

	<p>HO CHI MINH UNIVERSITY OF TECHNOLOGY AND EDUCATION</p> <p>FACULTY OF ELECTRICAL AND ELECTRONICS ENGINEERING</p>	<p>Programme: Biomedical Engineering</p> <p>Programme Level: Undergraduate</p>
---	--	--

Syllabus

1. **Course Name:** Biomedical Instrumentation
2. **Course Code:** DEMD330565
3. **Credits:** 3 credits (3:0:6) (3-hour lecture and 6 hours of self-study per week)
4. **Course Instructor(s):**
 - A. Duc-Dung Vo, MEng
 - B. Assoc. Prof. Thanh-Hai Nguyen
 - C. Thanh-Tam Nguyen, MEng
 - D. Quoc-Cuong Ngo, MEng
5. **Registration Requirements**
 - A. Pre-requisite Course(s): Basic Electronics
 - B. Previous Course(s): Electrical Circuits, Digital

6. Course Descriptions:

This course provides learners with basic knowledge about the principles of medical device design, medical device safety, classification of bioelectrodes, types of biosignals, biomedical signal amplification circuits and sensors commonly used in medical equipment. Knowing how to use methods to measure blood flow, volume, respiratory system, and sound. The course also equips basic knowledge about medical devices such as: Blood pressure monitor, Ultrasound machine, EGG, EEG, MRI, Electromyography, X-ray, Blood glucose measurement.

7. Course Learning Outcomes (CLOs)

CLOs	<p style="text-align: center;">Descriptions</p> <p style="text-align: center;"><i>After completing this course, learners should be able to:</i></p>	ELO(s)/PI(s)	Competency
CLO1	Explain the design functioning parameters of electronic medical devices.	ELO1/PI1.1	R
	<ul style="list-style-type: none"> - Present the fundamentals of different types of biomedical signals and electrodes used in diagnostic medical devices and equipment. - Present the structures and characteristics of various types of biomedical sensors and explain the working principles of different bioelectronic circuit designs. 	ELO1/PI1.2	
CLO2	Apply different measurement techniques using multiple biomedical devices.	ELO4/PI4.3	R

CLO3	Demonstrate teamwork ability to discuss and resolve medical device-related issues.	ELO6/PI6.3	R
	Read and understand documents about biomedical devices and equipment in English.	ELO6/PI6.4	
CLO4	Analyze biomedical device functioning parameters based on their working principles and internal circuitry. Some devices include a blood pressure monitor, ultrasound, EGG, EEG, EMG, MRI, X-ray, and blood glucose measurement.	ELO7/PI7.2	R

Notes: I: Introduction, R: Reinforce, M: Mastery

8. Course Content

- Medical device overview: Block diagram of medical device, physiological parameters.
- Biosensors: Introduction to the structure and operation of sensors used in medical devices.
- Bio-voltage amplification: Analyze signal amplification circuits such as measurement amplifier circuits; inverting, non-inverting amplifiers; optical, magnetic isolation amplifier.
- Band-pass selection for biomedical voltage amplifier circuits: specific circuit analysis of low-pass, high-pass, band-pass, and frequency-suppression circuits in medical equipment.
- Origin of biopotential: Analyze the origin of biological signals such as cell voltage, conduction voltage region, ...
- Bioelectrodes: Analyze electrode types including polarized and non-polarized electrodes.
- Methods for measuring flow, blood volume and sound.
- Methods of measuring the respiratory system include measurement of pulmonary indices and methods of measuring pulmonary indices
- Medical imaging system.
- Analysis of electrical circuit diagrams, operating principles of medical devices.
- Topic report (divided into groups) implements topics on medical equipment: Blood pressure monitor, Ultrasound machine, EGG, EEG, MRI, Electromyography, X-ray, Blood glucose measurement.

9. Teaching Methods

- Presentation
- Group activities

10. Student Assessments

- Grading scale: **10**
- Assessment plan:

No.	Content	CLOs	Competency	Assessment Methods	Assessment Tools	Weighting (%)
Formative Assessment						50
1	- Basic characteristics of types of biological signals - Structure and characteristics of	CLO1	R	Essay	Questions	20

	different types of sensors - Working principles of circuits applying to electronic components, amplifiers, analog - digital devices.					
2	Calculation of design parameters of electronic equipment for medical use.	CLO1	R	Essay	Questions	10
3	Teamwork skills and technical reports.	CLO3	R	Q&A	Scenarios	5
	Reading and understanding English documents related to medical equipment.	CLO2	R	Short-answer questions	Questions	5
4	Using methods to measure blood flow, blood volume, respiratory system and sound	CLO2	R	Essay	Questions	10
Summative Assessment						50
5	Reading the parameters of the device displayed on the screen, analysing the circuit diagram, the operating principle of medical equipment such as: Blood pressure monitor, Ultrasound machine, EGG, EEG, MRI, EMG, X-ray, Blood glucose measurement.	CLO4	R	Q&A	Rubric	50

11. Learning Materials

- Main readings: John G. Webster, John Wiley and Sons and Hand-outs, Medical Instrumentation Application and Design, Third Edition.
- Extra readings: David Prutchi, Michael Norris, Design and Development of Medical Electronic Instrumentation, 2005

12. General Information

Academic Integrity

All students in this class are subject to HCMUTE's Academic Integrity Policy (<http://sao.hcmute.edu.vn/>) and should acquaint themselves with its content and requirements, including a strict prohibition against plagiarism. Any violations will be reported to the Faculty of Electrical and Electronic Engineering Dean's office.

Notice of Change

All information in this syllabus (other than grading and absence policies) may be subject to change with reasonable advanced notice. Students need to regularly update the information of their registered class.

Intellectual Property

All contents of these lectures, including written materials distributed to the class, are under copyright protection from HCMUTE's Intellectual Property Regulations. Notes based on these materials may not be sold or commercialized without the express permission of the instructor.

13. Approval Date:

14. Endorsement:

Dean of Faculty	Head of Department	Course Instructor
Assoc. Prof. Minh-Tam Nguyen	Assoc. Prof. Thanh-Hai Nguyen	

15. Revision History:

1 st Revision:	<i>Course Instructor</i> Assoc. Prof. Thanh-Hai Nguyen <i>Head of Department</i>
2 nd Revision:	<i>Course Instructor</i>

	<p>Assoc. Prof. Thanh-Hai Nguyen <i>Head of Department</i></p>
--	---