

MOHAMMED SATHAK A J COLLEGE OF ENGINEERING													
Siruseri IT park, OMR, Chennai - 603103													
LESSON PLAN													
Department of Electronics and Communication Engineering													
Name of the Subject		MEDICAL ELECTRONICS					Regulation		2017				
Subject Code		EC8073					Year / Sem		III/V				
Acad Year		AY 2022-2023					Batch		2020-2024				
Course Objective													
To gain knowledge about the physiological parameters (characterstics) and recording methods of bioelectric signals													
To analyse the bio-chemicals and various physiological information													
To study about various assist devices used in hospitals													
To study the equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.													
To gain knowledge about the concepts of medical Instrumentation in recent technology (laser, telemedicine, endoscopy unit).													
Course Outcome													
At the end of the course, the students should be able to:													
CO1: Discuss the physiological parameters (characterstics) and recording methods of bioelectric signals													
CO2:Measure various bio chemical Information													
CO3:Measure various physiological information													
CO4:Illustrate the working of human assist devices used in hospitals and to know about telemetry principles													
CO5:Describe the recent trends in diagnosis & Therapy (laser, telemedicine, endoscopy unit).													
Lesson Plan													
Sl. No.	Topic(s)	T / R*	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO						
		Book											
UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING													
1	Introduction	T1	1	BB,PPT	L1	CO1	PO1						
2	Sources of Biomedical Signals, Basic Medical Instrumentation system	T1,R1	1	BB	L2	CO1	PO1-PO2						
3	Origin of Bio-potentials	T1	1	BB	L2	CO1	PO1						
4	Bio-potential electrodes (Ag-AgCl Electrodes, Surface Electrode, Nernst equation)	T1,R1	1	BB,PPT	L2	CO1	PO1,PO2						
5	Biological amplifiers	T1	1	BB,PPT	L2	CO1	PO1,PO2						
6	ECG – (Electrodes, Amplifiers, Lead set up, System, Waveforms and Signal Characteristics)	T1,R1	1	BB,PPT	L3	CO1	PO1,PO2,PO6,P07,PO12						
7	EEG – (Electrodes, Amplifiers, Lead set up, System, Waveforms and Signal Characteristics)	T1,R1	1	BB,PPT	L3	CO1	PO1,PO2,PO12						
8	EMG – (Electrodes, Amplifiers, Lead set up, System, Waveforms and Signal Characteristics)	T1,R1	1	BB,PPT	L3	CO1	PO1,PO2,PO12						
9	PCG – System and Signal Characteristics	T1,R1	1	BB,PPT	L3	CO1	PO1,PO2,PO12						
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any													
Assignment : comparison of various bio potential recording system													
Evaluation method : Assignment papers collected													
UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT													
10	Introduction to biochemical process- PH, PO2	R1	1	BB	L2	CO2	PO1,PO2						
11	PCO2	R1	1	BB	L2	CO2	PO1,PO2						
12	Colorimeter	R1	1	BB	L2	CO2	PO1,PO2						
13	Auto analyser	R1	1	BB	L3	CO2	PO1,PO2,PO12						
14	Blood flow meter	R1	1	BB	L3	CO2	PO1,PO2,PO6, PO7,PO12						
15	Cardiac output and Respiratory measurement	R1	1	BB,PPT	L3	CO3	PO1,PO2						
6	Blood pressure	R1	1	BB,PPT	L3	CO3	PO1,PO2,PO6,PO7,PO12						
17	Temperature and pulse	R1	1	BB	L3	CO3	PO1,PO2						
18	Blood Cell Counters	R1	1	BB	L2	CO2	PO1,PO2,PO12						
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any													
Miniproject: Temperature Monitoring													
Evaluation method : Implement and Evaluate													

