

230255 - FIBSYS - Optical-Fiber Telecommunication Systems for Internet (IP Over Wdm)

Coordinating unit:	230 - ETSETB - Barcelona School of Telecommunications Engineering		
Teaching unit:	739 - TSC - Department of Signal Theory and Communications		
Academic year:	2019		
Degree:	BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Teaching unit Optional)		
ECTS credits:	6	Teaching languages:	Catalan, Spanish, English

Teaching staff

Coordinator:	José A. Lázaro
Others:	José A. Lázaro, Jaume Comellas. Junyent Giralt, Gabriel

Prior skills

Basic background on communications

Teaching methodology

In the fall classes taught in English, and Spanish and Catalan in the spring.

- Lectures.
- Group work (distance).
- Individual work (distance).
- Exercises.
- Oral presentations.
- Short answer test (Control).
- Extended answer test (Final Exam).

Learning objectives of the subject

The aim of this course is to provide to the students a global vision of optical-fiber networks and their main application as back-bone of Internet. It will be provided a vision of the different methods of analysis, design, dimensioning, and performance evaluation of optical fibre based networks and WDM. First, we consider the parameters of interest for systems planning using tutorial software. Then, using this knowledge, we will study the design and evaluation of optical fibre based networks.

Study load

Total learning time: 150h	Hours large group:	52h	34.67%
	Self study:	98h	65.33%



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Content

<p>1. Introduction</p>	<p>Learning time: 17h 30m Theory classes: 6h Self study : 11h 30m</p>
<p>Description: - Historical evolution of Internet infrastructure. - State of the art.</p>	
<p>2. Internet Core and access networks</p>	<p>Learning time: 17h 30m Theory classes: 6h Self study : 11h 30m</p>
<p>Description: - Evolution of Internet core networks. - Internet access technologies.</p>	
<p>3. High capacity telecommunication systems ' the optical layer</p>	<p>Learning time: 17h 30m Theory classes: 6h Self study : 11h 30m</p>
<p>Description: - Optical-fiber core networks evolution. - High capacity telecommunication systems by WDM technology. - Introduction of current WDM networks standards.</p>	
<p>4. WDM telecommunication systems elements</p>	<p>Learning time: 13h 45m Theory classes: 5h Self study : 8h 45m</p>
<p>Description: - Optical devices for WDM communications. - Optical amplification in WDM communication systems.</p>	

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<p>5. WDM network design and analysis</p>	<p>Learning time: 13h 45m Theory classes: 5h Self study : 8h 45m</p>
<p>Description:</p> <ul style="list-style-type: none"> - Long haul WDM systems. - Regional and Metropolitan WDM networks. - WDM systems analysis, design and performance evaluation. 	
<p>6. Optical-fiber network fundamentals</p>	<p>Learning time: 17h 30m Theory classes: 6h Self study : 11h 30m</p>
<p>Description:</p> <ul style="list-style-type: none"> - Routing and wavelength assignment (unicast, broadcast, multicast). - Wavelength conversion. - Fault management, protection and survivability. 	
<p>7. Traffic grooming: IP over WDM</p>	<p>Learning time: 17h 30m Theory classes: 6h Self study : 11h 30m</p>
<p>Description:</p> <ul style="list-style-type: none"> - Standardized traffic grooming. - Traffic grooming evolution. 	
<p>8. Network control and management</p>	<p>Learning time: 17h 30m Theory classes: 6h Self study : 11h 30m</p>
<p>Description:</p> <ul style="list-style-type: none"> - Basic functions of network control and management. - Dynamic routing and wavelength-flexible spectrum assignment. 	

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<p>9. Introduction to advanced topics</p>	<p>Learning time: 17h 30m Theory classes: 6h Self study : 11h 30m</p>
<p>Description:</p> <ul style="list-style-type: none"> - Introduction to optical packet and burst switching (OPS and OBS). - Introduction GMPLS and Software Defined Networks. - Introduction to virtual-topology design and optimization. 	

Planning of activities

EXERCISES

Description:

During the course it will be proposed several exercises, from the simplest towards the analysis and design of optical fiber networks for several implementation scenarios.

ORAL PRESENTATION

Description:

The students will show the results of their personal and team work obtained at the most ambitious exercises of analysis and design of optical fiber networks at different scenarios.

SHORT ANSWER TEST (CONTROL)

Description:

It will be proposed optional short answer controls during the course, so that students can check their progress. Some of these controls will allow reducing the topics of the subject to be assessed at the final control.

EXTENDED ANSWER TEST (FINAL EXAMINATION)

Description:

At the end of the course, it will be proposed a control based on long answers that will allow to the students to show their knowledge and skills acquired in this course. This control can be alternatively evaluated by a personal and/or group work for those students showing good marks at the optional controls of short answers.

Qualification system

Final examination: 50%
Partial examinations and controls: 30%
Exercises: 20%

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Bibliography

Basic:

Ramaswami, R.; Sivarajan, K.N.; Sasaki, G.H. Optical networks: a practical perspective [on line]. 3rd ed. San Francisco: Morgan kaufmann, 2010 [Consultation: 29/07/2013]. Available on: <<http://www.sciencedirect.com/science/book/9780123740922>>. ISBN 9780123740922.

Mukherjee, B. Optical WDM networks. New York: Springer, 2006. ISBN 978-0387-29055-3.

Complementary:

Sivalingam, K.M.; Subramaniam, S.. Optical WDM networks: principles and practice [on line]. New York: Kluwer Academic Publishers, 2000 [Consultation: 10/10/2014]. Available on: <<http://link.springer.com/book/10.1007/b115953>>. ISBN 0306470217.

Iniewski, K. Internet networks: wired, wireless, and optical technologies [on line]. BGoa Raton, FL: CRC, 2009 [Consultation: 08/10/2014]. Available on: <<http://site.ebrary.com/lib/upcatalunya/docDetail.action?docID=10367161>>. ISBN 9781439808573.

Others resources:

Tutorial material on basic topics about optical communications, as the basic structure of optical fibers, etc. will be offered to those students who may request it.