230649 - TSYS - Telecommunications Systems

Degree competences to which the subject contributes

Specific:
1. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.
2. Ability to implement wired/wireless systems, in both fix and mobile communication environments.

Transversal:
4. 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.
5. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
6. 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

- Lectures
- Application classes
- Laboratory classes
- Exercises
- Short answer test (Control)
- Short answer test (Test)
- Extended answer test (Final Exam)

Learning objectives of the subject

Learning objectives of the subject:

To present advanced antenna concepts based on a modern time-space formulation, system oriented CAD design techniques and wireless antenna optimization and measurements. In addition, the course develops appreciation for research issues of antennas for mobile wireless and advanced communications systems.

Learning results of the subject:
- Ability to specify, design antennas of telecommunications in both a fixed, mobile, personal, local or long distance, with different bandwidths.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong> 125h</td>
<td>39h</td>
<td>0h</td>
<td>0h</td>
<td>0h</td>
<td>86h</td>
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<tr>
<td></td>
<td>31.20%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>68.80%</td>
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</tbody>
</table>
### Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Theory classes</th>
<th>Laboratory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Channel modeling. LOS, NLOS. MIMO channel.</td>
<td>16h</td>
<td>3h</td>
<td>1h</td>
<td>12h</td>
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<tr>
<td>2. Antenna modeling: time-frequency radiation parameters, impedance and matching.</td>
<td>17h</td>
<td>3h</td>
<td>2h</td>
<td>12h</td>
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<tr>
<td>3. Compact antennas: wire and slot antennas, small antennas, ground planes.</td>
<td>18h</td>
<td>4h</td>
<td>2h</td>
<td>12h</td>
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<td>4. Broadband antennas: principles of broadbanding, fractal antennas, UWB antennas.</td>
<td>18h</td>
<td>4h</td>
<td>2h</td>
<td>12h</td>
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<tr>
<td>5. Multielement antennas: Arrays, MIMO, smart and reconfigurable antennas.</td>
<td>18h</td>
<td>4h</td>
<td>2h</td>
<td>12h</td>
</tr>
<tr>
<td>6. Antennas in systems: wireless systems, active antennas, EMC topics, technology</td>
<td>10h</td>
<td>2h</td>
<td>1h</td>
<td>7h</td>
</tr>
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</table>
   **Learning time:** 10h
   - Theory classes: 2h
   - Laboratory classes: 1h
   - Self study: 7h

8. Application to radar and radionavigation systems
   **Learning time:** 18h
   - Theory classes: 4h
   - Laboratory classes: 2h
   - Self study: 12h

Planning of activities

**LABORATORY**

**Description:** Antenna design.

**EXERCISES**

**Description:** Exercises to strengthen the theoretical knowledge.

**ORAL PRESENTATION**

**Description:** Presentation of a work group.

**SHORT ANSWER TEST (CONTROL):**

**Description:** Mid term control.

**EXTENDED ANSWER TEST (FINAL EXAMINATION):**

**Description:** Final examination.
Final examination: from 20% to 70%
Partial examinations and controls: from 0% to 50%
Individual assessments: from 0% to 40%
Laboratory assessments: from 0% to 70%

Bibliography

Basic:


