Subject Description Form

Subject Code	EIE4449
Subject Title	Optical Communication Systems and Networks
Credit Value	3
Level	4
Exclusion	EIE581 Optical Wavelength Division Multiplexing Networks
Objectives	To provide students with the design and operating principles of modern optical communication systems and networks. Upon completion of the subject, students should be familiar with commonly used components and subsystems in optical communication and network systems and be able to design a simple optical communication link.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the basic operating principles of single mode and multimode fibres. 2. Understand the basic operating principles of light sources, detectors and amplifiers. 3. Understand the basic operating principles of passive optical devices. 4. Have the ability to design a simple optical communication link. 5. Appreciate the principles of optical communication networks. Category B: Attributes for all-roundedness 6. Present ideas and findings effectively. 7. Think critically. 8. Learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Optical Fibre 1.1 Principles of optical waveguiding, single mode and multimode fibres and their transmission characteristics. 2. Active and passive components 2.1 Light emitting diodes (LEDs) and semiconductor lasers: operating principles and characteristics. Semiconductor optical detectors: PINs and APDs. Optical amplifiers: Erbium doped fibre amplifiers (EDFAs). 2.2 Coupler, isolator, circulator, wavelength division multiplexer and demultiplexer. 3. Optical communication systems 3.1 Transmission impairments: noise, dispersion, nonlinearity and crosstalk. Bit error rate (BER), Q factor and receiver sensitivity. 3.2 Point to point link design: power budget and power penalty. 3.3 Wavelength division multiplexing (WDM). Design of multi-span WDM links. 4. Optical communication networks 4.1 WDM add/drop multiplexer, WDM optical crossconnect, Basic architecture of a WDM optical network. Passive optical networks (PONs). **Laboratory Experiments:** Practical Works: 1. Optical fibre passive component measurement 2. Common fibre optic test and measurement techniques

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1,2,3,4,5	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1,2,3,4,5,7,8	Supplementary to lectures and are conducted with smaller class size; Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Assignments and application examples are given and discussed.
Laboratory sessions	1,2,3,6,7	Students will enhance their understanding of the concepts learnt through measuring the characteristics of various fibre components. Students are given the opportunity to analyze results obtained and to solve practical problem encountered.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)							
		1	2	3	4	5	6	7	8
1. Continuous Assessment (total 40%)									
• Tests	20%	✓	✓	✓	✓	✓			
• Assignments	10%	✓	✓	✓	✓	✓		✓	✓
• Laboratory sessions	10%	✓	✓	✓			✓	✓	
2. Examination	60%	✓	✓	✓	✓	✓		✓	✓
Total	100 %								

The continuous assessment consists of a number of assignments, laboratory reports and tests.

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

Specific Assessment Methods/Tasks	Remark
Tests	Objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students' ability to remember facts and figures as well as their comprehension of subject materials and end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom
Assignments and examination	End-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; Students need to think critically and creatively in order to come with an alternate solution for an existing problem. They need to find additional information independently in order to solve a given problem
Laboratory sessions	Each group of students are required to produce a written report; Accuracy and the presentation of the report will be assessed.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Text Books:** 1. G. Kaiser, *Optical Fiber Communications*, 5th ed., McGraw-Hill, 2015. 2. John Senior, *Optical Fiber Communications: Principles and Practice*, 3rd ed., Pearson Education, 2009. **Reference Books:** 1. Jeff Hecht, *Understanding Fiber Optics,* 4th ed., Prentice-Hall, 2002.	
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