

**City University of Hong Kong
Course Syllabus**

**offered by
Department of Biomedical Engineering /
Department of Mechanical Engineering
with effect from Semester A 2018 / 19**

Part I Course Overview

| | |
|--|---|
| Course Title: | Advanced Automation Technology |
| Course Code: | MBE6007 |
| Course Duration: | 1 semester |
| Credit Units: | 3 credits |
| Level: | P6 |
| Medium of Instruction: | English |
| Medium of Assessment: | English |
| Prerequisites : <i>(Course Code and Title)</i> | Nil |
| Precursors: <i>(Course Code and Title)</i> | Nil |
| Equivalent Courses: <i>(Course Code and Title)</i> | MEEM6007 Advanced Automation Technology |
| Exclusive Courses: <i>(Course Code and Title)</i> | Nil |

Part II Course Details

1. Abstract

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 | ✓ | ✓ | ✓ | ✓ | 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) | | | | | | |
| | | | | | 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. Examination | Written exam at the end of the semester. | High | Significant | Moderate | Basic | Not even reaching marginal levels |
| 2. Project presentation and result | Include 3 parts on oral, lab demo and written report. | High | Significant | Moderate | Basic | Not even reaching marginal levels |
| 3. Project Report | Group reports but to include individual discussions | 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.)

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| 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. |