CA4718: POWER ELECTRONICS AND SMART LIGHTING CONTROLS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Power Electronics and Smart Lighting Controls

Subject Code
CA - Civil and Architectural Engineering
Course Number
4718

Academic Unit
Architecture and Civil Engineering (CA)

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 course provides knowledge of the lighting technologies, engineering practice and design techniques; and also introduces recent research and developments in low-voltage electrical engineering.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain lighting systems design principles for a building;	30	x	x	
2	Discuss and implement advanced/smart lighting technologies adopted in modern buildings;	45	x	x	
3	Apply new low-voltage technologies in buildings	25	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	Lectures	Students will engage in formal lectures to gain knowledge of (1) visual effects of lighting, lighting calculations, daylighting, human factors; (2) lighting design for special situations and its importance; (3) digital control theory, distributed control and smart lighting systems; (4) DC choppers, inverters.	1, 2, 3	2
2	Tutorials	Students will engage in tutorial activities to solve the practical questions and participate in group discussions.	1, 2, 3	1

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Mid-term Test	1, 2, 3	20		No
2	Assignment	1, 2	30		Yes

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%.

Assessment Rubrics (AR)

Assessment Task

Mid-term Test

Criterion

ABILITY to UNDERSTAND theories and knowledge to topics related to power electronics and lighting control techniques

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

Assignment

Criterion

ABILITY to APPLY suitable techniques to design lighting control systems

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 UNDERSTAND and APPLY theories and knowledge to topics related to power electronics and lighting control techniques

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
Photometry and radiometry. Human factors. Interior and outdoor lighting design. Daylighting. Computer aided lighting design. Case studies. New topics of research and development in illumination engineering . Topics of recent research and developments in smart lighting and LV electrical engineering.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Pritchard, D. C. (6th ed.) 1999, Lighting, Longman, Essex.
2	Dorf, R. C. (2nd ed.) 1997, The Electrical Engineering Handbook, CRC Press, Florida.
3	CIBSE 1997, Code for Interior Lighting, CIBSE, London.
4	CIE 2003, Spatial distribution of daylight: CIE standard general sky CIE standard 011/E: 2003, CIE, Vienna.
5	CIE 2004, Guide for the lighting of road tunnels and underpasses, CIE technical report; CIE 88 -2004, Vienna.
6	Karlicek R., Sun C.C., Zissis G., Ma R., Handbook of Advanced Lighting Technology, Springer International Publishing, 2017