	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM

Programme	**Bachelor of Technology in Electronics and Communication Engineering**	Year of Regulation	**2018-19**
Department	**Electronics and Communication Engineering**	Semester	**V**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 315	**Biomedical Instrumentation**	**3**	**1**	**0**	**4**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
			CO1	Ability to understand heart system and measurement
	To understand the various electronics instrument and their measurement methods		CO2	Ability to understand the Cardiovascular Measurements and Devices
	To understand the Electrical Activity in Neuromuscular System and Brain		CO3	Ability to understand the Electrical Activity in Neuromuscular System and Brain
	To understand the Cardiovascular Measurements and Devices		CO4	Ability to understand the advances on various medical equipment

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**	**3**	-	-	-	-	-	-	-	-	-	**3**	**3**	**3**
2	CO2	**3**	**2**	**3**	-	-	-	-	-	-	-	-	-	**2**	**2**	**2**
3	CO3	**3**	**2**	**3**	-	-	-	-	-	-	-	-	-	**3**	**3**	**3**
4	CO4	**3**	**2**	**3**	-	-	-	-	-	-	-	-	-	**2**	**2**	**2**
5	CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS

No.	Content	Hours	COs
I	Physiological Systems of The Body: Brief description of neuronal, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities. Electrodes, Sensors and Transducers: Bioelectric signals, Electrodes for biophysical sensing; surface electrodes; microelectrodes; review of transducers and other sensors for bio-medical applications. The Heart System and Measurements: The heart; electro conduction system of the heart; the heart as a potential source; the ECG waveform; the standard lead system; the ECG preamplifier; ECG machines.	**12**	**CO1**
II	Cardiovascular Measurements and Devices: Physiological pressures; blood pressure measurements; sphygmo manometers; oscillometric and ultrasonic methods; direct methods: manometers; pressure transducers; pressure amplifiers; typical calibration methods; systolic, diastolic and mean pressure detector circuits; pressure differentiation (dp/dt) circuits; automatic zero circuits; practical problems in pressure monitoring; cardiac output measurement; plethysmography; blood flow measurements; phonocardiography; vector cardiography; defibrillators circuits; pacemakers; heart lung machines.	**12**	**CO2**
III	The Human Respiratory System and Its Measurement: Internal (cellular) and external (lung) respiration; organs of respiration; mechanics of breathing; parameters of respiration; regulation of respiration; unbalanced and diseased states; environmental threats to the respiratory system; respiratory system measurements; respiratory transducers and instruments; spirometers; Respirator	**12**	**CO2**
IV	Measurement of Electrical Activity in Neuromuscular System and Brain: Neuron potential; muscle potential; electromyography (EMG); electroencephalography (EEG); EEG electrodes and the 10-20 system; EEG amplitude and frequency bands; the EEG system – simplified block diagram; preamplifiers and EEG system specifications; EEG diagnostic uses and sleep patterns; visual and auditory evoked potential recordings; EEG system artifacts.	**8**	**CO3**
V	Advances In Bio-Medical Instrumentation: Computer Tomography; Magnetic Resonance imaging; X-ray; Nuclear medicine; Ultrasound; lasers; Electromagnetic interference; Electrical safety; Bedside monitor.	**4**	**CO4**
	Total Hours	**48**	

Essential Readings

1. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, 4th edition., Singapore: Pearson Education, Inc., (2001). (ISBN 81-7808-327-2)
2. Cromwell L., Weibell F. J. and Pfeiffer E. A., “Biomedical Instrumentation and Measurements”, 2nd edition. Singapore: Pearson Education Inc., (2003). (ISBN 812970028X)

Supplementary Readings

1. J. G. Webster , “Encyclopedia of Medical Devices and Instrumentation”, 2nd Edition, New York: Wiley, 2006.
2. J. D. Bronzino, “The Biomedical Engineering Handbook”, CRC Press, 3rd Edition, 2006.
3. R S. Khandpur, “Handbook on Biomedical Instrumentation”, Tata McGraw-Hill Education, 2003 edition.