

## Subject Description Form

<b>Subject Code</b>	EIE515
<b>Subject Title</b>	Advanced Optical Communication Systems
<b>Credit Value</b>	3
<b>Level</b>	5
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	<u>Pre-requisite:</u> Nil <u>Mutual exclusions:</u> EIE4449
<b>Objectives</b>	<u>Objectives:</u> 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
<b>Intended Learning Outcomes</b>	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.
<b>Subject Synopsis/ Indicative Syllabus</b>	<u>Detailed subject contents:</u> 1. <u>Basic Concepts in Optical Networks: Principles and Challenges</u> 1.1 What is an optical network? 1.2 Optical networks: needs and challenges 2. <u>Enabling Technologies</u> 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. <u>Optical Link Design</u> 3.1 Optical amplified multispans 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. <u>Optical Communication Networks</u> 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.

<b>Student Study Effort Expected</b>	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.
<b>Reading List and References</b>	<u>References</u> 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, 3 <sup>rd</sup> ed., Pearson Education, 2009. 4. Jeff Hecht, Understanding Fiber Optics, 4th ed., Prentice-Hall, 2002.	

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