

**City University of Hong Kong
Course Syllabus**

**offered by
Department of Biomedical Engineering
with effect from Semester A 2024/25**

Part I Course Overview

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| Course Title: | Human Machine Interface |
| Course Code: | BME5108 |
| Course Duration: | 1 semester |
| Credit Units: | 3 credits |
| Level: | P5 |
| 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> | MBE5108/BME8121 Human Machine Interface |
| Exclusive Courses: <i>(Course Code and Title)</i> | Nil |

Part II Course Details

1. Abstract

A human machine interface gives a user a visual display of what's going on in the controller and a way to interact with the system. The course aims to develop an understanding of the history and state-of-the-art of human machine interface technologies and the communication between machines and humans to let students identify the appropriate concepts required in given control problems and apply them to formulate the suitable engineering solutions.

Upon completing the course, students should be able to:

- Understand the human machine interface technological integration of applying the principles and techniques to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities;
- manage and apply scientific methods for the design, implementation of user friendly user interface through hypermedia on automatic control system, mobile devices, the web, and desktop platforms; and
- evaluate the performance of the human machine interface with standard methods during an iterative design process to shorten the project schedules and decrease the budgets.

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 basic concepts and design mechanism of the human machine interface | | ✓ | ✓ | |
| 2. | Understand the scientific methods and design principles to different control objects and customize those generic concepts in meeting the needs of particular requirements | | | ✓ | |
| 3. | Identify the strategies and evaluation standards in satisfying a set of given requirements to user interface design | | | ✓ | |
| 4. | Design a user friendly user interface through hypermedia on automatic control system, mobile devices, the web, or desktop platforms | | | ✓ | ✓ |
| | | 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 real-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. Learning and Teaching Activities (LTAs)

(LTAs designed to facilitate students' achievement of the CILOs.)

| LTA | Brief Description | CILO No. | | | | Hours/week (if applicable) |
|--------------|--|----------|---|---|---|----------------------------|
| | | 1 | 2 | 3 | 4 | |
| Lecture | Lectures on the topics of the keyword syllabus | ✓ | ✓ | ✓ | ✓ | 2 hours/week |
| Tutorial | <u>Group work activities</u> Group projects are given to students for the investigation in relation to the CILOs. Students will discuss the projects during the tutorial period. The group assessment is based on the group presentation and the peer assessment. | ✓ | ✓ | ✓ | ✓ | 1 hour/week |
| (Self Study) | <u>Individual work activities</u> Students are required to carry out self study on webs and search appropriate information/data in conjunction with the lecturing materials to accomplish a set of given requirements. The work of the self study will be presented as an individual report for assessment. | ✓ | ✓ | ✓ | ✓ | (20 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: 50% | | | | | | |
| Group presentation & peer assessment | ✓ | ✓ | ✓ | ✓ | 25% | 20% of the marks is based on the presentation, and 5% is based on the peer assessment. |
| Individual report | ✓ | ✓ | ✓ | ✓ | 25% | 20% of the marks is based on the accomplishment of satisfying the given requirements, and 5% is based on the self study of webs. |
| Examination: 50% | | | | | | |
| 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.)

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

| Assessment Task | Criterion | Excellent (A+, A, A-) | Good (B+, B, B-) | Fair (C+, C, C-) | Marginal (D) | Failure (F) |
|---|---|--------------------------|---------------------|---------------------|-----------------|-----------------------------------|
| 1. Group presentation & peer assessment | Identify the needs for developing appropriate human-machine interfaces, and select one case towards developing a feasible solution through group effort. | High | Significant | Moderate | Basic | Not even reaching marginal levels |
| 2. Individual report | Critical literature search related to contemporary issues, strategies, design and technological developments in the area of human-machine interfaces. | High | Significant | Moderate | Basic | Not even reaching marginal levels |
| 3. Examination | Ability to describe the concepts involved for identifying the needs for developing human-machine interfaces and the strategies and standards that could be adopted while designing them. Application of relevant scientific techniques for interface designs suitable for various devices. | High | Significant | Moderate | Basic | Not even reaching marginal levels |

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

| Assessment Task | Criterion | Excellent (A+, A, A-) | Good (B+, B) | Marginal (B-, C+, C,) | Failure (F) |
|---|---|--------------------------|-----------------|--------------------------|-----------------------------------|
| 1. Group presentation & peer assessment | Identify the needs for developing appropriate human-machine interfaces, and select one case towards developing a feasible solution through group effort. | High | Significant | Basic | Not even reaching marginal levels |
| 2. Individual report | Critical literature search related to contemporary issues, strategies, design and technological developments in the area of human-machine interfaces. | High | Significant | Basic | Not even reaching marginal levels |
| 3. Examination | Ability to describe the concepts involved for identifying the needs for developing human-machine interfaces and the strategies and standards that could be adopted while designing them. Application of relevant scientific techniques for interface designs suitable for various devices. | High | Significant | 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.)

- Introduction to human machine interface; Programmable logic controller; Networked control systems
- User friendly user interface; Hypermedia domains; User model; Knowledge management; Frameworks
- Evaluating Interface Designs; Managing Design Processes; Command and Natural Languages; Interaction Devices; Information Visualization; Societal and Individual Impact of User Interfaces

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.)

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| 1. | Tyson Macaulay, Bryan L. Singer “Cybersecurity for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS”. CRC Press, 2012. |
| 2. | Dix, Alan, et. al. “Human-Computer interaction”. Pearson Education 2003 |
| 3. | Shneiderman, Ben; and Plaisant, Catherine “Designing the User Interface: Strategies for Effective Human-Computer Interaction”. Fourth ed. Addison Wesley 2004. |

2.2 Additional Readings

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

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| 1. | Newman, W M & Lamming, M G “Interactive System Design”. Addison-Wesley 1995. |
| 2. | Pearrow, Mark “Web site usability handbook”. Charles River Media 2000. |