

# GE1354: INTRODUCTION TO ELECTRONIC DESIGN

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## Effective Term

Semester A 2022/23

## 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.

**Teaching and Learning Activities (TLAs)**

	<b>TLAs</b>	<b>Brief Description</b>	<b>CILO No.</b>	<b>Hours/week (if applicable)</b>
1	Lecture	Lectures on various fundamental knowledge and concepts in simple electronic. systems	1, 2, 3	3 hrs/13 weeks
2	Laboratories	Labs to reinforce key concepts covered in lectures and tutorials.	2, 3	2 hrs/wk for 2 weeks
3	Project	Student is to apply the knowledge learnt in the course to complete a simple project design in the last 4 weeks to extend the experience to realize a self-initiated project in group	2, 3, 4, 5	2 hrs/wk for 4 weeks

**Assessment Tasks / Activities (ATs)**

	<b>ATs</b>	<b>CILO No.</b>	<b>Weighting (%)</b>	<b>Remarks (e.g. Parameter for GenAI use)</b>
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

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**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

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## 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.