

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

ACCREDITED BY NAAC WITH 'A++' GRADE

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Introduction to Biomedical Electronics

(Open Elective - III)

SYLLABUS FOR B.E. V – SEMESTER

(Civil, CSE, CSE (AI&ML), EEE, IT & Mechanical)

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: U24OE510EC
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To provide foundational knowledge of physiological systems and the origin of biomedical signals relevant to medical instrumentation.	On completion of the course, students will be able to
2. To introduce the basic components and performance requirements of medical instrumentation systems, including intelligent and non-invasive systems.	1. Recognize the fundamental need for biomedical signal acquisition and describe the structure and function of basic biomedical instrumentation systems.
3. To familiarize students with various electrodes and transducers used in biomedical applications, including their working principles and characteristics.	2. Explain the principles and applications of bioelectric signals, and evaluate the use of electrodes and transducers in biomedical measurements.
4. To develop understanding of therapeutic and prosthetic devices such as pacemakers, defibrillators, and ventilators, and their role in patient care.	3. Demonstrate the working principles and clinical relevance of therapeutic, prosthetic, and non-invasive biomedical instruments used in diagnosis and treatment.
5. To explore modern medical imaging technologies such as X-ray, CT, MRI, and thermography, and their applications in diagnostic medicine.	4. Apply mathematical, physical, and computational principles to interpret and analyze data from modern medical imaging systems such as X-ray, CT, and MRI.
	5. Integrate knowledge of biomedical instrumentation systems to analyze constraints and design considerations for safe, reliable, and intelligent healthcare solutions.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2			1							1		3
CO2	2	2											1		3
CO3	2	1	3			2									2
CO4	3	2	2			2									3
CO5	2	2	2			2							1		2

UNIT-I:

Basics of Biomedical Electronics: Physiological systems of the body, sources of biomedical signals, basic medical instrumentation system, performance requirements of medical instrumentation systems, Intelligent medical instrumentation systems, General constraints in design of medical instrumentation systems.

UNIT - II:

Bioelectric Signals, Electrodes, Transducers: Origin of bioelectrical signals, recording electrodes, electrodes for ECG, EEG, EMG, micro-electrodes. Transducer: Introduction, classification of transducers, performance characteristics of transducers, displacement position and motion transducers, pressure transducers, photoelectric transducer.

UNIT - III:

Therapeutic and Prosthetic Devices: Cardiac pacemaker, defibrillators, hemodynamic & haemodialysis, ventilators, infant incubators, surgical instruments, therapeutic applications of laser.

UNIT - IV:

Non-invasive Instrumentation: Temperature measurements, principles of ultrasonic measurements and its applications in medicine, medical thermography, physics of thermography infrared detectors and thermographic detectors.

UNIT - V:

Modern Medical Imaging System: Radiography: Production of X-rays, units of X-radiation, block diagram of X-ray machine, MRI, computed tomography: Block diagram and working.

Learning Resources:

1. L. Cromwell, Biomedical Instrumentation and Measurements, Prentice Hall.
2. Handbook of Biomedical Instrumentation by R.S. Khandpur.
3. S.K. Venkata Ram, Bio-medical Electronics and Instrumentation, Galgotia Publications, Pvt. Ltd.
4. https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_md01
5. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_bt78

The break-up of CIE : Internal Tests + Assignments + Quizzes

1. No. of Internal Tests	: 2	Max. Marks for each Internal Test	: 30
2. No. of Assignments	: 3	Max. Marks for each Assignment	: 5
3. No. of Quizzes	: 3	Max. Marks for each Quiz Test	: 5

Duration of Internal Tests: 90 Minutes

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