Course guides
230688 - NFIO - Networking and Future Internet Opportunities

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering.
Degree: MASTER'S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Optional subject).
Academic year: 2015
ECTS Credits: 5.0
Languages: English

LECTURER
Coordinating lecturer: Jaume Comellas
Others: Josep Solé ParetaJosé Antonio Lázaro VillaAlberto Cabellos

PRIOR SKILLS
Basic knowledge about Network Architecture as well as transmission technologies used in data networks.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY
This is a subject integrated in the framework of Erasmus+ programme, which consists in a collaboration activity among 7 Universities from different countries (coordinated by University of Aalborg, DK). There are two face-to-face seminars (one in April and the final one in July) which are mandatory to attend, and a main part of autonomous off-line student work. In the first phase the student works on different theoretical modules which are evaluated during the April meeting. Then, the student is assigned to a multi-national group which works in a project evaluated at the July meeting.

LEARNING OBJECTIVES OF THE SUBJECT
Knowledge of Future Internet technologies Knowledge of Future Internet seen from social and business perspectives. Skills in exploring the opportunities in Future Internet, by relating technical, social and business aspects. Competences in working together in teams across scientific areas, countries and cultures, and to bring into play his/her own knowledge in such a context.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>20</td>
<td>16.00</td>
</tr>
<tr>
<td>Self study</td>
<td>86</td>
<td>68.80</td>
</tr>
<tr>
<td>Hours small group</td>
<td>19</td>
<td>15.20</td>
</tr>
</tbody>
</table>

Total learning time: 125 h
## CONTENTS

### Advances in information systems

**Description:**
This module gives the student an introduction to advances and trends in information systems. More specifically, this module covers the state of the art in aspects such as big data, cloud computing and sociotechnical systems.

**Specific objectives:**
Knowledge of issues, architecture, technologies and impact concerning big data
Knowledge of issues, architecture, technologies and impact concerning cloud computing
Knowledge of issues, technologies and impact concerning usability and sociotechnical systems

**Related activities:**
Autonomous work, learning assessment

**Full-or-part-time:** 10 h
Self study: 10h

### Nanonetworking and Molecular Communications

**Description:**
Nano-networks and molecular communications principles.

**Specific objectives:**
Major molecular communication systems, namely the communication via diffusion, calcium signalling, and molecular motors and how these mechanisms can be translated into the telecommunication domain. Skills in basic issues in the Tera-hertz band; the differences and challenges of working in the Tera-hertz band of the electromagnetic spectrum; and how the Shannon limit will be applied to the Tera-hertz band. Knowledge of the microscopic theory on diffusion and how it can work in conjunction with information theory to evaluate the performance of a communication via a diffusion system.

**Full-or-part-time:** 10 h
Theory classes: 10h

### Future Internet Architecture

**Description:**
Deals with problems of the current Internet and introduces the approaches of new alternative Internet Architectures.

**Specific objectives:**

**Full-or-part-time:** 10 h
Theory classes: 10h

### Services and Applications

**Description:**
Introduction to special issues and trends in Internet services and applications.

**Specific objectives:**
Trends in Internet usage. The Internet of things. Design processes. The creation and pricing of services.

**Full-or-part-time:** 10 h
Theory classes: 10h
**Advances in Wireless Technologies**

**Description:**
Basic concepts in radio communications and the state of the art wireless and mobile systems, including their applications.

**Specific objectives:**
- Wireless sensor network, IEEE 802.11 with latest extensions: carrier sense multiple access with collision avoidance (CSMA/CA)
- Knowledge of mobile networks (cellular and latest evolutions LTE, LTE-A)

**Full-or-part-time:** 10 h
**Theory classes:** 10h

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**Implementation of broadband networks**

**Description:**
Implementation procedure of broadband access and distribution networks, including master plans for broadband networks. Common architectures which are used to design long haul IP networks and common logical and physical topologies of real life broadband IP networks.

**Specific objectives:**
- GIS tools
- Real-life architectures and equipment (and technologies) through the presentation of case studies
- Designing a network implementing proper topologies in each layer of the network

**Full-or-part-time:** 10 h
**Theory classes:** 10h

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**Advances in Broadband Technologies**

**Description:**
Current and future network technologies.

**Specific objectives:**
- Basic wired and wireless broadband access network technologies: Digital Subscriber Line (xDSL), Hybrid Fiber Coax (Cable TV & Cable Modems), Broadband Power Line (BPL), Fibre to the Home/Curb, CDMA, 3G, and WiFi and WiMax.
- Basic backbone network technologies: MPLS, SDH, Carrier-Ethernet, and DWDM, in conjunction with scalability, statistical multiplexing, traffic engineering, reliability and QoS provisioning concepts.

**Full-or-part-time:** 10 h
**Theory classes:** 10h

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**Network Security**

**Description:**
Introduction to network monitoring and security.

**Specific objectives:**
- Concepts about common threats including bots, spyware, adware, DoS/DDoS attacks, click-fraud, spam, and information theft.

**Full-or-part-time:** 8 h
**Theory classes:** 8h 20m
Enterprise Architecture

Description:
Introduction to enterprise architecture frameworks and enterprise architecture’s role in enterprise and infrastructure management.

Specific objectives:
Enterprise architecture frameworks.Knowledge of how enterprise architecture supports sustainability of business architecture and alignment between business processes and IT

Full-or-part-time: 8 h
Theory classes: 8h 20m

Entrepreneurship and corporate entrepreneurship

Description:
Linking technology and Future Internet prospects to commercial business models for ambitious corporate and start-up Entrepreneurs.

Specific objectives:
How to model an innovative idea and develop it into a successful enterprise through Business Model Canvas and through concrete examples of Future Internet-related business modelsKnowledge of how to set up your team, how to identify and how to approach your customers

Full-or-part-time: 10 h
Theory classes: 10h

GRADING SYSTEM

The final mark is obtained by adding 30% of the theoretical part and 70% from the project.

EXAMINATION RULES.

No specific rules.

RESOURCES

Audiovisual material:
- Class Notes. Resource