City University of Hong Kong
Course Syllabus

offered by
Department of Biomedical Engineering
with effect from Semester A 2022 / 2023

Part I Course Overview

Course Title:	Biomedical Instrumentation
Course Code:	BME8127
Course Duration:	1 Semester
Credit Units:	3
Level:	R8
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites : *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	MBE6111/BME6111 Biomedical Instrumentation
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

Bioinstrumentation, owing to numerous applications in global healthcare, has dramatically impacted the way we live. This course will provide a coherent and comprehensive introduction to the fundamental concepts, working principles, design underpinning the bioinstrumentation systems, in the context with contemporary applications in engineering and medicine. Various approaches to model, analyse, and optimize the bioinstrumentation systems at different length scales will be covered. Some specific topics such as unobtrusive sensing, wearable devices, blood pressure measuring devices, cardiac pacemakers, defibrillators, cochlear implant, etc will be discussed. The challenges facing the current bioinstrumentation systems and inspiration from the nature for the design of new bioinstrumentation will be addressed as well.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Describe basic concepts relevant with the biomedical instrumentation system			✓	
2.	Discuss the working principles of various important components (various biological, chemical and physical transducers) underpinning in important bioinstrumentation systems			✓	
3.	Interpret the integration and convergence concepts for the design of biomedical sensors and bioinstrumentation systems		✓	✓	
4.	Apply the system-level integration and scaling principles to design novel bioinstrumentation systems for multifunctional applications.			✓	✓
** If weighting is assigned to CILOs, they should add up to 100%.*		N.A.			

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	Explain the fundamental concepts, working principles, design as well as the analytical methods related with the bioinstrumentation.	✓	✓	✓	✓	3 hrs/week

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.				Weighting *	Remarks
	1	2	3	4		
Continuous Assessment: 50%						
Problem-based learning			✓	✓	10%	
Mid-term	✓	✓			20%	
Presentations/projects			✓	✓	20%	
Examination: 50%						
Examination	✓	✓	✓		50%	Duration: 2.5 hours
** The weightings should add up to 100%.*					100%	

For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

5. Assessment Rubrics

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
Problem-based learning	Ability to interpret the convergence concept of medical device design.	High	Significant	Basic	Below marginal level
Mid-term	Ability to understand basic concepts and working principles about the biomedical instrumentation system.	High	Significant	Basic	Not even reaching to marginal level
Presentations/projects	Ability to Apply the system-level integration and scaling principles to design novel bioinstrumentation systems for multifunctional applications.	High	Significant	Basic	Below marginal level
Examination	Ability to understand basic concepts, working principles, design methods and analysis skills related with bioinstrumentation.	High	Significant	Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
Problem-based learning	Ability to interpret the convergence concept of medical device design.	High	Significant	Moderate	Basic	Below marginal level
Mid-term	Ability to understand basic concepts and working principles about the biomedical instrumentation system.	High	Significant	Moderate	Basic	Not even reaching to marginal level
Presentations/projects	Ability to Apply the system-level integration and scaling principles to design novel bioinstrumentation systems for multifunctional applications.	High	Significant	Moderate	Basic	Below marginal level
Examination	Ability to understand basic concepts, working principles, design methods and analysis skills related with bioinstrumentation.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Static and dynamic characteristics of instrumentation systems, sensors (chemical, biological, physical…) and actuators
Unobtrusive sensing
Wearable devices
BioMEMS
Bioinspiration
Pacemakers
Defibrillators
Cochlear implant
Global healthcare

2. Reading List

2.1 Compulsory Readings

1.	Medical Instrumentation: Application and Design. -4th Ed or later by John G. Webster Wiley, 2010

2.2 Additional Readings

1.	Nakra, B.C. and Chaudhry, K.K., Instrumentation, measurement and analysis, McGraw-Hill.
2.	Morris, A.S., Measurement and instrumentation principles, Butterworth-Heinemann.