Subject Description Form

Subject Code	BSE511
Subject Title	Lighting Engineering
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with theories of lighting engineering and up-to-date knowledge of lighting technologies and practices. The subject covers photometric and colorimetric parameters, photometrics of lamps and luminaires, lighting design objectives, design and lighting engineering calculations, human factors in lighting and energy efficiency.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. appreciate human needs with respect to illumination; b. select lamps and lighting systems for an indoor or outdoor space to satisfy human needs; c. perform photometry calculations for lighting engineering analysis; d. analyze impact of human factors and energy on design of lighting systems; e. analyse daylighting in building; f. evaluate interior and exterior lighting systems and applications.
Subject Synopsis/ Indicative Syllabus	**Photometry and colorimetry:** Photometric quantities, standards and measurements. Colorimetric quantities and systems. Production and processing of photometric data. Electronic transfer of photometric data. **Lighting equipment and systems:** Incandescent lamps. Discharge lamps. Fluorescent lamps. Luminaries and control gear. Conventional and electronic ballasts. Lamp and ballast as a system. LED, new light sources and emerging lighting systems. **Lighting calculations:** Direct illuminance due to point, Lumen method. Calculation of light loss factors. Glare calculations. **Daylighting:** Daylighting benefits. Daylight availability. Sky models. Design techniques and calculations. Daylight-linked control systems. **Human and environmental factors:** Vision and human factors. Visual performance and its assessment. Lighting and comfort, glare. Non-visual effects of light. Lighting quality. **Lighting design:** Design objectives and criteria. Choices of lighting system, lamp and luminaries. Integration of electric light and daylight. Energy conservation. Maintenance of lighting systems. Lighting energy code. **Exterior lighting:** Design principles and calculations. Light trespass, glare and light pollution.

Teaching/Learning Methodology

1. Lectures and seminars are to disseminate the theories and concepts of the subject as well as their applications in the practical contexts, which are solidly supported by the discussions and illustrations of deliberately-selected cases and examples – LO# a to f.
2. Tutorials are to help students digest the knowledge delivered from the lectures and seminars – LO# a to f.
3. Problem solving exercises to help students to think and apply the theories and concepts to practical or simulated lighting engineering cases – LO# a to f.
4. Assigned reading and literature search – LO# a to f.
5. Case studies are to analyze, apply, integrate, synthesize and evaluate different aspects of lighting principles to solve problems in different lighting designs – LO# a to f.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a.	b.	c.	d.	e.	f.
1. Attendance/in-class quiz	5%	√	√	√	√	√	√
2. Assignment	15%	√	√	√	√	√	√
3. In-class test	30%	√	√	√	√	√	√
4. Examination	50%	√	√	√	√	√	√
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The subject assessment takes form of both coursework evaluation and final written examination. Each assessment method is designed to evaluate whether students have attained the subject outcomes and at what mastery levels.

<u>Continuous Assessment (45%)</u>

1. The in-class test/assignment is to assess students' understanding of the lighting engineering theories, concepts and practices delivered in the lectures, seminars and tutorials – LO# a to f.

<u>Examination (50%)</u>

2. The examination gives authentic cases to assess students' ability in solving real problems by applying their knowledge of different types of lighting systems and related issues – LO# a to f.

Reading List and References

Boyce, P.R. (2003). *Human Factors in Lighting*, 2nd Edition, Taylor & Francis, London.

Chartered Institution of Building Services Engineers (2009). *SLL Lighting Handbook*.

Chartered Institution of Building Services Engineers (2012). *SLL Code for Lighting.*

CIE 15:2004 *Colorimetry*.

CIE 97:2005 *Guide on the maintenance of indoor electric lighting systems*, 2nd Edition.

	CIE 117:1995 *Discomfort glare in interior lighting*. CIE 190:2010 *Calculation and presentation of unified glare rating tables for indoor lighting luminaires.* CIE S015/E:2005 *Lighting of outdoor work places*. IESNA (2011). *Lighting Handbook.* ISO 8995-1:2002 (CIE S008/E:2001) *Lighting of work places - Part 1: Indoors.* ISO 8995-3:2006 (CIE S 016/E:2005): *Lighting of work places – Part 3: Lighting requirements for safety and security of outdoor work places.* ISO 23539:2005 (CIE S010/E:2004) *Photometry – The CIE system of physical photometry.* Simons, R.H. and Bean, A.R. (2001). *Lighting Engineering – Applied Calculations*. Architectural Press.