Subject Description Form

Subject Code	EIE515
Subject Title	Advanced Optical Communication Systems
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: Nil Mutual exclusions: EIE4449
Objectives	Objectives: The subject aims to introduce (i) Optical networking, principles and challenges: current and future optical networks. (ii) Enabling technologies: Principles and device physics of optical components that form the building blocks of optical networks (e.g., WDM); Transmission technology for optical networks. (iii) Optical communication networks
Intended Learning Outcomes	Upon completion of the subject, the student will be a. Equipped with the tools and ideas of selecting, designing, installing, testing and maintaining an optical system providing data communication in a broadband local access, metro or wide-area network. b. Understand the key components of optical communication networks. c. Be able to design a simple optical transmission link.
Subject Synopsis/ Indicative Syllabus	**Detailed subject contents:** 1. Basic Concepts in Optical Networks: Principles and Challenges 1.1 What is an optical network? 1.2 Optical networks: needs and challenges 2. Enabling Technologies 2.1 Optical fiber (fundamental principles) 2.2 Optical transmitters 2.3 Optical receivers and filters 2.4 Optical amplifiers 2.5 Optical transmission link design 2.6 Optical switching elements 3. Optical Link Design 3.1 Optical amplified multispan link design 3.2 OSNR and Q factor 3.3 Power penalty due to dispersion and fibre nonlinearity 3.4 Advanced modulation formats 3.5 Coherent detection systems 4. Optical Communication Networks 4.1 Optical access networks 4.1.1 PON technologies 4.1.2 Ethernet PON access network 4.1.3 Wavelength division multiplexing (WDM) PON 4.2 Optical Networking Elements 4.2.1 Optical switches and add/drop multiplexers

	4.2.2 Reconfigurable add/drop multiplexer (ROADM)

Teaching/Learning Methodology

Method	Remarks
Lectures	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	Supplementary to lectures and are conducted with smaller class size if possible; Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Problems and application examples are given and discussed.
Assignment	Students will be given an opportunity to learn some of important and related techniques.

Teaching/Learning Methodology	Intended Subject Learning Outcomes		
	a	b	c
Lectures	✓	✓	✓
Tutorials	✓	✓	✓
Assignment	✓	✓	✓

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. Test	25%	✓	✓	
2. Assignment	25%	✓	✓	✓
3. Examination	50%	✓	✓	✓
Total	100%			

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

1. **Test:** Students will need to answer questions about fundamental concepts of optical fiber communications, optical network technologies and their applications.
2. **Assignment:** Students will be given an assignment, which requires students to do further reading, search for information, keep a breast of current developments, write a report, and give an oral presentation.
3. **Examination:** Students will need to answer questions about concepts of optical fiber communications, optical network technologies, and also the components, designs and applications.

Student Study Effort Expected	Class contact:	
	▪ Lectures and Tutorials	33 Hrs.
	▪ Assignment and Test	6 Hrs.
	Other student study effort:	
	▪ Self-study	55 Hrs.
	▪ Report writing	15 Hrs.
	Total student study effort	109 Hrs.
Reading List and References	**References** 1. G. Keiser, Optical Fiber Communications, 5th ed., McGraw-Hill, 2015. 2. M Cvijetic, I B Djordjevic, Advanced Optical Communication Systems and Networks, Artech House, 2013. 3. John Senior, Optical Fiber Communications: Principles and Practice, 3rd ed., Pearson Education, 2009. 4. Jeff Hecht, Understanding Fiber Optics, 4th ed., Prentice-Hall, 2002.	

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