

**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:	Instrumentation and Testing Technologies
Course Code:	MNE3061
Course Duration:	1 semester
Credit Units:	3 credits
Level:	B3
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites#: (Course Code and Title)	MBE2029/BME2029/MNE2029 Electrical and Electronic Principles I or equivalent, AND MBE2040/MNE2040 Basic Mechanical Engineering Principles or equivalent or MBE2003/MNE2003 Mechanics or MBE2109/BME2109/MNE2109 Engineering Mechanics
Precursors: (Course Code and Title)	Nil
Equivalent Courses: (Course Code and Title)	MBE3061 Instrumentation and Testing Technologies or MBE3120/MNE3120 Measurement and Instrumentation
Exclusive Courses: (Course Code and Title)	Nil

#Prerequisites which are not part of the Major Requirement are waived for students admitted with Advanced Standing.

Part II Course Details

1. Abstract

(A 150-word description about the course)

The aim of this course is to introduce testing and measurement technologies relevant to the design and implementation of product testing systems, with emphasis on the electric and biomedical industries.

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.	Explain the fundamental concepts related with the static and dynamic characteristics of the state of the art instrumentation and testing systems.		✓	✓	✓
2.	Familiarize with the scaling analysis, manufacturing and assembling concepts for the design of instrumentation and testing systems.		✓	✓	✓
3.	Explain the working principles of various important transducers (pressure, motion, temperature, flow, etc.) underlying instrumentation and testing systems.		✓	✓	✓
4.	Demonstrate critical thinking in the design of novel instrumentation and testing systems.		✓		
		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	
Lecture	There will be 24 hours of lectures. The lectures cover measurement concept fundamentals, basic knowledge and applications of transducers, methods for measuring physical parameters (such as motion, power, temperature, acoustics, and electrical quantities), elements and design of testing systems, product standards and conformity testing.	✓	✓	✓	✓	2 hrs/week
Laboratory Work	Practical experience is an important part of this course. There will be 6-8 three-hour laboratory sessions. Possible topics to be included are evaluation of errors and uncertainties, response characteristics of transducers / instruments, application of transducers (such as thermometers, strain gages), tests of physical parameters, pneumatics, PLC programming, computer-based data logging, etc. Industrial experience of product testing will also be pursued through site visits or workshop in collaboration with local product testing laboratories.	✓	✓	✓	✓	3 hrs/week for 8 weeks

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: 50%						
Mid-term Test		✓	✓	✓	25%	
Laboratory Reports	✓	✓	✓	✓	25%	Reports to be submitted on the experiments conducted during the lab sessions
Examination: 50% (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. Mid-term Test	Ability to grasp fundamental knowledge related to the static and dynamic characteristics of instrumentation and testing systems.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Laboratory Reports	Ability to design experiment, conduct proper measurement by applying the learned knowledge to specific problems, and perform data analysis.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	Ability to understand basic concepts related to the instrumentation and testing technologies.	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.)

Error analysis; uncertainties; static and dynamic characteristics of instruments; transducers; signal manipulation; measurement of mechanical / electrical parameters, etc.; testing fixtures; locating and work holding principles, automation devices, pneumatics, programmable logic controller, standards and conformity.

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.	Morris, A.S., "Measurement and Instrumentation Principles", Butterworth-Heinemann, ISBN-13: 978-0750650816, 2001.
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2.2 Additional Readings

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

1.	Nakra, B.C. and Chaudhry, K.K., "Instrumentation, Measurement and Analysis", McGraw-Hill, ISBN-13: 978-0070681088, 2010.
2.	Boyes, W.E., "Handbook of Jig and Fixture Design", Society of Manufacturing Engineers, USA, ISBN-13: 978-0872633650, 1989.

Online Resources:

Online learning material is provided via University computer network.