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:	Regenerative Medicine
Course Code:	BME5111
Course Duration:	1 semester
Credit Units:	3 credits
Level:	P5
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)*	MBE5111/BME8123 Regenerative Medicine
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

The course Regenerative Medicine is an interdisciplinary and translational subject between clinical medicine, biomedical engineering and developmental biology which deals with the "process of replacing, engineering or regenerating human cells, tissues or organs to restore or establish normal function. It is an emerging biomedical engineering field which applies both engineering and biologic technologies to regenerate damaged tissues and even substitute non-functioning organs in human bodies.

This course is set up in such a way that student can understand this interdisciplinary subject with minimal background. Its major components include cell and tissue biology, biomaterials, and the engineering and clinical implementation. Clinical applications covered in this course include tissue regeneration of bone, cartilage, etc.

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.	**Describe** the basic principles of stem cell biology and tissue engineering approaches.			✓	
2.	**Explain** fundamental concepts on stem cell biology and tissue development.			✓	
3.	**Assess** the existing techniques to design and fabricate tissue culture systems, and to develop implementation protocols for proper tissue development in the systems on basis of therapeutic cells and functional biomaterials.			✓	✓
4.	**Identify** the practical issues for implementation.		✓	✓	
5.	**Design** a feasible and effective engineering approach to a specific tissue engineering problem, by applying the knowledge involved in all the above CILOs as a whole.		✓	✓	✓
		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	5	
Lecture	Introduction of key concepts.	✓	✓	✓	✓	✓	2 hrs/week
Tutorial	Sample questions and case studies.	✓	✓	✓	✓	✓	1 hr/week

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	5		
Continuous Assessment: 40%							
Quiz I	✓	✓	✓			20%	
Quiz II			✓	✓	✓	20%	
Examination: 60%							
Examination	✓	✓	✓	✓	✓	60%	Duration: 2 hours
						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

(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. Examination	Ability to Explain the principles and methodology related to engineered regenerative medicine including stem cell technology and tissue engineering.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Quizzes	Ability to Explain the principles and methodology related to engineered regenerative medicine including stem cell technology and tissue engineering.	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. Examination	Ability to Explain the principles and methodology related to engineered regenerative medicine including stem cell technology and tissue engineering.	High	Significant	Basic	Not even reaching marginal levels
2. Quizzes	Ability to Explain the principles and methodology related to engineered regenerative medicine including stem cell technology and tissue engineering.	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.)

Principles: tissue development; therapy concepts; biomaterials; microenvironment; construct; bioreactor.
Tissue and cell biology: cell type; stem cell; growth; differentiation; stemness; cell signalling; adhesion; migration; extracellular matrix; morphogenesis.
Biomechanics and biomaterials: mechanical properties; transport; flow; biocompatibility.
Engineering strategies: cell/tissue culture techniques; biologic scaffold; polymers; degradable polymers; bioreactor design.
Tissue structure and regeneration: skin; bone; cartilage; neural system; cardiovascular tissues; musculoskeletal tissues.
Other Issues: cell source; immune response; ethical considerations.

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.	Blitterswijk, C. V. (2008). Tissue Engineering. Academic Press, London: Elservier.
2.	Lanza, R. and Atala, A. (2013). Essentials of Stem Cell Biology. Academic Press, London: Elsevier.

2.2 Additional Readings

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

1.	Palsson, B., Bhatia, S. (2004). Tissue engineering. Upper Saddle River, N.J.: Pearson Prentice Hall.
2.	Vunjak-Novakovic, G. (2006). Culture of cells for tissue engineering. Hoboken, N.J.: Wiley-Liss. (Accessible via http://encore.lib.cityu.edu.hk).
3.	Pallua, N., Suscheck, C. V. (2011). Tissue Engineering: From Lab to Clinic. Berlin, Heidelberg: Springer-Verlag Berlin Heidelberg. (Accessible via http://encore.lib.cityu.edu.hk).
4.	Alberts, B. (2008). Molecular biology of the cell. 5th ed. New York: Garland Science.
5.	Solomon, E. P., Phillips, G. A. (1987). Understanding human anatomy and physiology. Philadelphia: Saunders.
6.	Panno, J. (2010). Stem cell research: medical applications and ethical controversies. Rev. ed. N.Y.: Facts On File, Inc.