The Hong Kong University of Science and Technology

UG Course Syllabus

Introduction to Biosensors and Bioinstrumentation

ELEC 4810

Credits: 4

Pre-requisites: ELEC 2400 OR ELEC 2420

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Course Description

This course builds on the fundamental knowledge of biosensors and bioinstrumentation. Lectures and hands-on laboratory experiments cover: (1) Basic concepts of biomedical signal analysis; (2) Measurements of bioelectrical, biomechanical and biochemical signals for medical diagnosis and clinical monitoring; (3) Principles of biosensors and biochips; (4) Simple design of new bioinstrumentation and biosensor to solve biomedical problems.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Understand the broad role that an electric engineer can play in biomedical engineering
2. Describe and analyze biomedical applications from electrical, chemical and mechanical engineering perspectives
3. Recognize how engineering and mathematics can be applied to the analysis and constructive manipulation of biological systems and the development of biomedical therapies
4. Design a variety of biomedical instruments via comprehensive labs
5. Work collaboratively in an interdisciplinary setting
6. Undertake more advanced courses in biomedical engineering

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below:

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Mid-Term	18%	dd/mm/yyyy *
Homework	12%	dd/mm/yyyy *
Laboratory	24%	dd/mm/yyyy *
Final examination	46%	dd/mm/yyyy

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework	ILO1, ILO2, ILO3. ILO6	This task assesses students' ability to explain and apply concepts (ILO 1,2), evaluate their analysis and instrumentation capabilities (ILO 3), and develop the understanding on more advanced concepts and technology (ILO 6).
Laboratory	ILO1, ILO3, ILO4, ILO5, ILO6	The laboratory practices assess the students' understanding on the application of electronic technology in biomedicine (ILO1), skills to instrument biomedical sensors and devices on based on the knowledge learned from related courses (ILO3,4), and the capabilities to work collaboratively to solve interdisciplinary and advanced problems (IOL5,6).

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.

F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

Using generative artificial intelligence tools to complete assessment tasks is NOT allowed.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include [specific details, e.g., strengths, areas for improvement]. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

N/A

Required Texts and Materials

Textbook(s):

John G. Webster, Medical Instrumentation: Application and Design, 4th edition

Reference Books/Materials:

1. Joseph J. Carr and Johyn M. Brown, Introduction to Biomedical Equipment Technology, 4th edition, 2001
2. Joseph. D. Bronzino, Biomedical engineering and instrumentation: basic concepts and applications
3. Richard Aston, Principles of biomedical instrumentation and measurement
4. Walter Welkowitz, Biomedical instruments: theory and design
5. A. Edward Profio, Biomedical engineering

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.