

Sem.	Subject code	Course title	No. of hours	Credits	Paper type
V	17U5PMC7	Biomedical instrumentation	3	3	Major Core

**Objectives:**

To enable the students to understand the physics and theory behind the bio sensitive system like (i) bioelectric signal recording, (ii) physiological assist devices, (iii) equipments, (iv) biotelemetric devices and their safety measures.

**Learning outcome:**

To make the students to familiarize the physical design and maintenance of different biomedical instruments used in medical field.

**Unit I: Biopotential electrodes and transducers**

Cell structure-Nature of cancer cells-Transport of ions through cell membrane-Resting and action potential-Half cell potential-Bioelectric potential-Design and components of medical instruments-Electrodes - Surface, needle, depth electrodes-Electrical circuits.

**Unit II: Bioelectric signal recording**

Introduction-Characterstics of recording systems-Electrocardiography (ECG) - Electroencephalograph (EEG)-Electromyograph (EMG)-Electroneurograph (ENG)-Recording units.

**Unit III: Physiological assist device**

Cardiac pacemakers-Natural and artificial pacemakers-Pacemaker batteries-Defibrillator–A.C./D.C. Synchronized defibrillator-Stimulators-Bladder Stimulators-Heart lung machine-Variou types of oxygenators-Kidney machine–Hemodialysing units-Peritoneal dialysis.

**Unit IV: Clinical and operation theater equipments**

Flame photometer-Spectrofluometer-pH meters-Audiometer-Endoscopes-Electromagnetic and laser blood flow meters-Ventilators-Diathermy units-Ultrasonic, microwave and short wave diathermy–Types and their applications–Surgical diathermy.

**Unit V: Biotelemetry and safety instrumentation**

Principles of a biotelemetry system: Dadiotelemetry with subcarrier-Multiple channel telemetry systems-Problems in implant telemetry-Uses of biotelemetry-Physiological effects of 50 Hz current-Microshock and macroshock–Electrical accidents in hospitals-Devices to protect against electrical hazards.

**Text book(s):**

1. Biomedical Instrumentation, M. Arumugam, Anuradha Publishing Co., Kumbakonam, Tamilnadu, (2004).

**Unit I:** Chapter 1.1-1.7, 2.2–2.4, 2.41, 2.4.6, a, b, 2.4.7.

**Unit II:** 4.2–4.8

**Unit III:** 5.2,5.2.1,5.2.2,5.2.3,5.3,5.5,5.5.1,a,b,5.7, 5.7.3,5.8, 5.8.3, 5.8.4

**Unit IV:** 6.2.6.3, 6.4, 6.5, 6.8, 6.10, 6.10.1, 6.14.1, 7.5.2, 7.5.3, 7.7, 10.4

**Unit V:** 8.2, 8.4.3, 8.4.4, 8.5, 8.6, 9.3, 9.4, 9.5, 9.6

**Books for reference:**

1. Handbook of biomedical instrumentation, R. S. Khandpur, Tata McGraw Hill, New Delhi, (1990).
  2. Principles of biomedical instrumentation and measurements, Richard Aston, Merrill Publishing Co., London, (1990).
  3. Biomedical instrumentation, Marvin D. Weiss, Chilton Book Co., (1973).
  4. Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Prentice-Hall, (1980).
  5. B.Jacobson and J.G.Webster, Medicine and clinical Engineering, Prentice Hall of India, New Delhi, (1979).
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**Websites:**

1. [www.accessengineeringlibrary.com/browse/handbook-of-biomedical-instrumentation-third-edition](http://www.accessengineeringlibrary.com/browse/handbook-of-biomedical-instrumentation-third-edition)
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