UNIT III ASSIST DEVICES							
19	Introduction to Assist devices	T1	1	BB,NPTEL	L2	CO4	PO1,PO2
20	Cardiac Pacemaker: Primary node and Secondary node	T1,R1	1	PPT	L3	CO4	PO1,PO2,P12
21	Cardiac Pacemaker: Generation of action potentials	T1	1	PPT	L2	CO4	PO1,PO2,PO12
22	DC Defibrillator: Definition Block diagram	T1	1	PPT	L3	CO4	PO1,PO2,PO12
23	Internal Defibrillator and External Defibrillator	T1,R1	1	PPT	L2	CO4	PO1,P O2
24	A.C. defibrillator and D.C. defibrillator	T1	1	PPT	L2	CO4	PO1,P O2
25	Dialyzer -peritoneal,hemodialysis	T1,R1	1	BB	L4	CO4	PO1,PO2,PO4, PO12
26	MRI	T1	1	BB	L3	CO4	PO1,PO2,PO6,PO 7,PO12
27	Ultrasonic Imaging system	T1	1	BB	L3	CO4	PO1,PO2,PO6,PO 7,PO12
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any : Industrial Visit							
Evaluation method : Visit the nearby hospital for learning of medical equipments and submit a report							
UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY							
28	Diathermies- shortwave	T1,R1	1	BB	L3	CO4	PO1,PO2,PO12
29	Ultrasonic	T1,R1	1	BB	L3	CO4	PO1,PO2
39	Microwave applications	T1	1	PPT	L4	CO4	PO1,PO2
31	Surgical diathermy	T1	1	PPT	L3	CO4	PO1,PO2
32	Telemetry principles	T1	1	PPT	L2	CO4	PO1,PO12
33	Frequency selection	T1,R1	1	BB	L2	CO4	PO1
34	Biotelemetry	T1	1	PPT	L2	CO4	PO1,PO2,PO12
35	single channel bio telenetry	T1	1	PPT	L2	CO4	PO1,PO2,PO12
36	multichannel bio telemetry ,ECG telemetry	T1	1	PPT	L2	CO4	PO1,PO2,PO12
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any :Case study							
Compare the side effects of Microwave ,CT Scan,MRI,							
Evaluation method : Online MCQ Quiz							
UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION							
37	Introduction to medical instrumentation	R1	1	BB	L2	CO5	PO1-PO2, PO6,PO12
38	Telemedicine,Introduction	T1	1	BB	L2	CO5	PO1-PO2, PO6,PO12
39	Telemedicine concepts	T1	1	BB	L2	CO5	PO1- PO2,PO6,PO12
40	Insulin Pumps	R1	1	PPT	L3	CO4	PO1,PO2, PO6,PO7,PO12
41	Radio pill,	R1	1	PPT	L2	CO5	PO1,PO2,PO6, PO12
42	Endomicroscopy	R1	1	PPT	L3	CO4	PO1,PO2, PO6,PO7,PO12
43	Brain machine interface	R1	1	PPT	L3	CO4	PO1,PO2,PO6,PO 7,PO12
44	Brain machine interface-blocks	T1	1	PPT	L3	CO4	PO1,PO2, PO6,PO7,PO12
45	Lab on a chip	T1	1	BB	L2	CO5	PO1-PO2,PO6, PO12
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any							
Quiz: Quiz on Recent trends in medical Instruementation							
Evaluation method: Individual quiz sheets collected							
Content Beyond the Syllabus Planned							
1	EOG recording						
2	CT SCAN						
Text Books							
1	1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.						
Reference Books							
1	1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA Mc Graw-Hill, New Delhi, 2003.						
2	2. John G.Webster, “Medical Instrumentation Application and Design”, 3rd Edition, Wiley India Edition, 2007						
3	2. Joseph J.Carr and John M.Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, New York, 2004.						
Website / URL References							
1	https://npTEL.ac.in/courses/102/101/102101068/ , http://www.bem.fi/book/15/15.htm						
2	https://youtu.be/XPmxngLV2GI , http://highered.mcgraw-hill.com/sites/dl/free/0070960526/323541/mhriib_ch11.pdf						
3	https://youtu.be/FejwQWkwfUQ						
4	https://youtu.be/iPXVdTCMktM						
5	https://youtu.be/mumf8VchVJw						

Blooms Level														
Level 1 (L1) : Remembering				Lower Order Thinking	Fixed Hour Exams	Level 4 (L4) : Analysing							Higher Order Thinking	Projects / Mini Projects
Level 2 (L2) : Understanding						Level 5 (L5) : Evaluating								
Level 3 (L3) : Applying						Level 6 (L6) : Creating								
Mapping syllabus with Bloom's Taxonomy LOT and HOT														
Unit No	Unit Name				L1	L2	L3	L4	L5	L6	LOT	HOT	Total	
Unit 1	ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING				1	4	4	0	0	0	9	0	9	
Unit 2	BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT				0	4	5	0	0	0	9	0	9	
Unit 3	ASSIST DEVICES				0	4	4	1	0	0	8	1	9	
Unit 4	PHYSICAL MEDICINE AND BIOTELEMETRY				0	5	3	1	0	0	8	1	9	
Unit 5	RECENT TRENDS IN MEDICAL INSTRUMENTATION				0	5	4	0	0	0	9	0	9	
Total					1	22	20	3	0	0	43	2	45	
Total Percentage					2.22	48.89	44.44	6.67	0.00	0.00	95.56	4.44	100.00	
CO PO Mapping														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	0	0	0	1	1	0	0	0	0	1	1	0
CO2	3	3	0	0	0	1	1	0	0	0	0	2	1	0
CO3	3	3	0	0	0	1	1	0	0	0	0	2	1	0
CO4	3	3	0	3	0	0	1	0	0	0	0	1	1	0
CO5	3	3	0	0	0	0	0	0	0	0	0	2	0	0
Avg	3	3	0	0.6	0	0.6	0.8	0	0	0	0	1.6	0.8	0
Justification for CO-PO mapping														
CO1	Various fundamental key elements related to bioscience are described Highly in PO1 .high correlation of Different concepts of recording bio signals are being analyzed to produce engineering solutions in medical field PO2.Less impact environmental engineering solutions and society PO6,PO7.Here is a reasonable need for continuous learning required PO12													
CO2	Various fundamental key elements like electrode and non electrical parameter are described Highly in PO1 .High correlation of Different measurement concepts are being analyzed to produce engineering solutions in medical field PO2.Less impact environmental engineering solutions and society PO6,PO7.Here is a reasonable need for continuous learning required PO12													
CO3	Highly described Various fundamental key elements used for assist devices indicated in PO1 .Modern equipments concepts are being analyzed to produce engineering solutions in medical field PO2.Less impact environmental engineering solutions and society PO6,PO7.Here is a reasonable need for continuous learning required PO12													
CO4	fundamental key of physical medicine and telemetry signals used for medical field are described in PO1 Highly .Understands the work of different telemetry concepts in combination -PO2. Side effects of different scanning method asked .PO4.Less impact environmental engineering solutions and society PO6,PO7.Here is a reasonable need for continuous learning required PO12													
CO5	Highly descibed Basic concepts used in the latest medical technology advancement PO1. Different systems are analyzed PO2 .Less impact environmental engineering solutions and society PO6,PO7.Here is a reasonable need for continuous learning required PO12													
3		High level			2		Moderate level			1		Low level		
Name & Sign of Faculty Incharge : Dr.M.Sivakumar														
Name & Sign of Subject Expert :														
Head of the Department : Dr.M.Sivakumar														
Format No :231														

