

BME8121: HUMAN MACHINE INTERFACE

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Human Machine Interface

Subject Code

BME - Biomedical Engineering

Course Number

8121

Academic Unit

Biomedical Engineering (BME)

College/School

College of Biomedicine (BD)

Course Duration

One Semester

Credit Units

3

Level

R8 - Research Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

MBE5108/BME5108 Human Machine Interface

Exclusive Courses

Nil

Part II Course Details

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.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the basic concepts and design mechanism of the human machine interface		x	x	
2	Understand the scientific methods and design principles to different control objects and customize those generic concepts in meeting the needs of particular requirements			x	
3	Identify the strategies and evaluation standards in satisfying a set of given requirements to user interface design			x	
4	Design a user friendly user interface through hypermedia on automatic control system, mobile devices, the web, or desktop platforms			x	x

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.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Lectures on the topics of the keyword syllabus	1, 2, 3, 4	2 hrs/week

2	Tutorial	Group work activities 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, 2, 3, 4	1 hrs/week
3	(Self Study)	Individual work activities 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.	1, 2, 3, 4	(20 hrs total)

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Group presentation & peer assessment	1, 2, 3, 4	25	20% of the marks is based on the presentation, and 5% is based on the peer assessment.
2	Individual report	1, 2, 3, 4	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.

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

0

Minimum Examination Passing Requirement (%)

0

Assessment Rubrics (AR)

Assessment Task

Group presentation & peer assessment (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Identify the needs for developing appropriate human-machine interfaces, and select one case towards developing a feasible solution through group effort.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Individual report (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Critical literature search related to contemporary issues, strategies, design and technological developments in the area of human-machine interfaces.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

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.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Group presentation & peer assessment (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Identify the needs for developing appropriate human-machine interfaces, and select one case towards developing a feasible solution through group effort.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

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Part III Other Information

Keyword Syllabus

- 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

Reading List

Compulsory Readings

Title	
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.

Additional Readings

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