GE1354: INTRODUCTION TO ELECTRONIC DESIGN

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Introduction to Electronic Design

Subject Code
GE - Gateway Education
Course Number
1354

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

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

GE Area (Primary)
Area 3 - Science and Technology

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
EE1003 Introduction to Electronic Design and Workshop

Exclusive Courses
Nil

Part II Course Details

Abstract

Since the invention of first electronic transistor in 1947, there is a tremendous development of electronic technology over the past 70 years. Nowadays, electronic technology has been penetrating almost every aspect of our life and creating huge impact in our community. A few examples are mobile phones, TV, and Octopus card which are all popular electronic products used by everyone. In fact, our ways of living are greatly influenced by these technologies. All these products consist of a key electronic component – a tiny computer chip for executing all the desired functions of the devices or appliances. Attributed to the years of efforts by different scientists and engineers, these computer chips are now much faster, smaller, cheaper and easier for users even without much technical background.

Regardless of your science or arts background, have you ever thought about building an electronic product to control a system or to measure signals such as heart pulses? In fact, there are endless ideas in applying these fascinating computer chips in project design relevant to your specific needs.

The course teaches the basic electronic systems, signals and basic computing theory. The aim of this course is to develop students from different disciplines on their fundamental understanding of simple electronic systems, in order to allow students to turn their ideas into a simple design work, supplemented by lectures and hands-on training. At the final four weeks of the course, students from different majors will form multi-disciplinary project groups for exploring real problems and their possible electronic and computing design. Each project group will be provided with a low-cost and easy-to-use tiny computer board (unit) with some build-in features for sensing body movements, displaying texts and graphics, informing the environmental temperature, etc., that allow the students to realize their own functional products.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify recent technology developments for modern electronic applications		x		
2	Describe the fundamental and basic principles of electronic systems and signal processing applications.		x	x	x
3	Apply programming techniques and integrate electronic components and units for simple product design		x	x	x
4	Demonstrate processes from design idea to product realization		x	x	
5	Demonstrate presentation skills to describe design idea and product		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 participate in lectures where they will learn various fundamental knowledge and concepts in simple electronic systems, which they will apply in subsequent activities to deepen their understanding and practical skills.	1, 2, 3	3 hrs/13 weeks
2	Laboratories	Students will engage in lab sessions designed to reinforce key concepts covered in lectures and tutorials, enabling them to apply theoretical knowledge through hands-on practice and collaborative problem-solving.	2, 3	2 hrs/wk for 2 weeks
3	Project	The student is to apply the knowledge learned in the course to complete a simple project design in the last four weeks to extend the experience to realize a self-initiated project in the group	2, 3, 4, 5	2 hrs/wk for 4 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Project: demo, presentation, report. laboratories	1, 2, 3, 4, 5	20	
2	Tests (min.: 2) & quizzes	1, 2, 3, 4	30	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

Remark: To pass the course, students are required to achieve at least 30% in the continuous assessment and 30% in the examination. Also, 75% laboratory attendance rate must be obtained.

Assessment Rubrics (AR)

Assessment Task
Examination

Criterion
Achievements in CILOs

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
Coursework

Criterion
Achievements in CILOs

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

Waves and Acoustic
Waves: vibrations, simple harmonic motions, the relationship among wavelength, period, frequency and speed, interactions of two or more waves, the Doppler effect; Acoustic: amplitude and loudness, frequency and pitch, interference and beats, fundamental frequency and harmonics.

Basic Signal Processing

Introduction to Signals (e.g. heart pulses), time and frequency domains, bandwidth, noise and gain in dB, continuous-time and discrete-time signal, analogue to digital signal conversion, audio systems, basic difference equations, simple digital low pass filtering.

Computation implementation
Introduction to basic Python, implementation on simple microprocessor platform.

Basics of Electronic Design
Four weeks of laboratory work to implement a mini project, for example, voice filtering, heart pulse waveform measurement and walking steps measurement, using basic signal processing and electronic circuit techniques.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Electronics All-in-One for Dummies, 2nd Edition by Doug Lowe, Publisher: Wiley, 2017. ISBN: 978-1-119-32079-1
2	Getting Started with the BBC Micro:Bit Mike Tooley, Bernard Babani Publishing, 2017
3	Beginning Programming with Python® For Dummies® by John Paul Mueller Publisher: John Wiley & Sons, Inc.,2014. ISBN 978-1-118-89145-2
4	Signals & Systems, Alan Oppenheim, Pearson New International Edition.

Annex (for GE courses only)

A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)

PILO 1: Demonstrate the capacity for self-directed learning

1, 2, 3, 4, 5

PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology

1, 2, 3

PILO 3: Demonstrate critical thinking skills

3, 4

PILO 4: Interpret information and numerical data

2, 3, 4

PILO 5: Produce structured, well-organised and fluent text

3, 4, 5

PILO 6: Demonstrate effective oral communication skills

3, 4, 5

PILO 7: Demonstrate an ability to work effectively in a team

3, 4

PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation

1, 3, 4, 5

B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

Selected Assessment Task

Project Demo and Project Report.