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:	Biomechanics
Course Code:	MBE6121
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)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course aims to introduce students to the concepts that are required for the development of biomedical prosthetic devices in the human body; to provide a supportive, directed experiential and cooperative learning environment for students to acquire and develop technique knowledge to solve diverse engineering problems in various biomedical products.

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 essential concepts of biomechanics and their impacts on the behavior of physical bodies subject to forces or displacements		✓		
2.	Identify the mechanical engineering problems in biomaterials and biomedical devices, explain the problems with critical thinking generated from mechanics concepts, and solve the problems with mechanics theory			✓	
3.	Apply the biomechanics knowledge to explain structural and functional behavior of biomedical applications by conducting a group project				✓
4	Present the background, literature information, methodology and results or conclusion of the group project with both scientific written reports and oral presentation			✓	✓
		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	
Lecture	In classroom Lecture is placed on the conceptual understanding and practical applications of various biomechanics topics.	✓	✓			2 hrs/week
Tutorial/Demo sessions	Tutorial/Demo sessions in classroom or in laboratory is to show students a clearer image of the real world biomedical applications. Students are expected to be actively involved in the process of learning by diagnosing and taking actions on solving a strategically important problem and applying the engineering concepts and associated methodologies to identify and solve real-life problems.			✓	✓	1 hr/week

Assessment Tasks/Activities	CILO No.				Weighting	Remarks
	1	2	3	4		
Continuous Assessment: 40%						
In-class Test	✓	✓			20%	The in-class test is to assess whether students can list and explain the basic concepts in mechanics and understand the working methodology of various bio- applications.
Oral presentation and project report			✓	✓	20%	The oral presentation and project report is to assess students' capability on identifying and solving strategic biomechanics problems.
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.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. In-class test	Describe the mechanical design concepts and principles and provide solution to related design problems.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Group-project report and presentation	Ability to identify problems and PROPOSE methods in analysing/solving biomechanics related problems in real life.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	Explain the fundamental concepts and working principles, select proper machine elements and solve problems in the design process.	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.)

- Biomechanics, biomaterials, cells, tissues, organs, implants, human musculoskeletal system, biomedical devices, cell/surface interactions, endovascular system, drug delivery, dental implants, hip/knee implants, doctor and patients, ethical issues

- Solid mechanics, fluid mechanics, physical bodies, vector, force, displacement, moment, mechanical properties, Hooke's law, stress, strain, elasticity, plasticity, viscoelasticity, fracture, fatigue, wear, corrosion, toughening of materials, composites

- Problem identification and solving techniques, reporting and presentation

In addition to the examination and in-class test, students are required to learn through a group project in order to improve their understanding on strategic thinking, problem solving, team working processes, the relationships and interactions between the fields of knowledge that they have learnt in this and other courses.

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.	Lecture notes and other teaching materials posted in on-line learning system.
2.	Biomechanics: Concepts and Computation (Cambridge Texts in Biomedical Engineering), Cees Oomens, Marcel Brekelmans and Frank Baaijens, Cambridge University Press, 2009

2.2 Additional Readings

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

1.	Biomechanics: Mechanical Properties of Living Tissues, Y.C. Fung, Springer, 1993 (Second Edition)
2.	Fundamentals of Biomechanics, Duane Knudson, Springer, 2007 (Second Edition)
3.	Introductory Biomechanics: from Cells to Organisms, C. Ross Ethier and Craig A. Simmons, Cambridge University Press, 2007
4	Biomechanics: Circulation, Y.C. Fung, Springer, 2010
5	Biomechanics: Principles and Applications, D.R. Peterson and J.D. Bronzino, Editors, CRC Press, 2008
6	Biomaterials Science: An Introduction to Materials in Medicine, B.D. Ratner, A.S. Hoffman, F.J. Schoen and J.E. Lemons, Editors, Academic Press, 2004 (Second Edition)
7	Biomechanics in the Muskuloskeletal System, M. Panjabi & A.A. White II, Philadelphia, PA, 2001
8	Basic Orthopedic Biomechanics, V.C. Mow and W.C. Hayes, Lippincott-Willimas & Wilkins Press, 1997
9	An Introduction to Tissue-Biomaterials Interactions, K.C. Dee, D.A. Puleo and R. Bizios, Wiley-Liss, John Wiley & Sons, 2002