

# CA4718: POWER ELECTRONICS AND SMART LIGHTING CONTROLS

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## Effective Term

Semester A 2022/23

## 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	design lighting systems 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.

### Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Lectures will cover the topics 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	Tutorial questions will be given every week and tutorial will be provided for students to solve the tutorial questions.	1, 2, 3	1

**Assessment Tasks / Activities (ATs)**

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Mid-term Test	1, 2, 3	20	
2	Assignment	1, 2	30	

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

2

**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