270129 - IM - Wireless and Mobile Communications

Coordinating unit: 270 - FIB - Barcelona School of Informatics
Teaching unit: 701 - AC - Department of Computer Architecture
Academic year: 2017
Degree: BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff

Coordinator: - Jorge García Vidal (jorge@ac.upc.edu)
Others: - Jose Maria Barceló Ordinas (joseb@ac.upc.edu)

Prior skills

Basic knowledge of TCP / IP networks and network protocols.
Basic knowledge of probability and linear algebra

Requirements

- Prerequisite XC

Degree competences to which the subject contributes

Specific:
CTI1.1. To demonstrate understanding the environment of an organization and its needs in the field of the information and communication technologies.
CTI1.2. To select, design, deploy, integrate and manage communication networks and infrastructures in an organization.
CTI1.3. To select, deploy, integrate and manage information systems which satisfy the organization needs with the identified cost and quality criteria.
CTI1.4. To select, design, deploy, integrate, evaluate, build, manage, exploit and maintain the hardware, software and network technologies, according to the adequate cost and quality parameters.
CTI2.1. To manage, plan and coordinate the management of the computers infrastructure: hardware, software, networks and communications.
CTI3.1. To conceive systems, applications and services based on network technologies, taking into account Internet, web, electronic commerce, multimedia, interactive services and ubiquitous computation.
CTI3.2. To implement and manage ubiquitous systems (mobile computing systems).
CTI3.4. To design communications software.

General:
G2. SUSTAINABILITY AND SOCIAL COMPROMISE: to know and understand the complexity of the economic and social phenomena typical of the welfare society. To be capable of analyze and evaluate the social and environmental impact.

Teaching methodology

* Classroom sessions
* Lab classes (python programming)
* Case-based sessions (mobile app design)
Learning objectives of the subject

1. knowledge of specific problems in the radio transmission
2. know the technology of wireless networks
3. knowing the value chain of mobile Internet
4. know the basic processing techniques for smartphone sensors
5. understand the business models, development costs, marketing, competition, etc., associated with the development of a mobile application
6. work together to develop a design work
7. technologies know no children of short-range.
8. known auxiliary technologies: positioning, secure mobile payments, advertising insertion, etc.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Theory classes: 45h</th>
<th>30.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 15h</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 6h</td>
<td>4.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 84h</td>
<td>56.00%</td>
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</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Degree competences to which the content contributes:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The value chain of mobile Internet</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Radio Transmission</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Cellular networks</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>WiFi Networks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>IEEE 802.11. CSMA / CA. Different standards of physical (802.11b, 802.11g, 802.11a, 802.11n). Solutions security (WEP, WPA). New standards: 802.11ac, 802.11ah.</em></td>
<td></td>
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<tr>
<td><strong>Low power wireless transmission technologies</strong></td>
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<tr>
<td><em>Bluetooth. 802.15.4. RFID and NFC. Mesh Networks and adhoc networks. Sensor networks. 6LowPAN, CoAP.</em></td>
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<tr>
<td><strong>Sensors and signal processing techniques</strong></td>
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</tbody>
</table>
### Description:

### LBS and Complementary Technology

#### Degree competences to which the content contributes:

**Description:**
Positioning techniques, GPS, and Based Location Services (LBS). Secure Payment. Mobile Advertising.
# Planning of activities

## Topic 1

<table>
<thead>
<tr>
<th>Hours: 6h</th>
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<tbody>
<tr>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>Practical classes: 0h</td>
</tr>
<tr>
<td>Laboratory classes: 0h</td>
</tr>
<tr>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td>Self study: 3h</td>
</tr>
</tbody>
</table>

**Description:**


**Specific objectives:**

3

## item 2

<table>
<thead>
<tr>
<th>Hours: 24h</th>
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<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Practical classes: 0h</td>
</tr>
<tr>
<td>Laboratory classes: 0h</td>
</tr>
<tr>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td>Self study: 18h</td>
</tr>
</tbody>
</table>

**Description:**


**Specific objectives:**

1

## item 3

<table>
<thead>
<tr>
<th>Hours: 12h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Practical classes: 0h</td>
</tr>
<tr>
<td>Laboratory classes: 0h</td>
</tr>
<tr>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td>Self study: 6h</td>
</tr>
</tbody>
</table>

**Description:**

IEEE 802.11. CSMA / CA. Different standards of physical (802.11b, 802.11g, 802.11a). Solutions security (WEP, WPA). New standards: 802.11n, 802.11p, 802.11.

**Specific objectives:**

2
## Use case: Mobile Application Design

**Description:**
The goal is to design a mobile application. You can choose an application. It will analyze the applications available on Apple App Store or Android Market with similar characteristics, comparing our implementation with the competition. We will choose a business model (ie, how will money with this application), marketing, etc.. We will design the application (graphics, functionality, etc.). On a voluntary basis can we deploy the application for Android OS and IOS. In this case you can publish the application for the market.

**Specific objectives:**
3, 4, 5

<table>
<thead>
<tr>
<th>Hours</th>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Laboratory classes</th>
<th>Guided activities</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>20h</td>
<td>0h</td>
<td>0h</td>
<td>9h</td>
<td>0h</td>
<td>11h</td>
</tr>
</tbody>
</table>

## item 4

**Description:**

**Specific objectives:**
2

## Partial Review

**Description:**
Exam topics 1-3

**Specific objectives:**
1, 2, 3

<table>
<thead>
<tr>
<th>Hours</th>
<th>Guided activities</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>6h</td>
<td>1h</td>
<td>5h</td>
</tr>
</tbody>
</table>

## item 5

**Hours:** 12h
- Theory classes: 6h
- Practical classes: 0h
- Laboratory classes: 0h
- Guided activities: 0h
- Self study: 6h
Description:
Bluetooth. Zigbee. RFID and NFC. Mesh Networks and adhoc networks. Sensor networks. 6LowPAN and CoAP.

Specific objectives:

item 6

Hours: 9h
- Theory classes: 6h
- Practical classes: 0h
- Laboratory classes: 0h
- Guided activities: 0h
- Self study: 3h

Description:

Specific objectives:

item 7

Hours: 9h
- Theory classes: 5h
- Practical classes: 0h
- Laboratory classes: 0h
- Guided activities: 0h
- Self study: 4h

Description:
Positioning techniques and Location Based Services (LBS). Secure Payment. Mobile Advertising.

Specific objectives:

item 8

Hours: 12h
- Theory classes: 3h
- Practical classes: 0h
- Laboratory classes: 6h
- Guided activities: 0h
- Self study: 3h

Description:
Sensors. Signal processing

Specific objectives:
Presentation mobile application

**Description:**
Presentation of the application designed

**Specific objectives:**
3, 4, 5, 6

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**Final Exam**

**Description:**
Review of issues 1-8

**Specific objectives:**
1, 2, 3, 4, 5, 6, 7, 8

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**Qualification system**

Ep: Midterm exam: 0 <= Ep <= 10
Ef: Final exam: 0 <= Ef <= 10
Ec: Use case: 0 <= Ec <= 1.

Final mark = 0.8xMAX (Ef, 0, 75 x Ef +0.25 x Ep) + 2xEC

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**Bibliography**

**Basic:**

