# City University of Hong Kong Course Syllabus

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

# Part I Course Overview

Course Title:	Basic Mechanical Engineering Principles					
Course Code:	MNE2040					
Course Duration:	1 semester					
3 credits						
Level <sup>.</sup>	B2					
Medium of Instruction:	English					
Medium of Assessment:	English					
<b>Prerequisites</b> : (Course Code and Title)	Nil					
<b>Precursors</b> : (Course Code and Title)	AP1201/PHY1201 General Physics I <sup>1</sup>					
<b>Equivalent Courses</b> : (Course Code and Title)	MBE2040 Basic Mechanical Engineering Principles					
<b>Exclusive Courses</b> : (Course Code and Title)	MBE2003/MNE2003 Mechanics <b>or</b> MBE2107/MNE2107 Basics of Mechanical Engineering <b>or</b> MBE2109/BME2109/MNE2109 Engineering Mechanics					

<sup>&</sup>lt;sup>1</sup> While there is no pre-requisite for MNE2040, students without adequate physics background are strongly advised to check with your programme/major leader before you enroll for this course.

# Part II Course Details

# 1. Abstract

(A 150-word description about the course)

This course aims to provide students an introduction to the mechanical engineering science when they would like to acquire an overview of the elementary topics in statics, dynamics, mechanics of machines, and strength of materials, fluid mechanics, and thermodynamics and so on. The theory is developed as far as possible while the mathematical formulae are kept to a minimum, and work examples illustrate the application of basic principles to engineering problems. At the end of the course, the students will appreciate how engineers design the hardware that improves and builds our society. Even though the students will not be an expert in mechanical engineering they will discover engineering is a practical discipline with the objective to design things that work, that are cost-effective to make, that are safe to use, and that are responsible to the environment.

While this course aims to provide a balanced introduction to various branches of engineering science, it is impossible to cover any of the topics in depth given the time constraint. Students are therefore advised to consult other courses that cover the topics more comprehensively if they want to pursue a career where mechanical engineering design is a required core competence.

#### 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)	Discov curricu learnin	ery-en lum rel g outco	riched ated omes
			(please tick where appropriate)		
			Al	A2	A3
1.	<b>Describe</b> the basic principles of kinematics and kinetics of				
	machines, friction and vibration.				
2.	Describe the basic principles of steady state fluid flow,				
	basic heat transfer and the fundamental concepts of stress				
	and strain analysis.				
3.	Select relevant principles to obtain the solutions for				
	mechanical engineering problems.				
4.	Analyse and present the results of experiments in a proper				
	format of a written report such that a technically-qualified				
	person can follow and obtain similar findings.				
* If we	eighting 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	CIL	O No	э.		Hours/week (if applicable)
		1	2	3	4	
Lecture	Explain key concepts and theories	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	2 hrs/week
	on kinematics and kinetics of					
	machines, and solid mechanics.					
Laboratory	Investigate concepts through	$\checkmark$	$\checkmark$		$\checkmark$	3 hrs/week for 5 weeks
Work	hand-on experiments; Acquire skills					
	in handling of apparatus and in					
	engineering report write up;					
	Promote active participation.					
Consultation	Provide room to clarify doubts that	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	1 hr/week <sup>@</sup>
	would enhance the understanding of					
	the subject.					

Note: <sup>@</sup>1 hour per week will be scheduled as "consultation hour" for clearing doubts of students who can meet the teaching staff on an individual or small group basis. When the class size exceeds 50 students, an additional consultation hour will be provided and the students will be divided into two groups.

#### 4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting*	Remarks
		2	3	4		
Continuous Assessment: 40%						
Tests		$\checkmark$	$\checkmark$		20%	
Laboratory Reports	$\checkmark$	$\checkmark$		✓	20%	3-4 reports to be submitted
Examination: 60% (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	Good	Fair	Marginal	Failure
		(A+, A, A-)	(B+, B, B-)	(C+, C, C-)	(D)	(F)
1. Tests	Ability to solve given mechanical problems and provide correct numerical answers.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2.Laboratory Reports	<ul><li>2.1 Capacity for self-learning to understand the basic principles through performing experiments by following instructions given.</li><li>2.2 Ability to analyse and present the results of experiments in the proper technical report format.</li></ul>	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	<ul> <li>3.1 Ability to explain the basic principles of solid and fluid mechanics, and heat and fluid flow.</li> <li>3.2 Capacity for analysing and solving given mechanical problems using relevant and appropriate formulae.</li> </ul>	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.)

- Motions of bodies equations of motions, relative velocity, angular motion
- Newton's laws, impulse and momentum
- Statics vector representation of a force (2D), equilibrium, moments, contact forces
- Work, energy and power
- Dry friction lubrication and fluid friction, friction on a plane
- Introduction to simple harmonic motion harmonic motion, natural frequency
- Stresses and strains direct loading, safety factor, shear loading
- Loading of beams shear force and shear force diagrams, bending moment and bending moment diagrams
- Stresses in beams and shafts bending of beams, second moment of area, stresses in circular shaft
- Thermofluid situations fluids, pressure, pressure measurement, closed system
- Properties of fluids Ideal gases, specific heats, liquid and vapour
- Steady flow of fluid continuity equation, momentum equation, energy equation, steady flow, Bernoulli's equation
- Flow with friction viscosity, journal bearing, Reynolds number, pressure drop in pipes
- Basic heat transfer modes of heat transfer, thermal resistance

# 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.	Foundations of Mechanical Engineering by Anthony Johnson and Keith Sherwin, Published by
	Chapman & Hall.
2.	Mechanical Engineering Science by Hannah & Hiller, published by Prentice Hall.
3.	An Introduction to Mechanical Engineering by Jonathan Wickert, published by Thomas.