# CA4718: POWER ELECTRONICS AND SMART LIGHTING CONTROLS

**Effective Term**
Semester A 2024/25

## 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 (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

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**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

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**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

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# 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. |

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|---|---|
| 6 | Karlicek R., Sun C.C., Zissis G., Ma R., Handbook of Advanced Lighting Technology, Springer International Publishing, 2017 |