BME4105: BIOMEDICAL DEVICES FOR DIGITAL MEDICINE

New Syllabus Proposal

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Biomedical Devices for Digital Medicine

Subject Code
BME - Biomedical Engineering
Course Number
4105

Academic Unit
Biomedical Engineering (BME)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The aim of this course is to introduce the state-of-the-art knowledge of biomedical devices for digital medicine. Biomedical device is an emerging biomedical engineering field which applies materials science, engineering, and physical technologies. This course will provide students with fundamental understanding of basic principles underlying biomedical devices, and develop skills in the areas of wearable biosensors with health monitoring of physiological signals, advanced manufacturing (3D printing, microelectronics fabrication, and inkjet printing), energy harvesting from accessible power sources (light, chemical, mechanical, and thermal energy).

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic principles of biosensing technology and biomedical devices.		x	x	
2	Explain representative designs and fundamental concepts on biomedical devices.		x	x	
3	Identify advanced manufacturing process for biosensor and integrated system technologies.			x	x
4	Design a biosensor or analyze the collected information related health monitoring.			x	x
5	Apply a feasible and effective engineering approach to a problem of biomedical device, with the knowledge involved in all the above CILOs.		x	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	Students will develop an understanding of biomedical devices.	1, 2, 3, 4	3 hours/week for 13 weeks

2	Tutorial and Mini-project Presentation	Students will engage in case studies and discussion related to the assignment. Students will discuss with peers about various highlighted topics on design of biomedical devices or data processing.	1, 2, 3, 4, 5	1 hour/week for 11 weeks and 2 hours/week for 2 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignment	1, 2, 3, 4	15	
2	Mini-project Report (one per group)	1, 2, 3, 4, 5	15	
3	Mini-project Presentation (one per group)	2, 3, 4, 5	20	

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

Assignment

Criterion

ABILITY to EXPLAIN and IDENTIFY the technologies related to biomedical devices in details.

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
Mini-project Report

Criterion
ABILITY to REPORT the principles, designs, and data processing related to biomedical 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
Mini-project Presentation

Criterion
ABILITY to PRESENT the literature survey and EVALUATE the result of different approaches.

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

Criterion
ABILITY to EXPLAIN the methodology and procedure related to biomedical 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

Part III Other Information

Keyword Syllabus
Wearable devices, digital medicine, flexible electronics, biosensors.

Reading List

Compulsory Readings

	Title
1	N.A.

Additional Readings

	Title
1	Chandra Mouli Pandey, Bansi Dhar Malhotra Biosensors: Fundamentals and Applications 2nd Edition, 2019 ISBN 978-3-11-063780-9
2	Raymond H. W. Lam, Weiqiang Chen Biomedical Devices: Materials, Design, and Manufacturing, 2019 ISBN 978-3-030-24236-7
3	Shabbir Syed-Abdul, Xinxin Zhu, Luis Fernandez-Luque Digital Health: Mobile and Wearable Devices for Participatory Health Applications, 2020 ISBN 978-0-12-820077-3
4	Edward Sazonov Wearable Sensors: Fundamentals, Implementation and Applications, 2020 ISBN 978-0-12-819246-7