

**B.P. PODDAR INSTITUTE OF MANAGEMENT AND TECHNOLOGY**

137, VIP Road, PoddarVihar, Kolkata: 7000052

**Department of Electrical Engineering**  
**Academic Year -2025-26(Even Semester)****LESSON PLAN**

**Program** : Electrical Engineering      **Credit:** 3      **Contact:** 3hrs  
**Course Name** : Biomedical Instrumentation  
**Course Code** : OE-EE 801B  
**Course Coordinator** : Dr. Nandita Sanyal

<b>Lectures Number</b>	<b>Topics to be covered</b>	<b>Text Books / Reference</b>	<b>Teaching Pedagogies</b>
L1	Fundamentals of Medical Instrumentation- Sources of Biomedical Signals	<b>T1/T3</b>	Power Point Presentation/Chalk & Talk
L2	Generalized medical instrumentation block diagram	<b>T1/T3</b>	Power Point Presentation/Chalk & Talk
L3	Classification of Medical instruments based on application diagnostic instruments	<b>T1/T3</b>	Power Point Presentation/Chalk & Talk
L4	Medical instruments based on application - therapeutic instrument .	<b>T1/T3</b>	Power Point Presentation/Chalk & Talk
L5	Medical instruments based on application Imaging, analytical	<b>T1/T3</b>	Power Point Presentation/Chalk & Talk
	Power Point Presentation on CO1		
L6	Medical electrodes - ECG, EEG	<b>T1/T3/R2</b>	Lecture Chalk & Talk
L7	Medical electrodes - EMG,	<b>T1/T3/R2</b>	Lecture Chalk & Talk
L8	Defibrillator	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L9	Medical transducers: Body temperature	<b>T1/T3/R2</b>	Lecture Chalk & Talk
L10	Medical transducers: Blood pressure, respiration rate.	<b>T1/T3/R2</b>	Lecture Chalk & Talk

	Report writing on CO2		Power Point Presentation/Chalk & Talk
	Discussion on Assignments		Power Point Presentation/Chalk & Talk
L11	Biomedical Recorders: Electrocardiograph (ECG) machine -ECG block diagram	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L12	Bipolar and unipolar leads, Phono- cardiograph.	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L13	Biomedical Recorders:EEG 10-20 electrode placement system	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L14	EEG readout device,	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L15	Electro-myograph (EMG) machine.	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L16	Bio-feedback Instrumentation. Pulse Oximeter.	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
	Discussion on CT1 Questions		Power Point Presentation/Chalk & Talk
L17	Medical Imaging Equipments: X- ray machine	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L18	Medical Imaging Equipments: CT Scan machine	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L19	Medical Imaging Equipments: MRI Scan Machine	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L20	Properties of Ultra Sound	<b>T1/T3/R2</b>	Power Point Presentation/Chalk &

			Talk
L21	Ultrasonic foetal monitors. Echoencephalography. .	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L22	Echocardiograph. Colour Doppler ultrasound machine	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L23	Surgical & Therapeutic Instruments	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L24	Electro-surgery machine (cautery),	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L25	Hemo-dialysis machine	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L26	Muscle stimulators, Defibrillator Machine	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L27	Medical Laboratory Instruments:	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L28	Types of test- Blood cell, Bio chemistry,	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L29	Blood Cell Counter, Bio chemistry analyze,	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk
L30	Auto analyzer, Blood gas analyzer.	<b>T1/T3/R2</b>	Power Point Presentation/Chalk & Talk

### Text books:

- T1 Handbook of Biomedical instrumentation, R. S. Khandpur, Tata McGraw Hill, New Delhi, 2003  
T2 Introduction to Biomedical equipment technology, Joseph J. Carr and J.M. Brown, Pearson education, New Delhi, 2000

T3 Biomedical instrumentation measurements, Leslie P. Cromwell, Fred J. Weibell, Erich A. Pfeiffer, PHI Learning, New Delhi, 2018

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### Reference books:

- R1 Medical instrumentation application & design, John G. Webster, Editor, John Wiley and Sons, New Delhi, 2009  
R2 Introduction to Biomedical Instrumentation, Mandeep Singh, PHI, 2010

### Web References:

#### USEFUL VIDEO LINK

<https://www.youtube.com/watch?v=YgnGPw4AxO0>

cell and their structures <https://www.youtube.com/watch?v=URUJD5NEXC8>

action and resting potential [https://www.youtube.com/watch?v=ZY6CL2D\\_SpA](https://www.youtube.com/watch?v=ZY6CL2D_SpA)

different types of electrodes [https://www.youtube.com/watch?v=cP1h\\_uuXBR4](https://www.youtube.com/watch?v=cP1h_uuXBR4)

Sensors used in biomedicine <https://www.youtube.com/watch?v=dmlDFY7eNLo>

selection criteria for transducers and electrodes <https://www.youtube.com/watch?v=FYggY7LLDrw>

#### ELECTRO – PHYSIOLOGICAL MEASUREMENT

<https://www.youtube.com/watch?v=5zwIKWqOqOc> EEG

<https://www.youtube.com/watch?v=SmiTJ0ubzPo> EMG

<https://www.youtube.com/watch?v=4kkIvP1jNLA>

#### NON – ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure <https://www.youtube.com/watch?v=f6HtqolhKqo> blood flow cardiac

output <https://www.youtube.com/watch?v=hpQFToprlH8> cardiac rate

<https://www.youtube.com/watch?v=ke1zlgXaaSg> heart sound

<https://www.youtube.com/watch?v=dBwr2GZCmQM> measurement of gas volume

<https://www.youtube.com/watch?v=dcqa4md4pAg> flow rate of CO<sub>2</sub> and O<sub>2</sub> UNIT IV MEDICAL

#### IMAGING PARAMETER MEASUREMENTS

X- RAY machine

[https://www.youtube.com/watch?v=hTz\\_rGP4v9Y](https://www.youtube.com/watch?v=hTz_rGP4v9Y) computer tomography

<https://www.youtube.com/watch?v=0OdNI3ISgLc> magnetic resonance imaging system

[https://www.youtube.com/watch?v=E44W54z\\_Ykw](https://www.youtube.com/watch?v=E44W54z_Ykw) 197 ultrasonography

<https://www.youtube.com/watch?v=X8ab6NAIV5I> endoscopy

<https://www.youtube.com/watch?v=F6hdQJdWFkk>

#### ASSISTING AND THERAPETIC DEVICES

Cardiac pacemakers [https://www.youtube.com/watch?v=53\\_jyoA47Fk](https://www.youtube.com/watch?v=53_jyoA47Fk) defibrillators ventilators

<https://www.youtube.com/watch?v=V8VIw0fk4X0> muscle stimulators

<https://www.youtube.com/watch?v=zNBVQPvIX6g> diathermy

<https://www.youtube.com/watch?v=xGqN2IWjBsA> introduction to artificial kidney artificial heart

<https://www.youtube.com/watch?v=YKesLS2j2WU> <https://www.youtube.com/watch?v=fjISP5n939o>  
heart lung machine