



# National Institute of Technology Meghalaya

An Institute of National Importance

**CURRICULUM**

Programme	<b>Bachelor of Technology in Electrical and Electronics Engineering</b>	Year of Regulation	<b>2019-20</b>
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Department	<b>Electrical Engineering</b>	Semester	<b>VI</b>
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Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
<b>EE320</b>	<b>Biomedical Instrumentation</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>200</b>

Course Objectives	To explore the roles of Engineering in Healthcare systems		Course Outcomes	CO1	Ability to <b>enhance</b> basic understand about the origin of various biomedical signals and to understand the signal conditioning circuits and data acquisition process
	To acquire knowledge about various biomedical sensors, transducers, instruments and their applications in measurement and diagnosis of physiological variables for better healthcare technologies.			CO2	Ability to <b>comprehend</b> various sensors and physiological transducers used for <b>biomedical applications</b>
	To enhance the knowledge of data acquisition and biomedical transducer to perform PC based measurements.			CO3	Ability to <b>develop</b> an understanding of the recent trends in measurement and recording principles of various <b>medical instruments</b>
	To develop an understanding of the patient safety related to the medical instruments				
	To understand the basics of data acquisition and recording of various biomedical signals				

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	3	3	0	1	3	0	0	1	2	0	0	1	3	0	3
2	CO2	3	3	2	2	3	0	0	1	2	0	0	1	3	3	2
3	CO3	2	3	3	1	1	1	2	0	0	0	0	0	2	3	2
4	CO4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

## SYLLABUS

No.	Content	Hours	COs
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I	<b>Bio-Electric Signals and Electronics:</b> Origin of bio-electric signals, Basis of bioelectric signals: Electrocardiogram, Electroencephalogram, Electromyogram. Bioelectric potentials, Biopotential electrodes. Biomedical amplifiers. Principles of recording for bioelectric events	09	CO1
II	<b>Physiological Transducers:</b> Roles of Engineering in Healthcare systems. Problems encountered in measuring physiological parameters. Fundamentals of Transducers for biomedical applications. Various types of transducers: variable resistance transducers, variable inductance transducers, variable capacitance transducers, thermosensitive transducers, photoelectric transducers, piezoelectric transducers for measurement of different physiological parameters and their selection for medical applications	12	CO2
			CO1
III	<b>Bio-Medical Instrumentation System:</b> Generalized Medical Instrumentation System, Instrumentation for the clinical laboratory, Instrumentation for diagnostic X-ray, Basic principles of instruments and devices for Electrocardiogram, Electroencephalogram, Electromyogram and audiometer. PC based biomedical instrumentation.	15	CO3
			CO1
Total Hours		36	
<b>Essential Readings</b>			
1. L. Cromwell, Biomedical Instrumentation and Measurements, Pearson Education India, Second Edition, 2015.			
2. R. A. Natarajan, Biomedical Instrumentation and Measurements, Prentice-Hall of India Pvt. Ltd, Second Edition, 1990.			
3. J. G. Webster, Medical Instrumentation: Application and Design, Wiley India, Fourth Edition, 2009.			
<b>Supplementary Readings</b>			
1. R. Aston, Principles of Biomedical Instrumentation and Measurement, Pearson Prentice Hall, First Edition, 1990.			
2. R. S. Khandpur, Handbook of Biomedical Instrumentation, McGraw Hill Education, Third Edition, 2014.			
3. J. Bronzino, Biomedical Engineering & Instrumentation, PWS Engg: Boston, Third Edition, 1986.			
4. J. Enderle, Bioinstrumentation, Morgan & Claypool Publisher, Second Edition, 2006.			
5. A. Richard , Principles of Bio-medical Instrumentation and Measurement, Merril Publishing Company: New York, Second Edition, 2002.			