Subject Description Form

Subject Code	AP5022
Subject Title	Energy Efficient Lighting and Control
Credit Value	3
Level	5
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	1. To study various aspects concerning the technology and physics of light-emitting diodes for the applications in solid-state lighting; 2. To introduce concepts in lighting electronics and circuits, and the technology and applications in lighting control. 3. To demonstrate the applications of such technologies in various scenarios such as built environment.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) explain the technology and physics of white-light emitting diodes (white- LEDs) made from IIIV semiconductors; (b) rationalize the industry and users' perspectives for LEDs and SSL; (c) describe the principles of different lighting control components; (d) evaluate various lighting control circuits and demonstrate their applications in lighting control; and (e) realize the use of energy-efficient lighting technologies in built environment.
Subject Synopsis/ Indicative Syllabus	**Light-emitting diode (LED)**: Principles of operation of LEDs. Heterostructure materials systems, chip design, and characteristics of LEDs. Light extraction, solid-state sources of white light. Nonvisual and visual applications of SSL. **Lighting electronics**: Diodes; transistors; amplifiers; analog to digital conversion; integrated circuits; microprocessor. **Lighting control components**: Electromagnetic components; electronic components. **Dimmers and control systems**: Dimmer laws; dimmer circuits; standard protocols for lighting control; networks and buses; cordless control; architectural and entertainment lighting control; energy management and building control; emergency and security lighting. **Applications of lighting control:** Commercial, industrial, and architectural applications; practical lighting design.

Teaching/Learning Methodology	**Lecture**: Delivery of lectures interactively to enable students to participate actively in acquiring knowledge, and to raise questions and discuss to clarify their doubts generated in their learning process.
	Tutorial: For the students to consolidate the contents of lectures. Students are properly guided to participate actively in solving problems, raising questions, and discussion.

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. Assignments	30%	✓	✓	✓	✓	
	2. In-class quizzes	10%	✓	✓	✓		✓
	3. Presentation	30%	✓	✓	✓	✓	✓
	4. Test	30%	✓	✓	✓	✓	
	Total	100%					

Assignments and In-class quizzes: Assignments 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. In-class quizzes would be administered during the subject as a means of timely checking learning progress by referring to the intended outcomes and as means of checking how effectively, the students digest and consolidate the materials taught in the class.

Project: Students are required to prepare slide presentations on assigned topics related to modern lighting technology and deliver that in form of video presentation. The presentation slides and video presentation will be assessed based on the clarity and depth of content involved, demonstration of higher order thinking (problem analysis, critical thinking and creative thinking), and the presentation skills (verbal and visual).

Test: A major written test will review students' understanding of course materials. The emphasis of assessment would be put on evaluating the understanding, analysis, and problem-solving ability of the students.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study efforts:	
	▪ Reading and self-study	81 Hrs.
	The total student study effort	120 Hrs.

Reading List and References	G. Held, Introduction to Light-Emitting Diode Technology and Applications (Taylor & Francis, Boca Raton 2009). Jinmin Li and G. Q. Zhang, Light-Emitting Diodes: Materials, Processes, Devices and Applications (Solid State Lighting Technology and Application Series Book 4), Springer, 2019. Craig DiLouie, Advanced Lighting Controls - Energy Savings, Productivity, Technology and Applications, ebook, River Publishers, 2021 Robert S. Simpson, "Lighting control technology and applications", Focal Press, 2003. Stanley Lyons, "Emergency Lighting for industrial, commercial and residential premises", Butterworth-Heinemann Ltd, 1992. Norbert M. Lechner and Patricia Andrasik, Heating, Cooling, Lighting: Sustainable Design Strategies Towards Net Zero Architecture, 5th ed., Wiley, 2021