

Subject Description Form

Subject Code	AP40003
Subject Title	Solid State Lighting
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	Solid-state lighting (SSL) has revolutionized the lighting industry. Light-emitting diodes (LEDs)—traditionally used in signs, signals and displays—are rapidly evolving to provide light sources for general illumination. The objective of this course is studied all aspects of the technology and physics of light-emitting diodes for the applications in solid-state lighting.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> (a) acknowledge the historical developments and milestones of SSL research and development; (b) understand all aspects of the technology and physics of white- LEDs made from III-V semiconductors; (c) identify elementary properties of LEDs such as the electrical and optical characteristics; (d) understand the advanced LEDs physics including high-efficiency device designs, light extraction, radiative and non-radiative recombination dynamics, spontaneous recombination in resonant-cavity structures; and (e) understand the industry and users' perspectives for LEDs and SSL.
Subject Synopsis/ Indicative Syllabus	<ul style="list-style-type: none"> (1) Principles of operation of LEDs. (2) Heterostructure materials systems, chip design and characteristics of LEDs. (3) Light extraction, solid-state sources of white light. (4) Nonvisual and visual applications of SSL.
Teaching/Learning Methodology	<p>Lecture: Delivery of lectures interactively to enable students to participate actively in acquiring knowledge, and to raise questions and discuss for clarifying their doubts generated in their learning process.</p> <p>Tutorial: For the students to consolidate the contents of lectures. Students are properly guided to participate actively in solving problems, raising questions and discussion.</p>

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
	(1) Continuous assessment	40	✓	✓	✓	✓	✓
	(2) Examination	60	✓	✓	✓	✓	✓
	Total	100					
	<p>Continuous assessment: Assignments in general include end-of-chapter problems, which are used to reinforce and assess the concepts and skills acquired by the students; and to let them know the level of understanding that they are expected to reach. At least one test would be administered during the course of the subject as a means of timely checking of learning progress by referring to the intended outcomes, and as means of checking how effective the students digest and consolidate the materials taught in the class.</p> <p>Examination: This is a major assessment component of the subject. It would be a closed-book examination. Complicated formulas would be given to avoid rote memory, such that the emphasis of assessment would be put on testing the understanding, analysis and problem solving ability of the students.</p>						
Student Study Effort Expected	Class contact:						
	• Lecture		33 h				
	• Tutorial		6 h				
	Other student study effort:						
	▪ Self-study		81 h				
	Total student study effort		120 h				
Reading List and References	<p>E. F. Schubert, Light-Emitting Diodes (Cambridge, Cambridge, 2006).</p> <p>A. Žukauskas, M. S. Shur, and R. Gaska, Introduction to Solid-State Lighting (Wiley, New York, 2002).</p> <p>S. Winder, S. (2008). Power Supplies for LED Driving. (Newnes, Amsterdam, 2008).</p> <p>G. Held, Introduction to Light-Emitting Diode Technology and Applications (Taylor & Francis, Boca Raton 2009).</p>						