

**City University of Hong Kong  
Course Syllabus**

**offered by  
Department of Materials Science and Engineering  
with effect from Semester B 2019 / 2020**

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**Part I Course Overview**

<b>Course Title:</b>	Materials, Civilization and Modern Development						
<b>Course Code:</b>	GE1340						
<b>Course Duration:</b>	1 semester						
<b>Credit Units:</b>	3 credits						
<b>Level:</b>	B1						
<b>Proposed Area:</b> <i>(for GE courses only)</i>	<table border="1"><tr><td><input type="checkbox"/></td><td>Arts and Humanities</td></tr><tr><td><input type="checkbox"/></td><td>Study of Societies, Social and Business Organisations</td></tr><tr><td><input checked="" type="checkbox"/></td><td>Science and Technology</td></tr></table>	<input type="checkbox"/>	Arts and Humanities	<input type="checkbox"/>	Study of Societies, Social and Business Organisations	<input checked="" type="checkbox"/>	Science and Technology
<input type="checkbox"/>	Arts and Humanities						
<input type="checkbox"/>	Study of Societies, Social and Business Organisations						
<input checked="" type="checkbox"/>	Science and Technology						
<b>Medium of Instruction:</b>	English						
<b>Medium of Assessment:</b>	English						
<b>Prerequisites:</b> <i>(Course Code and Title)</i>	Nil						
<b>Precursors:</b> <i>(Course Code and Title)</i>	Nil						
<b>Equivalent Courses:</b> <i>(Course Code and Title)</i>	Nil						
<b>Exclusive Courses:</b> <i>(Course Code and Title)</i>	Nil						

## Part II Course Details

### 1. Abstract

(A 150-word description about the course)

Human civilization has been classified as Stone Age, Bronze Age, Iron Age, and Silicon Age. In essence, it is based on the control of fire or temperature in processing materials for quality improvement of human life. The success of materials applications has impacted the well-being of people. Examples in clothing, food processing (which can also be studied under materials science), housing, and transportation are ubiquitous. Sword making, musical instrument, china, and lithographic printing, etc., have all impacted the development of our advanced civilization. While the above examples are focusing on the technological advancements, Art Nouveau was an example of success of materials manipulation by artists. On the other hand, the sinking of Titanic and the collapse of World Trade Center are very sad events in human history due to steel failure at low and high temperatures, respectively. Silicon technology is playing a significant role in our IT-based society, which is affecting our daily life significantly. The cost of making one transistor on a silicon chip nowadays is even cheaper than the printing of one alphabet on a newspaper. Today, the world is facing the task of sustainable development, the success of which hinges on the R&D in materials science that can support the needed new technologies. In this course, the historical trends of materials processing and development, the basic physical properties of materials, the challenge in applications of new materials, and the future of materials in sustainable development will be covered. In this course, students will be guided into the amazing world of “**MATERIALS**” by a series of lectures and carry out a group project.

### 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 historical relationships of materials discovery and the different stages of human civilization developments, i.e. Stone, Bronze, Iron, and Silicon Ages.			✓	
2.	Classify the basic properties of various structural and functional materials from the technological perspective.		✓	✓	
3.	Explain how developments in materials technology impact the industrial revolution and quality of life from historical perspectives.		✓	✓	✓
4.	Reflect the importance of the development of new materials on modern and sustainable development.			✓	✓
		N.A.			

\* If weighting is assigned to CILOs, they should add up to 100%.

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	
Histories of materials advancement on the development of human civilization through the Stone Age, Bronze Age and Iron Age during human civilization. The easing of the urgent needs for sustainable development.	The ancient development indicated the control of firing and temperature is the key to develop new materials, including pottery, bronzes and irons.	✓				4/week 1-2
Classification of materials based on atomic bonding, crystalline structures, and microstructural features.	Provide basic knowledge to understand atomic and crystal lattice structures of various materials.		✓			8/week 2-4
Basic properties of various structural and functional materials.	Briefly mention all physical, mechanical and metallurgical properties of materials.		✓			6/week 5-6
Material processing/development and industrial revolution.	Briefly mention the ways to fabricate and process various materials.			✓		3/week 7
Material processing/development and quality of life.	To develop the structure-properties correlations.			✓		3/week 8
Laboratory visit and demonstration.	Experimental and computational tools used in the development and characterization of advanced materials. Students will be demonstrated to the study of materials with the smallest dimensions using available technology.				✓	3/week 9
Correlation of advanced material development with high-tech industries, and potential solutions for sustainable development.	Briefly mention the requirement of advanced materials with special properties for high-tech application.				✓	3/week 10
Group discussion and presentation.	Conduct laboratory and field trip work.	✓	✓	✓	✓	3/week 11-12

**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: 70%						
In-class Quiz (individual)	✓	✓	✓	✓	30%	In-class quiz
Homework Assignments	✓	✓	✓	✓	20%	Total 4 homework assignments
Group Project and Report (team work)			✓	✓	20%	Special report for laboratory work or laboratory/museum visit.
Examination: 30% (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. In-class Quiz (individual)	To determine the level of understanding of the lectured materials.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Homework Assignments	To determine the level of understanding of the lectured materials.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Group Project and Report (team work)	To conduct the experimental work or make field trips for special exhibitions.	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	To determine the level of understanding of the lectured materials.	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.)*

- Historical classification of Human civilization
- Atomic structure and classification of materials
- Physical and mechanical properties of materials
- Materials and quality of life
- Modern structural and functional materials
- Material processing, fabrication and analysis
- Advanced materials, technology innovation and industrial development
- Sustainable development

**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.)*

**2.2 Additional Readings**

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

1.	“Understanding Materials Science: History, Properties and applications”, by Rolf. E. Hummel, Springer, Second Edition, 2004.
2.	“The Substance of Civilization”, by Stephen L. Sass, Arcade Publication, New York, 1998.
3.	“Materials Science and Engineering; An Introduction”, by W. D. Callister, John Wiley & Sons, Inc., 2007.

- A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

<b>GE PILO</b>	<b>Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)</b>
PILO 1: Demonstrate the capacity for self-directed learning	CILO 2-4
PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology	CILO 1-4
PILO 3: Demonstrate critical thinking skills	CILO 3-4
PILO 4: Interpret information and numerical data	CILO 3-4
PILO 5: Produce structured, well-organised and fluent text	
PILO 6: Demonstrate effective oral communication skills	CILO 4
PILO 7: Demonstrate an ability to work effectively in a team	CILO 4
PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues	CILO 1 and 3
PILO 9: Value ethical and socially responsible actions	
PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation	CILO 1, 3 and 4

*GE course leaders should cover the mandatory PILOs for the GE area (Area 1: Arts and Humanities; Area 2: Study of Societies, Social and Business Organisations; Area 3: Science and Technology) for which they have classified their course; for quality assurance purposes, they are advised to carefully consider if it is beneficial to claim any coverage of additional PILOs. General advice would be to restrict PILOs to only the essential ones. (Please refer to the curricular mapping of GE programme: [http://www.cityu.edu.hk/edge/ge/faculty/curricular\\_mapping.htm](http://www.cityu.edu.hk/edge/ge/faculty/curricular_mapping.htm).)*

- B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

<b>Selected Assessment Task</b>
Group project reports.