City University of Hong Kong
Course Syllabus

offered by
Department of Biomedical Engineering /
Department of Mechanical Engineering
with effect from Semester A 2018 / 19

Part I Course Overview

Course Title:	Tissue Engineering
Course Code:	MBE2104
Course Duration:	1 semester
Credit Units:	3 credits
Level:	B2
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)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

The course Tissue Engineering is designed to help students establish the fundamental knowledge and sense, as well as to introduce about the basic engineering techniques applied in the field. Tissue engineering is an emerging biomedical engineering field which applies both biologic and engineering 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 skin, 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 tissue engineering approaches.			√	
2.	**Explain** fundamental concepts on cell biology and tissue development.			√	
3.	**Practice** the existing techniques relevant to the assessment of tissue culture and protocols for proper tissue development in the systems.			√	√
4.	**Identify** the practical issues for implementation.		√	√	
5.	**Apply** 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.		√	√	√
** 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)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lecture	Introduction of key concepts.	✓	✓	✓	✓	✓	2 hrs/week
Tutorial	Case studies and introduction of project.	✓	✓	✓	✓	✓	1 hr/week
Laboratory	Provide opportunity to students for gaining hands-on experience via the laboratory works.	✓	✓	✓			3 hrs/week for 3 weeks

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: 50%							
Assignment	✓	✓		✓		15%	1 individual presentation
Laboratory Reports	✓	✓	✓			15%	2-3 reports to be submitted
Project Report			✓	✓	✓	20%	Report to be submitted
Examination: 50% (duration: 2 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

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

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignment	Ability to Identify and Explain the technology related to tissue engineering	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Laboratory Reports	Ability to Explain and Analyze the experimental results obtained in the laboratories related to tissue engineering.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Project Report	Capacity for Self-directed Learning, Discovery and Innovation of the new tissue engineering technology.	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	Ability to Explain the methodology and procedure related to tissue engineering.	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

(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.

2.2 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.