, Nervous system generation of bioelectric potentials, Action potential, Resting potential, Neuronal communication

Session No.	Topics to be covered	Text books	Instructional objective	Student Outcome
1	Introduction	1.Khandpur.R.S., <i>Hand book of Bio-Medical Instrumentation</i> Tate McGraw –Hill,2003 2.Dr.Arumugam , <i>Bio-Medical Instrumentation</i> Anuradha Agencies,2003	Learn the basic human physiology	(a) an ability to apply knowledge of mathematics, science and engineering (d) an ability to function on multidisciplinary teams
2	Generalized medical instrumentation system, components of instrumentation system			
3	Physiological systems of the body, cardiovascular system			
4	Respiratory system			
5	Nervous system			
6	Generation of bioelectric potentials,			
7	Action potential, Resting potential			
8	Neuronal communication			

BIO- POTENTIAL ELECTRODES, TRANSDUCERS & RECORDERS The electrode – electrolyte interface, Polarization, Ag/AgCl Electrodes, Body surface electrodes, Internal Electrodes. Transducers in general, Pressure Transducers, Temperature transducers, pulse sensors, Basic recording system, Direct Writing recorder, UV recorders, Thermal array recorders, Electrostatic recorder, Instrumentation Tape recorder

Session No.	Topics to be covered	Text books	Instructional objective	Student Outcome
9	The electrode – electrolyte interface, Polarization	1.Khandpur.R.S., <i>Hand book of Bio-Medical Instrumentation</i> Tate McGraw –Hill,2003	Understand the applications of measuring, recording and monitoring instruments	(a) an ability to apply knowledge of mathematics, science and engineering (d) an ability to function on multidisciplinary teams
10	Ag/Agcl Electrodes, Body surface electrodes, Internal Electrodes			
11	Transducers in general, Pressure Transducers	2.Cromwell, <i>Bio-Medical Instruments and Measurements</i> , Prentice Hall of India		
12	Temperature transducers, pulse sensors			
13	Basic recording system, Direct Writing recorder	3.Dr.Arumugam , <i>Bio-Medical Instrumentation</i> Anuradha Agencies, 2003		
14	UV recorders, Thermal array recorders			
15	Electrostatic recorder, Instrumentation Tape recorder			

MEDICAL IMAGING SYSTEMS Information content of an image, Modulation transfer function, Noise –equivalent bandwidth, generation of X-rays, X-ray machine, computed Tomography, Magnetic Resonance Imaging – Principle, Image reconstruction techniques, Basic NMR components, Ultrasonic Imaging systems – Types of ultrasound imaging, Applications of different scan, Bio Telemetry

Session No.	Topics to be covered	Text books	Instructional objective	Student Outcome
16	Information content of an image, Modulation transfer function, Noise – equivalent bandwidth	1.Cromwell, <i>Bio-Medical Instruments and Measurements</i> , Prentice Hall of India 2.Dr.Arumugam , <i>Bio-Medical Instrumentation</i> Anuradha Agencies	Understand the applications of measuring, recording and monitoring instruments	(a) an ability to apply knowledge of mathematics, science and engineering (d) an ability to function on multidisciplinary teams (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (j) a knowledge of contemporary issues
17	Generation of X-rays, X-ray machine			
18	Computed Tomography			
19	Magnetic Resonance Imaging – Principle, Image reconstruction techniques,			
20	Basic NMR components			
21	Ultrasonic Imaging systems – Types of ultrasound imaging,			
22	Applications of different scan			
23	Bio Telemetry			
MONITORING SYSTEMS: Electrocardiogram, Effects of artifacts on ECG recordings, ECG recorder Principles, EEG & EMG recorders, Phonocardiogram, stethoscope, BP measuring Instrument- Sphygmomanometer and cardiac catheterization, ultrasonic blood flow meter, Principle of Photoelectric calorimeter, computerized patient monitoring system.				
Session No.	Topics to be covered	Text books	Instructional objective	Student Outcome
24	Electrocardiogram, Effects of artifacts on ECG recordings	1. John. G. Webster, Editor, <i>Medical Instrumentation, Application and Design</i> , John Wiley & Sons.1989. 2.Prof.Venkataram.S.K., <i>Bio-Medical Electronics & Instrumentation</i> , Galgotia Publications.2000	Understand the applications of measuring, recording and monitoring instruments	(a) an ability to apply knowledge of mathematics, science and engineering (d) an ability to function on multidisciplinary teams (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (j) a knowledge of contemporary issues
25	ECG recorder Principles			
26	EEG & EMG recorders			
27	Phonocardiogram, stethoscope			
28	BP measuring Instrument- Sphygmomanometer			
29	Cardiac catheterization			
30	Ultrasonic blood flow meter			
31	Principle of Photoelectric calorimeter			
32	Computerized patient monitoring system			
SUPPORTING SYSTEMS: Pacemaker systems – Different pacing modes of operation, Transcutaneous Electrical Nerve stimulation (TENS) – Stimulation modes & application techniques, surgical diathermy, laser applications in medicine, Hemo Dialysis, Lithotripsy and introduction to electrical safety.				

Session No.	Topics to be covered	Text books	Instructional objective	Student Outcome
33	Pacemaker systems – Different pacing modes of operation	1.Cromwell, <i>Bio-Medical Instruments and Measurements</i> , Prentice Hall of India 2.John. G. Webster, Editor, <i>Medical Instrumentation, Application and Design</i> , JohnWiley & Sons.1989.	Understand the concepts of various medical instruments and supporting systems	(a) an ability to apply knowledge of mathematics, science, and engineering
34	Transcutaneous Electrical Nerve stimulation (TENS) – Stimulation modes & application techniques			(d) an ability to function on multidisciplinary teams
35	Surgical diathermy			(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
36	Laser applications in medicine			
37	Hemo Dialysis			
38	Lithotripsy			
39	Introduction to electrical safety			