

# **BME311 Biomedical Sensors and Measurements**

**Level:** 3

**Credit Units:** 5 Credit Units

**Language:** ENGLISH

**Presentation Pattern:** EVERY JULY

## **Synopsis:**

BME311 addresses the requirements of key components in a generalized medical instrumentation system. A thorough analysis of the basic sensors and their principles of operation, amplifier design and appropriate signal processing are covered. It also covers the origin of biopotentials and how these could be applied to interface with measurement systems through the use of biopotential electrodes and amplifiers. The last part of the course is on the understanding of some of the therapeutic devices, particularly from the point of view of their circuit design and working principle. A lot of emphasis is also laid on the understanding of the electrical safety issues involved with the use of medical instruments on patients.

The aim of this course is to teach the students some of the fundamental principles, applications and design of the medical sensors and measurements commonly used in biomedical instrumentation and equipment. Fundamental principles of operation and general types of devices are covered. Quantitative methods of analysis are developed including simplifying assumptions to make the students understand and design a measurement system.

## **Topics:**

- Introduction to biomedical sensors and measurements
- Transducers
- Biopotentials
- Pacemakers and Defibrillators
- Electrodes
- Electrical Safety

## **Textbooks:**

John G. Webster: Medical Instrumentation: Application and Design 5 John Wiley & Sons, Inc  
ISBN-13: 9781119457312

**Learning Outcome:**

- Analyze signal conditioning circuits like inverting, non-inverting, differential and instrumentation opamp amplifiers, including low-pass and high-pass filters.
- Illustrate the basic principles and measurements of different biomedical sensors and electrodes.
- Explain the origin of biopotentials and calculate cell and ion concentration potentials.
- Examine the working principles of therapeutic devices like pacemakers and defibrillators.
- Show how instrumentation systems can be simulated with computer software SIMULINK through laboratory sessions.
- Evaluate the physiological effects of electricity on humans and how electrical shock protection devices installed in hospitals can provide electrical safety.

**Assessment Strategies (Evening Class):**

<b>Components</b>	<b>Description</b>	<b>Weightage Allocation (%)</b>
Overall Continuous Assessment	QUIZ 1	15
	QUIZ 2	15
Overall Examinable Components	Written Exam	70
<b>Total</b>		<b>100</b>