BME6007: ADVANCED AUTOMATION TECHNOLOGY

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Advanced Automation Technology

Subject Code
BME - Biomedical Engineering
Course Number
6007

Academic Unit
Biomedical Engineering (BME)

College/School
College of Biomedicine (BD)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
MBE6007/MNE6007/BME8126 Advanced Automation Technology

Exclusive Courses
Nil

Part II Course Details

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.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	To give an account of the basic theories of robotics and machine vision.		x		
2	To develop the ability to interpret basic vision problems.			x	
3	To analyze the principles in vision systems.			x	
4	To design robot systems for applications in automation.				x
5	To apply robots and sensing systems in automation and other applications.			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	On robot and vision systems	1, 2, 3, 4	2 hours/week
2	Tutorial	To give some details on understanding the lectures'	1, 2, 3, 4	1 hour/week
3	Laboratory	to give students opportunity to learn from practice	1, 2, 3, 4, 5	3 hours/week, for 2 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Project presentation and result	1, 2, 3, 4, 5	35	
2	Project Report	1, 2, 3, 4, 5	15	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

Assessment Rubrics (AR)

Assessment Task

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

Criterion

Written exam at the end of the semester.

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

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

Criterion

Include 3 parts on oral, lab demo and written report.

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

Criterion
Group reports but to include individual discussions

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 from Semester A 2022/23 to Summer Term 2024)

Criterion
Written exam at the end of the semester.

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Project presentation and result (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Include 3 parts on oral, lab demo and written report.

Excellent
(A+, A, A-) High

Good

(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Project Report (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Group reports but to include individual discussions

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
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.

Reading List

Compulsory Readings

	Title
1	N.A.

Additional Readings

	Title
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.