

This document is prepared from the following University Notifications

- https://www.du.ac.in/uploads/new-web/15092023_Indis_sem1.pdf
- https://www.du.ac.in/uploads/new-web/notifications-2021/28032023_nep-Faculty%20of%20Interdisciplinary%20&%20Applied%20Sciences.pdf
- https://www.du.ac.in/uploads/new-web/15092023_Indis_sem3.pdf
- https://www.du.ac.in/uploads/new-web/18092023_Inter_4.pdf

DISCIPLINE SPECIFIC ELECTIVES (DSE) COURSES OFFERED BY THE DEPARTMENT

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Medical Electronics & Instrumentation	4	3	-	1	Class XII passed with Physics + Mathematics/Applied Mathematics + Chemistry OR Physics + Mathematics/Applied Mathematics + Computer Science/Informatics Practices	Basic Instrumentation & Measurement Techniques (DSC 4, Sem II), Micro-processor (DSC 11, Sem IV)

Learning Objectives

- This course introduces the student to the fundamental understanding of various types of Biomedical Signals and their physiological aspects.
- The students analyse the various types of Biomedical instruments and their working and practical implementation.
- Learn about Modern Imaging systems like CT and MRI techniques and various other cardiac instruments.
- Learn about Instrumentation for clinical lab: blood cell counter, oximeter, blood gas and blood ph analyser.
- Learn about the emerging fields like EEG, ECG, EMG etc.
- To learn about patient safety and precaution for instruments and electrodes.

Learning outcomes

The Learning Outcomes of this course are as follows:

- Understand the basic knowledge of physiology and generation of bio electric signals (ECG, EMG, EEG etc.) in humans.
- Describe cardio vascular monitoring systems , Bed side monitor, ECG-Telemetry.
- Describe the basic knowledge on respiratory and pulmonary measurements.
- Describe modern methods of imaging techniques like CT, X-Ray, NMR and MRI.

This document is prepared from the following University Notifications

- https://www.du.ac.in/uploads/new-web/15092023_Indis_sem1.pdf
- https://www.du.ac.in/uploads/new-web/notifications-2021/28032023_nep-Faculty%20of%20Interdisciplinary%20&%20Applied%20Sciences.pdf
- https://www.du.ac.in/uploads/new-web/15092023_Indis_sem3.pdf
- https://www.du.ac.in/uploads/new-web/18092023_Inter_4.pdf

-
- Describe conditions for patient safety
 - Describe instrumentation for clinical Lab like Blood cell counters, oximeter, blood gas and blood pH analyser..

SYLLABUS OF ELDSE-4A

Total Hours- Theory: 45 Hours, Practicals: 30 Hours

UNIT – I (10 Hours)

Biomedical signals and transducers

Physiological systems of human body: Introduction, Origin of biomedical signals, Use of microprocessors, Microcontrollers and computers in medical instruments, **Transducers:** Ultrasound transducer, Radiation and chemical thermometry, optical fibre sensor, biosensors, optical glucose sensor, Electrodes & its types: for ECG, EMG & EEG

UNIT – II (12 Hours)

Cardiovascular monitoring systems: Patient cardiovascular Monitoring systems Cardiovascular System, blood pressure measurement, cardiac rate and output measurement, Cardiac monitor- Waveforms, ECG amplifier, phonocardiography, Ballisto cardiography, Eco-Cardiograph, Bed side monitor –block diagram- measuring parameters-cardiac tachometer-Alarms-Lead fault indicator-central monitoring. Telemetry – modulation systems – choice of carrier frequency – single channel telemetry systems, Cardiac pacemakers: Introduction, Cardiac defibrillators

UNIT – III (12Hours)

Imaging Systems

X-rays: Properties and production, Block diagram of x-ray machine, Diagnostic radiology, Dental X-ray, Basic principle and components of X-Ray Computed Tomography (CT)

MRI: Principle and NMR imaging components
Introduction to Ultrasonic imaging system.

UNIT – IV (11 Hours)

Patient's safety: Precaution, safety codes for electro medical equipment, Electric safety analyser, Testing of biomedical equipment.

Instrumentation for Clinical Laboratory: Blood cell counters, Oximeter, Blood flow meter, Blood gas analysers, Blood pH analyser.

Measurement in Respiratory system: Physiology of respiratory system, Measurement of breathing mechanics Spiro meter, Respiratory therapy equipment Inhalators ventilators & Respirators, Humidifiers, Nebulizers Aspirators.

Practical component (if any) – Medical Electronics & Instrumentation

This document is prepared from the following University Notifications

- https://www.du.ac.in/uploads/new-web/15092023_Indis_sem1.pdf
 - https://www.du.ac.in/uploads/new-web/notifications-2021/28032023_nep-Faculty%20of%20Interdisciplinary%20&%20Applied%20Sciences.pdf
 - https://www.du.ac.in/uploads/new-web/15092023_Indis_sem3.pdf
 - https://www.du.ac.in/uploads/new-web/18092023_Inter_4.pdf
-

Learning outcomes

The Learning Outcomes of this course are as follows:

- Familiarize with functioning of biomedical instrumentation
- Perform experiments on the biomedical instruments, collect & analyze the data
- Prepare the technical report on the experiments carried

LIST OF PRACTICALS (Total Practical Hours- 30 Hours)

1. To simulate Bio potential Amplifier.
2. Study on ECG simulator.
3. Study on EEG simulator.
4. Study on EMG simulator.
5. Study of various leads and electrode position for ECG and EEG.
6. Study of pulse rate monitor (Pulse oximetry).
7. To simulate defibrillator.
8. Measurement of heart sound using electronic stethoscope.
9. Simulation of blood cell counter.
10. Study of NMR using virtual lab.
11. Visit to a Diagnostic lab/Pathology lab/Hospital to understand working of various instruments and preparation of a report.

Note: Students shall sincerely work towards completing all the above listed practicals for this course. In any circumstance, the completed number of practicals shall not be less than ten.

Essential/recommended readings

1. Khandpur R. S. - Handbook of Biomedical Instrumentation, TMH.
2. Joseph J. Carr & John M. Brown, Introduction to Biomedical Equipment Technology, Pearson.
3. Shakti Chatterjee, — Textbook of Biomedical Instrumentation System||, Cengage Learning.
4. Prof. S.K.VenkataRam-Bio-Medical Electronics and Instrumentation, Galgotia Publications.

Suggestive readings

1. Bertil Jacobson & John G. Webster - Medicine and Clinical Engineering, PHI.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.