

# BME2104: TISSUE ENGINEERING

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## Effective Term

Semester A 2025/26

## Part I Course Overview

### Course Title

Tissue Engineering

### Subject Code

BME - Biomedical Engineering

### Course Number

2104

### Academic Unit

Biomedical Engineering (BME)

### College/School

College of Biomedicine (BD)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

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.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic principles of tissue engineering approaches.		x	
2	Explain fundamental concepts on cell biology and tissue development.		x	
3	Apply the existing techniques relevant to the assessment of tissue culture and protocols for proper tissue development in the systems.		x	x
4	Identify the practical issues for implementation.	x	x	
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.	x	x	x

#### 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.

### Learning and Teaching Activities (LTAs)

LTAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lecture	Students will develop an understanding of the key concepts of tissue engineering.	1, 2, 3, 4, 5	3 hrs/week
2	Tutorial	Students will engage in case studies and discussion of the project.	1, 2, 3, 4, 5	1 hr/week
3	Laboratory	Students will gain hands-on experience via the laboratory works.	1, 2, 3	3 hrs/week for 3 weeks

### Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- for nil entry)	Allow Use of GenAI?
1	Assignment	1, 2, 4	15	1 individual presentation	Yes
2	Laboratory Reports	1, 2, 3	15	2-3 reports to be submitted	Yes
3	Project Report	3, 4, 5	20	Report to be submitted	Yes

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

2

**Minimum Continuous Assessment Passing Requirement (%)**

30

**Minimum Examination Passing Requirement (%)**

30

**Assessment Rubrics (AR)****Assessment Task**

1. Assignment

**Criterion**

Ability to Identify and Explain the technology related to tissue engineering

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

**Assessment Task**

2. Laboratory Reports

**Criterion**

Ability to Explain and Analyze the experimental results obtained in the laboratories related to tissue engineering.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

3. Project Report

**Criterion**

Capacity for Self-directed Learning, Discovery and Innovation of the new tissue engineering technology.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

4. Examination

**Criterion**

Ability to Explain the methodology and procedure related to tissue engineering.

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

## Part III Other Information

### Keyword Syllabus

- 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.

### Reading List

#### Compulsory Readings

Title	
1	Blitterswijk, C. V. (2008). Tissue Engineering. Academic Press, London: Elsevier.

#### Additional Readings

Title	
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 <a href="http://encore.lib.cityu.edu.hk">http://encore.lib.cityu.edu.hk</a> ).
3	Pallua, N., Suscheck, C. V. (2011). Tissue Engineering: From Lab to Clinic. Berlin, Heidelberg: Springer-Verlag Berlin Heidelberg. (Accessible via <a href="http://encore.lib.cityu.edu.hk">http://encore.lib.cityu.edu.hk</a> ).
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.