

## ELI- 603: Biomedical Instrumentation-II

48 Periods

### UNIT 1

**Anaesthesia machine:** Need of anesthesia, anesthesia delivery system, breathing circuits.

**Clinical Laboratory Instruments:** General principle and working of Blood Gases Analyzer, Auto-analyzer, Blood Cell Counters, ELISA reader, spectrophotometer, flame photometer.

12 Periods

### UNIT 2

**Medical Imaging system:** Ultrasound, properties, its generation & detection, types of transducers, diagnostic application – A Scan, B Scan, M Scan, real time ultrasonic imaging, linear array scanners.

X-ray computed tomography (CT Scanner) and computer-aided tomography (CAT)-principle, contrast scale, scanning system, processing unit, viewing, storage.

Magnetic Resonance Imaging: Basic principle, working and construction.

12 Periods

### UNIT 3

**Nuclear medicine system:** radioactive emissions, rectilinear scanner, gamma camera, imaging system, ECT (emission coupled tomography), positron emission tomography (PET), Single-photon emission computed tomography (SPECT), safety measures.

12 Periods

### UNIT 4

**Surgical scopy and diathermy equipments: Fibre Optics-** Endoscopes -light sources, video processors, camera, and fiber optic cable, Principles and applications.

**Diathermy:** Infrared radiation (IR) diathermy, ultraviolet (UV) diathermy, short wave diathermy, microwave diathermy, ultrasonic diathermy, surgical Diathermy.

12 Periods

### UNIT 1

Chapter 14, 32 - Khandpur R.S., Handbook of Biomedical Instrumentation, Tata MacGraw-Hill Publishing, India (2009), 2<sup>nd</sup> edition

Chapter 16 - Carr J. J, Brown J. M. Introduction to Biomedical Equipment Technology, Pearson Education Inc (2009), 4<sup>th</sup> edition

Chapter 7- Mandeep Singh, Introduction to Biomedical Instrumentation, PHI learning private limited (2010), 1st edition

### UNIT 2

Chapter 14 - Cromwell L., Wiebell F. J., Pfeiffer EA, Biomedical Instrumentation and Measurements, Prentice Hall (2010), 2<sup>nd</sup> edition

Chapter 17, 23 - Carr J. J, Brown J. M. Introduction to Biomedical Equipment Technology, Pearson Education Inc (2009), 4<sup>th</sup> edition

Chapter 19, 20, 22, 23- Khandpur R.S., Handbook of Biomedical Instrumentation, Tata MacGraw-Hill Publishing, India (2009), 2<sup>nd</sup> edition

Chapter 8- Mandeep Singh, Introduction to Biomedical Instrumentation, PHI learning private limited (2010), 1st edition

### **UNIT 3**

Chapter 23- Carr J. J, Brown J. M. Introduction to Biomedical Equipment Technology, Pearson Education Inc (2010), 2<sup>nd</sup> edition

Chapter 21 - Khandpur R.S., Handbook of Biomedical Instrumentation, Tata MacGraw-Hill Publishing (2009), 2<sup>nd</sup> edition

### **UNIT 4**

Chapter 21 -Carr J. J, Brown J. M. Introduction to Biomedical Equipment Technology, Pearson Education Inc (2010), 2<sup>nd</sup> edition

Chapter 27 - Khandpur R.S., Handbook of Biomedical Instrumentation, Tata MacGraw-Hill Publishing (2009), 2<sup>nd</sup> edition

Chapter 9, 12- Mandeep Singh, Introduction to Biomedical Instrumentation, PHI learning private limited (2010), 1st edition

### **Essential Books:**

1. Cromwell L., Wiebell F. J., Pfeiffer EA, Biomedical Instrumentation and Measurements, Second edition, Prentice Hall (2010), 2<sup>nd</sup> edition
2. Carr J. J, Brown J. M. Introduction to Biomedical Equipment Technology, Fourth edition, Pearson Education Inc (2010), 2<sup>nd</sup> edition
3. Khandpur R.S., Handbook of Biomedical Instrumentation, Second edition, Tata MacGraw-Hill Publishing (2009), 2<sup>nd</sup> edition
4. Joseph D. Bronzino, The Biomedical Engineering Handbook, IEEE Press (2000), 2<sup>nd</sup> edition, Volume 1.
5. Richard Aston, Principles of Biomedical Instrumentation & Measurement, Merrill Publishing Company, (1990), 1<sup>st</sup> edition
6. Mandeep Singh, Introduction to Biomedical Instrumentation, PHI learning private limited (2010), 1<sup>st</sup> edition

### **Suggested Books:**

1. Bertil Jacobson & John G. Webster, Medicine and Clinical Engineering, PHI
2. Prof. S.K. Venkata Ram-Bio-Medical Electronics and Instrumentation, Galgotia Publications
3. John G. Webster, Medical Instrumentation-Application and Design, Wiley Student Edition

### **Practicals based on Biomedical Instrumentation-II (any eight):**

1. Study of ultrasound transducers based on medical system.
2. Differentiating arteries and veins using ultrasound transducers.
3. Measurement of respiration rate using thermistor /other electrodes.
4. Measurement of pulse rate using photoelectric transducer & pulse counting for known period.
5. Study of X ray/CT machine (through demonstration).
6. Study of nuclear imaging techniques (through demonstration).
7. Study of mammograms and CT scan images.
8. Analysis of blood sample using Auto-analyzer
9. To check blood gases using blood gas analyzer

10. To estimate different parameters of blood using blood cell counter.
11. Estimation of serum total protein using spectrometer.
12. Estimation of sodium and potassium in blood serum or urine sample.