City University of Hong Kong
Course Syllabus

offered by
Department of Mechanical Engineering
with effect from Semester A 2023 / 24

Part I Course Overview

Course Title:	Advanced Automation Technology
Course Code:	MNE6007
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)*	MBE6007/BME6007/MNE8118/BME8126 Advanced Automation Technology
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

The aim of the course is to provide the students with the understanding of the basic principles in some important technology in automation. This course will lay down the foundations of the engineering principles in such a way that the students can identify the appropriate concepts required in given engineering problems and apply them to formulate the suitable engineering solutions in automation and other applications.

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.	To **give** an account of the basic theories of robotics and machine vision.		✓		
2.	To **develop** the ability to interpret basic vision problems.			✓	
3.	To **analyze** the principles in vision systems.			✓	
4.	To **design** robot systems for applications in automation.				✓
5.	To **apply** robots and sensing systems in automation and other applications.			✓	✓
** If weightings 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	On robot and vision systems	✓	✓	✓	✓	2 hours/week
Tutorial	To give some details on understanding the lectures'	✓	✓	✓	✓	1 hour/week
Laboratory	to give students opportunity to learn from practice, to give students opportunity to learn from practice, as part of the project in AT below.	✓	✓	✓	✓	3 hours/week, for 2 weeks in Week 6 & 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: 50%						
Project presentation and result	✓	✓	✓	✓	35%	
Project Report	✓	✓	✓	✓	15%	
Examination: 50% (duration: 2 hours)						
Examination	✓	✓	✓	✓	50%	
** 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.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Examination	Written exam at the end of the semester, to assess the level of understanding of the student on the ATs.	High	Significant	Moderate	Not even reaching marginal levels
2. Project presentation and result	Include 3 parts on oral, lab demo and written report, to see how well the student can apply the knowledge learnt in project work.	High	Significant	Moderate	Not even reaching marginal levels
3. Project Report	Group reports including individual discussions, to show students' ability to analyse and critically judge the method developed and results achieved in the project.	High	Significant	Moderate	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Examination	Written exam at the end of the semester, to assess the level of understanding of the student on the ATs.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Project presentation and result	Include 3 parts on oral, lab demo and written report, to see how well the student can apply the knowledge learnt in project work.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Project Report	Group reports including individual discussions, to show students' ability to analyse and critically judge the method developed and results achieved in the project.	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.)

Robotics, Robot sensing, Robot vision, Machine vision systems, Image acquisition, Image pre-processing, Image filtering, Edge detection, Segmentation, Shape description and recognition, Camera calibration, Neural Network (NN) architectures, training and testing of NN, applications of NN in pattern recognition and automation.

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.)

N.A.

2.2 Additional Readings

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

1.	K. S. Fu, R. C. Gonzalez and C. S. G. Lee, Robotics, Control, Sensing, Vision, and Intelligence, McGRAW-Hill Int.
2.	S. K. Saha, Introduction to Robotics, McGRAW-Hill Int. 2008.
3.	G. Becky, et al, Robotics: State of the Art and Future Challenges, Imperial College Press. 2008.
4.	M. Sonka, et al, Image Processing, Analysis, and Machine Vision, Int. Thomson Pub., 1999.
5.	R. Jain, et al, Machine Vision, McGraw-Hill Inc., 1995.
6.	D. A. Forsyth and J. Ponce, Computer Vision, Person Education , Inc., 2003.
7.	Dinwiddie, Keith, Basic Robotics, Boston, MA : Cengage Learning, TJ211 .D569 2015.
8.	Niku Saeed B, Introduction to Robotics : Analysis, Control, Applications, Hoboken : John Wiley Inc, 2015.