230699 - SHORT - Short Range Communications

**Coordinating unit:** 230 - ETSETB - Barcelona School of Telecommunications Engineering  
**Teaching unit:** 744 - ENTEL - Department of Network Engineering  
**Academic year:** 2018  
**Degree:** MASTER’S DEGREE IN TELECOMMUNICATIONS ENGINEERING (Syllabus 2013). (Teaching unit Optional)  
**ECTS credits:** 5  
**Teaching languages:** English

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**Teaching staff**

**Coordinator:** Paradells Aspas, Josep

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**Opening hours**

**Timetable:** Wednesday from 15h to 18h  
Thursday from 17h to 20h

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**Prior skills**

The course assumes some basics about radio frequency concepts and transmission techniques such as modulation and coding.

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**Learning objectives of the subject**

Introduce students to the short-range communications technologies presenting and justifying its operation

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**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group:</th>
<th>39h</th>
<th>31.20%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self study:</td>
<td>86h</td>
<td>68.80%</td>
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</tbody>
</table>

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# Contents

<table>
<thead>
<tr>
<th>Contents and organisation</th>
<th>Learning time: 1h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 1h</td>
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</table>

**Description:**
- Introduction to the subject, content motivation
- Organisation of the subject, contents and evaluation

<table>
<thead>
<tr>
<th>RFID</th>
<th>Learning time: 6h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
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</tbody>
</table>

**Description:**
- Basics principles
- Applications
- Examples of usage: Mifare Ultralight

<table>
<thead>
<tr>
<th>NFC</th>
<th>Learning time: 3h</th>
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<tbody>
<tr>
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<td>Theory classes: 3h</td>
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</table>

**Description:**
- Physic Layer
- Information structure
- Example of usage
- Home Lab: NFC

<table>
<thead>
<tr>
<th>Bluetooth</th>
<th>Learning time: 9h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 9h</td>
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</tbody>
</table>

**Description:**
- Evolution
- Protocol architecture (physical layer, link layer, HCI, SDP, profiles,..)
- Connection procedures
- Bluetooth Low Energy
- Home Lab: BLE
### Personal area networks IEEE802.15.4

**Description:**
- Channels and access mechanisms (includes IEEE802.15.4e)
- Capacity and power consumption performance
- Channel
- Procedures
- Example of channel Ultra Wide Band (UWB) IEEE802.15.4a
- Distance ranging and location
- Home Lab: Usage of an UWB system

**Learning time:** 12h  
**Theory classes:** 12h

### Wireless Area Networks IEEE802.11

**Description:**
- Architecture and roles
- Physical channels: 11, 11b, 11g/a, 11ac, 11ad
- Access Mechanisms and performance
- Service quality (IEEE802.11e)
- Power saving
- Security
- Mesh networks (IEEE802.11s)
- Deployment and optimization
- Home Lab: Trace analysis of system IEEE802.11

**Learning time:** 6h  
**Theory classes:** 6h

### Testx

**Description:**
- Intermediate tests

**Learning time:** 2h  
**Theory classes:** 2h

### Bibliography

- Personal area networks IEEE802.15.4
- Wireless Area Networks IEEE802.11
- Testx