EE3070: DESIGN PROJECT

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Design Project

Subject Code
EE - Electrical Engineering
Course Number
3070

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

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
EE2004 Microcomputer Systems

Precursors
Nil

Equivalent Courses
EE3004 Electronic Product Design or EE3274 Design Project or EE3316 Information Product Design

Exclusive Courses
Nil

Part II Course Details

Abstract
The aim of this course is to enable students to gain practical experience and nurture their creativity in Electronic Product Design under the In-house product design scheme. Another aim of this course is to provide students with a clear

understanding of the practical design problems of electronic products at an introductory level. The objective is for students to become familiar with the concept of product design, component tolerances, production constraints, safety requirements, and EMC standards are dealt with through a case study.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify and recognize the essential design and production procedures of electronic products		x	x	x
2	Apply fundamental analysis methods and theorems to the solution of the case study		x	x	x
3	Design and implement a prototype for meeting the case study requirements		x	x	x
4	Demonstrate problem-solving skills in product design		x	x	x
5	Present the design work		x	x	x
6	Form the foundation for the product manufacturing project, the penultimate part of the industrial training programme run in the summer semester		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)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Seminar and Laboratory OR Recognized open competition	Seminar: Exploring design problem, report writing, technical specification, realizing prototypes, and preparing presentation. Laboratory: Laboratory work. OR Recognized open competition: Participation in recognized open competition	1, 2, 3, 4, 5, 6	Seminar: 3-hr seminar / wk (total 1 week) Laboratory: 3-hr lab / wk (total 12 weeks) OR Recognized open competition: No less than 3 hrs lab / wk (total 13 weeks)

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Project: Proposal, reports, presentation, demonstration	1, 2, 3, 4, 5, 6	100	

Continuous Assessment (%)

100

Examination (%)

0

Additional Information for ATs

Remark:
To pass the course, students are required to achieve at least 40% of the coursework mark and a laboratory attendance of at least 75% recorded.

Students can participate in recognized open competitions, such as Robocon and MATE ROV, to replace the project case designed by the course leader. The coordinators of the open competitions will conduct the assessment.

Assessment Rubrics (AR)

Assessment Task

Laboratory Work

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

Modern Design Technology Manufacturability
Modular design, auto-insertion, surface mount technology, sources of design tips. Basic concepts of Design for Manufacture.

Electronic Circuit Testability Design
Testability: testing paradigms (in-circuit and functional); test points and accessibility of circuits for testing; principle of product partitioning.

Electronic Circuit Reliability
Design for circuit reliability: causes of component failure; reliability calculations and its prediction; means of improving circuit reliability. Environmental Stress Screening.

Tolerance Design
Tolerance analysis; Monte Carlo analysis; Design margins.

EMI, EMC and Safety Standards
Introduction to EMI, EMC and safety; standards, regulations and test methods applicable to the electronic products, systems and processes. Safety standards for mains supplied electronic products.

Firmware and Software Design
Modelling; In-circuit emulator and on-chip debug; Implementation; Validation and testing; interfacing techniques; firmware design; APP programming.

Software Design for Information Technology System Design
Conceptual model; context, description within life cycle, Design description; identification, stakeholders, design views and viewpoints, elements, overlays, rationale, languages, Design viewpoints; context, composition, logical, dependency, information, patterns, interface, structure, concerns, state dynamics, algorithm, resource.

3D printing
Design; modelling; fabrication.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Weyerer M and Goldemund G: Testability of Electronic Circuits, (Prentice Hall, c1992)
2	Ott Henry W: Noise Reduction Techniques in Electronic Systems, (Wiley Interscience, 1989)

3	Thomas L Lenders, William D Brown, Earnest W Fant, Eric M Malstrom, Neil M Schmitt: Electronics Manufacturing Processes, (Prentice Hall, c1994)
4	Handbook of Product Design for Manufacturing: a Practical Guide to Low Cost Production, (McGraw Hill, c1986)
5	R Spence, R S Soin: Tolerance Design of Electronic Circuits, (Addison Wesley, 1988)
6	IEEE Std 1016TM-2009, "IEEE Standard for Information Technology – Systems Design – Software Design Descriptions,"