Subject Description Form

Subject Code	AP40007
Subject Title	Simulation and Analysis of Optoelectronic Devices
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	AP20001
Objectives	To teach students to (1) formulate and (2) develop advanced computer simulations for the design and analysis optoelectronic devices, and to learn and to excel a software program – MATLAB.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) learn the fundamental theories for the propagation, generation, modulation and detection of light and understand the physics behind the operation of optoelectronic devices; (b) understand the most common numerical techniques for the development of computer simulation for the optoelectronic devices; and (c) and program their own codes using MATLAB.
Subject Synopsis/ Indicative Syllabus	**Optical waveguide theory**: Review of EM theory, effective index method, optical fiber waveguide, metallic optical waveguide. **Computer simulation of optical waveguides using MATLAB**: Finite-difference time-domain method, Finite element technique. **Analysis and simulation of semiconductor lasers**: Optical processes in semiconductors, Fabry Perot, distributed feedback, and vertical-cavity surface-emitting lasers. **Analysis and simulation of light modulation and detection**: Direct modulation of semiconductor lasers, electrooptic effects and amplitude modulators, *p-i-n* photodiodes.
Teaching/Learning Methodology	A self-consistent and independent learning and studying approach – lectures provides an overview of the subject and stimulating students' interest in it, – laboratory session provides an environment for the taught knowledge (i.e., lectures) to be implemented for practical applications. Furthermore, laboratory exercises will be designed in a way that students can gain knowledge to enhance their understanding of the lectures contents. Hence, this course's teaching/learning methodology can encourage self-learning independent study throughout the course.

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
(1) Continuous assessment	40	✓	✓	✓
(2) Examination	60	✓	✓	
Total	100			

For prolong training and monitoring of student's progress in programming skill; continuous assignments (included computer laboratories, assignments and a mid-term test) are required for the students. Examination will be conducted to make a comprehensive assessment of students' intended learning outcomes as stated above.

Student Study Effort Expected

Class contact:	
• Lecture	22 h
• Laboratory	24 h
Other student study effort:	
• self-study	74 h
Total student study effort	120 h

Reading List and References

S.L. Chuang, 'Physics of photonic devices', 2nd edition, John Wily & Sons, 2009.

K. Kawano & T. Kitoh, 'Introduction to optical waveguide analysis', John Wily & Sons, 2001.

J.E. Carroll, J. Whiteaway & D. Plumb, 'Distributed feedback semiconductor lasers', SPIE Press, 1998.

S.F. Yu, 'Analysis and design of vertical cavity surface emitting lasers', John Wily & Sons, 2003.

J. Kiusalaas, 'Numerical methods in engineering with matlab', Cambridge University Press, 2005.