

**City University of Hong Kong  
Course Syllabus**

**offered by  
Department of Mechanical Engineering  
with effect from Semester A 2019 / 2020**

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**Part I Course Overview**

<b>Course Title:</b>	Basic Engineering Materials and Processing
<b>Course Code:</b>	MNE2106
<b>Course Duration:</b>	1 semester
<b>Credit Units:</b>	2 credits
<b>Level:</b>	B2
<b>Medium of Instruction:</b>	English
<b>Medium of Assessment:</b>	English
<b>Prerequisites#:</b> (Course Code and Title)	AP1201/PHY1201 General Physics I <b>or</b> BCH1100 Chemistry
<b>Precursors:</b> (Course Code and Title)	HKDSE Physics or Design and Applied Technology or equivalent
<b>Equivalent Courses:</b> (Course Code and Title)	MBE2106 Basic Engineering Materials and Processing
<b>Exclusive Courses:</b> (Course Code and Title)	MBE2034/MNE2034 Engineering Materials and Processing

**#Waived for students admitted through Advanced Standing route if the course is not part of College Requirement**

## Part II Course Details

### 1. Abstract

(A 150-word description about the course)

The aims of this course are to equip students:

- with basic knowledge of the structure and properties of engineering materials, both metallic and non-metallic type, used in engineering applications; and
- with ability to identify the typical processes and operations involved for conversion and shaping of materials into discrete mechanical components of various 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.	<b>Describe</b> the basic structure and behaviour of some engineering materials		✓	✓	
2.	<b>Apply</b> basic knowledge of materials to select suitable engineering materials for mechanical components/products			✓	
3.	<b>Outline</b> the basic configurational features and operational principles of commonly available important manufacturing processes			✓	
4.	<b>Select</b> manufacturing processes for producing various components of a mechanical product			✓	

\* 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	
Lecture	Explain the fundamental concepts involved with: (i) the basic structure and mechanical behaviour of some commonly available engineering materials; (ii) the selection of appropriate materials for specific and major components of products, (iii) the operational features and capabilities of some commonly used manufacturing processes; and (iv) the selection of suitable processes to produce given components/products.	✓	✓	✓	✓	2 hrs/week for 13 weeks
Laboratory Work	Practical demonstration to show the students about the configurational features and operational aspects of several manufacturing processes/equipment.	✓		✓	✓	2 hrs total

### 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: 40%						
Tests	✓	✓	✓	✓	30%	2 tests
Laboratory Report(s)			✓	✓	10%	1-2 report(s)
Examination: 60% (duration: 2 hours)						
					100%	

\* The weightings should add up to 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. Tests	1.1 Describe the basic structure and behaviour of commonly used engineering materials, and to select the materials for mechanical components or products. 1.2 Outline the features and operational principles of some commonly available manufacturing processes, and to select processes for producing a designed mechanical product or component.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Laboratory Report(s)	2.1 Evidence of understanding the features and working principles of various manufacturing processes demonstrated. 2.2 Evidence of self-learning and information searching.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	3.1 Describe the basic structure and behaviour of commonly used engineering materials. 3.2 Apply knowledge of materials to select appropriate engineering materials for mechanical components or products. 3.3 Outline the key features and operational principles of manufacturing processes for making mechanical components or products. 3.4 Ability to select manufacturing processes for producing components of a mechanical product.	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.)*

(i) Introduction to Engineering Materials

- Structure and Properties of Metals and Plastics: Structure of metals and plastics, deformation, strain hardening, recovery, cold, warm and hot working.
- Mechanical Behaviour: Stress-strain curves, ductility, and failure.

(ii) Introduction to Manufacturing Processes

- Metal Casting Processes: Common casting processes and types of products produced.
- Bulk Forming: Basic flat and shape rolling, forging, extrusion, drawing processes.
- Sheet Metal Forming: Blanking and shearing, bending, deep drawing processes.
- Processing of metal powders and ceramics: Common powder metallurgy processes.
- Plastics Processing: Types of engineering plastics, extrusion, injection molding, blow molding, thermoforming, vacuum forming, and compression molding.
- Material Removal: Machining processes for different shapes, turning, milling, drilling, grinding, and some unconventional processes.

**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.	“Manufacturing Engineering and Technology”, Serope Kalpakjian and Steven R. Schmid, Prentice Hall, 4 <sup>th</sup> or later edition.
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**2.2 Additional Readings**

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

1.	“Introduction to Manufacturing Processes”, John A. Schey, McGraw-Hill International 2 <sup>nd</sup> or later edition.
2.	“Manufacturing Processes for Engineering Materials”, Serope Kalpakjian, Addison Wesley Publishing Co., 3 <sup>rd</sup> or later edition.
3.	“Introduction to Materials Science for Engineers”, James F. Shackelford, Prentice Hall, 5 <sup>th</sup> or later edition.