



# ST. JOSEPH'S

COLLEGE OF ENGINEERING  
AND TECHNOLOGY,  
- PALAI -  
AUTONOMOUS

Choondacherry P.O., Pala, Kottayam - 686579  
Kerala, India



## CURRICULUM & SYLLABUS

### Minor in Biomedical Technology

**Offered by : Department of Electronics and Communication  
Engineering (EC)**

**Eligible Departments: AD, CA, CC, CE, CS, ME**

**2024 SCHEME**

**[www.sjcetpalai.ac.in](http://www.sjcetpalai.ac.in)**

## CURRICULUM

Minor in Biomedical Technology											
Sl. No	Semester	Course Code	Course Title	Credit Structure			SS	Total Marks		Credits	Hrs./ Week
				L	T	P		CIA	ESE		
1	3	24SJMNECT329	ELECTRICAL AND ELECTRONICS INSTRUMENTS IN BIOMEDICAL ENGINEERING*/ MOOC#	3	1	0	5	40	60	4	4
2	4	24SJMNECT429	MICROCONTROLLERS AND APPLICATIONS*/ MOOC#	3	1	0	5	40	60	4	4
3	5	24SJMNECT529	MEDICAL EMBEDDED SYSTEMS*/ MOOC#	3	1	0	5	40	60	4	4
4	6	24SJMNECT629	HOSPITAL SAFETY AND MANAGEMENT*/ MOOC#	3	0	0	5	40	60	3	3
<b>Total</b>							<b>20</b>			<b>15</b>	<b>15</b>

*\*Students must register for theory courses listed in the 3<sup>rd</sup> and 4<sup>th</sup> semesters of the Minor curriculum.*

*#Students who fail a theory course listed in the Minor curriculum are permitted to register for an alternate MOOC course specified in the Minor curriculum.*

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### SEMESTER 3 (S3)

#### ELECTRICAL AND ELECTRONIC INSTRUMENTS IN BIOMEDICAL ENGINEERING

Course Code	24SJMNECT329	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Mins
Prerequisites (if any)	Nil	Course Type	Theory

Course Outcomes		Bloom's Knowledge Level (KL)
CO 1	Understand the basics of anatomy and physiology of the human body.	K2
CO 2	Understand the different techniques for the measurement of various physiological parameters	K2
CO 3	Describe modern imaging techniques for medical diagnosis	K2
CO 4	Identify the various therapeutic equipment used in the biomedical field	K2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	-	1	1	2	-	-	-	-	2
CO2	1	-	2	2	1	-	-	-	-	-	2
CO3	2	-	2	2	1	-	-	-	-	-	2
CO4	2	-	2	2	1	-	-	-	-	-	2

### Syllabus

#### Module 1

Human Physiological systems: Brief discussion of Heart and Cardio-vascular system, Physiology of Respiratory system - Anatomy of Nervous and Muscular systems, Problems encountered in measuring living systems

Bioelectric potential: Resting and action potential - Generation and propagation – Bioelectric potentials associated with physiological systems (ECG, EEG and EMG).

Bio potential Electrodes: Theory – Surface electrode – Microelectrode- Needle electrodes.

Transducers for biomedical applications: Transducers for the measurement of pressure, temperature and respiration rate.

#### Module 2

Measurement of blood pressure: Direct and indirect measurement – Oscillometric method – Ultrasonic method-Measurement of blood flow and cardiac output- Plethysmography – Photoelectric and Impedance Plethysmographs- Measurement of heart sounds – Phonocardiography.

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Cardiac measurements: Electro-conduction system of the heart- Electro-cardiography – Electrodes and leads – Einthoven triangle- ECG read out devices- ECG machine – block diagram

### **Module 3**

Measurements from the nervous system: Neuronal communication waveforms and features - 10-20 electrode measurement- EEG Block diagram – Brain-Computer interfacing.

Muscle response: Electromyography- Block diagram of EMG recorders – Nerve conduction velocity measurement

Measurements of respiratory parameters: Spirometer-Pneumograph

### **Module 4**

Modern Imaging Systems: Basic X-ray machines - CAT scanner- Principle of operation - scanning components - Ultrasonic Imaging principle - types of Ultrasound Imaging – MRI and PET scanning (Principle only).

Therapeutic equipment: Cardiac Pacemakers - Defibrillators - Hemodialysis machines - Artificial kidney – Lithotripsy - Short wave and Microwave Diathermy machines

Ventilators - Heart Lung machine - Infant Incubators

### **Text Books**

1. L. Cromwell, F. J. Weibell and L. A. Pfeiffer, “Biomedical Instrumentation Measurements”, Pearson Education, Delhi, 1990.
2. J. G. Webster, “Medical Instrumentation, Application and Design”, John Wiley and Sons

### **Reference Books**

1. R. S. Khandpur, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill
2. J. J. Carr and J. M. Brown, “Introduction to Biomedical Equipment Technology”, Pearson Education
3. Achim Schweikard, “Medical Robotics”, Springer

**Course Assessment Method (CIE: 40 marks, ESE: 60 marks)**

### **Continuous Internal Evaluation Marks (CIE): 40 Marks**

Attendance  (Weightage: 12.5%)	Assignment/ Microproject  (Weightage: 37.5%)	Internal Examination- 1 (Written)  (Weightage: 25%)	Internal Examination- 2 (Written)  (Weightage: 25%)	Total
5	15	10	10	40



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### **End Semester Examination Marks (ESE) : 60 marks**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

<b>Part A</b>	<b>Part B</b>	<b>Total</b>
<ul style="list-style-type: none"><li>• 2 Questions from each module.</li><li>• Total of 8 Questions, each carrying 3 marks</li></ul> <p><b>(8x3 =24marks)</b></p>	<ul style="list-style-type: none"><li>• Each question carries 9 marks.</li><li>• Two questions will be given from each module, out of which 1 question should be answered.</li><li>• Each question can have a maximum of 3 sub divisions.</li></ul> <p><b>(4x9 = 36 marks)</b></p>	<p><b>60</b></p>

