City University of Hong Kong
Course Syllabus

offered by Department of Biomedical Engineering
with effect from Semester A 2024/25

Part I   Course Overview

Course Title:	Medical Diagnostics
Course Code:	BME6137
Course Duration:	1 semester
Credit Units:	3 credits
Level:	P6
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)*	BME8137 Medical Diagnostics
Exclusive Courses: *(Course Code and Title)*	Nil

Part II   Course Details

1.   Abstract

This course will provide students a comprehensive overview of different concepts and tools used in disease prediction, diagnosis, prevention and optimal treatment planning. The first focus area will emphasize the role of diagnostic imaging in detecting molecules, genes, and cells. Emphasis will be placed on how these techniques can help study molecular mechanisms of disease in vivo. Topics include nuclear imaging techniques: PET, SPECT; molecular MRI and optical imaging methods, targeted probes, molecular imaging in the context of cancer and infectious diseases. The second focus areas will include molecular diagnostics including nucleic acid techniques, OMICS, rapid molecular diagnostics in cancer and infectious disease testing and precision medicine. Introduction to basics of radiomics and AI in diagnosis will also be included. Following the completion of the course, students will have built a strong foundation for future exploration and study in molecular diagnostics.

2.   Course Intended Learning Outcomes (CILOs)
(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs#	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	**Understand** the principles of medical diagnostics and **apply** them to diagnosis of cancer and infectious diseases.		✓	✓	
2.	**Explain** the fundamentals of common tools of molecular diagnostic tests and imaging technologies.		✓	✓	
3.	**Discuss** the utility of molecular diagnostics in the clinic.		✓	✓	
4.	**Critically evaluate** current literature and **present** scientific written and oral reports on relevant topics.		✓	✓	✓
		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 real-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. Learning and Teaching Activities (LTAs)
(LTAs designed to facilitate students' achievement of the CILOs.)

LTA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	Explain key concepts in medical diagnostics	✓	✓	✓	✓	2 hours/week
Tutorial	Solve problems based on concepts discussed during lectures	✓	✓	✓	✓	1 hours/week
Mini-project	Prepare oral and written proposals on topic of choice through literature review.		✓	✓	✓	N.A.

4. Assessment Tasks/Activities (ATs)
(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting	Remarks
	1	2	3	4		
Continuous Assessment: 60 %						
Assignments	✓	✓	✓	✓	20 %	Assignments based on course modules discussed during the lectures
Individual term project (report + presentation)	✓	✓	✓	✓	40 %	Individual term project based on written report and/or oral presentation. The project will focus on review of medical diagnostic test and its clinical application
Examination	✓	✓	✓	✓	40%	Final exam at the end of semester on questions based on coursework discussed in the lectures
Examination: 40 % (duration: 2 hours)						
					100%	

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignment	Ability to describe in detail various concepts learned in different modules; solve problems relevant to in vivo molecular imaging and in vitro molecular diagnostics.	High	Significant	Moderate	Basic	Not even reaching marginal levels.
2. Project	Capacity for self-directed learning; quality of literature review; ability to critically assess the topic; quality of scientific presentation: written and oral.	High	Significant	Moderate	Basic	Not even reaching marginal levels.
3. Examination	Ability to explain basic concepts and applications of medical diagnostics, apply concepts to solve problems, based on lecture content	High	Significant	Moderate	Basic	Not even reaching marginal levels.

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C,)	Failure (F)
1. Assignment	Ability to describe in detail various concepts learned in different modules; solve problems relevant to in vivo molecular imaging and in vitro molecular diagnostics.	High	Significant	Basic	Not even reaching marginal levels.
2. Project	Capacity for self-directed learning; quality of literature review; ability to critically assess the topic; quality of scientific presentation: written and oral.	High	Significant	Basic	Not even reaching marginal levels.
3. Examination	Ability to explain basic concepts and applications of medical diagnostics, apply concepts to solve problems, based on lecture content	High	Significant	Basic	Not even reaching marginal levels.

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

1.   **Keyword Syllabus**
       (An indication of the key topics of the course.)

Precision Medicine, Molecular imaging, Nuclear Imaging, Biomarkers, Molecular Diagnostics, Rapid Diagnostic Tests, Nucleic Acid Techniques, Cancer Imaging, Infectious Diseases.

2.   **Reading List**
2.1   **Compulsory Readings**
       (Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Molecular Imaging: Principles and Practice. Weissleder R, Ross BD, Rehemtulla A, Gambhir SS (eds). Available online
2.	Medical Biotechnology. Edition 1 by Bernard R. Glick, Cheryl L. Patten, Terry L. Delovitch. Available online.
3.	Scientific articles

2.2   **Additional Readings**
       (Additional references for students to learn to expand their knowledge about the subject.)

1.	Janeway's Immunobiology
2.	The Cell. 2ⁿᵈ Edition. Geoffrey M. Cooper
3.	Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, selected sections