

BIEN 1010

Introduction to Biomedical Engineering

Hong Kong University of Science and Technology, Spring 2024–25

Course Syllabus

Teaching Team

Instructor:

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Course Description

This course is designed as an introductory course in biomedical engineering. The aim of this course is to present some of the basic science and human physiology knowledge used by biomedical engineers and illustrates the first steps in applying this knowledge to solve problems in human medicine. The second goal of this course is to link knowledge of basic science and engineering to fields of specialization and current research. This course also introduces the sub-specialties in biomedical engineering and through real-life examples to emphasize the types of problems biomedical engineers solve.

Prerequisites

No prerequisites.

Expected Learning Outcomes

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

- Appreciate the breadth and versatility of a bio/biomedical engineering education.
- Describe what bio/biomedical engineering is and what bio/biomedical engineers do.
- Make an informed decision in selecting your program of study at HKUST.
- Perform basic calculations in understanding bio/biomedical technology.

Suggested Textbooks

1. “Biomedical Engineering: Bridging Medicine and Technology”, W. Mark Saltzman, Cambridge University Press; 2nd edition (2009)
2. Introduction to Biomedical Engineering”, John Enderle, Academic Press; 3rd edition (2011)

Assessment Methods

The course is letter-graded. The final grade will be awarded based on performance in the following categories, with weights in parentheses:

- Class participation (10%, in-class Canvas)
- Homework (10%, 4 sets)
- Group Project (Total 20%, 5% report, 5% peer evaluation, 10% poster presentation)
 - **If your peer evaluation score is less than 30%, you will lose that 5% report**
 - **If you do not show up for the poster presentation, you will lose that 10% poster presentation**
- Midterm examination (30%)
- Final examination (30%), **only** covers the second half of the course materials and about 1.5 hours

*****All homework and reports should be submitted through Canvas*****

Graded homework submitted after the deadline will receive no credit. No exceptions.

Class participation will be graded on the basis of Canvas responses.

You are expected to follow academic integrity rules: <http://www.ust.hk/vpaa0/integrity>. Please pay special attention to the offense of plagiarism, which involves claiming credit for others’ work as if it is your own, e.g., copying the homework of your classmate, or using the information on the internet without referencing the source. Serious offenders will be referred to the University for disciplinary action.

Tentative Course Schedule

This is only tentative and is subject to revision. Updated schedules will be announced and posted on Canvas.

Topics to be covered
01. Course overview
02. What is biomedical engineering?
03. Basic of biomolecular and cellular principles

04. Basic of biomolecular and cellular principles (Part II)
05. Module 1: Bioinstrumentation overview and body temperature
06. Module 1: Blood pressure
07. Module 1: Pulse oximetry
08. Module 1: From blood tests to flow cytometry
09. Module 1: From blood tests to flow cytometry (Part II)
10. Module 1: Bioimaging overview, X-ray and CT Scan
11. Module 1: MRI, PET, and ultrasound
12. Module 1: Optical and photoacoustic imaging
13. Bioimaging research sharing: sharing by professors or postgraduate students
14. <i>Midterm examination</i>
15. Module 2: Biomolecular engineering overview
16. Module 2: Drug delivery, tissue engineering, and nanobiotechnology
18. Module 2: Drug delivery, tissue engineering, and nanobiotechnology (Part II)
19. Module 2: Engineering of immunity
20. Module 2: Engineering of immunity (Part II)
21. Module 2: COVID-19
22. Module 2: Biomedical engineering and cancer
23. Project oral presentation
24. Project oral presentation
25. Final examination review