240AR055 - Networked Control Systems

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2017
Degree: MASTER'S DEGREE IN AUTOMATIC CONTROL AND ROBOTICS (Syllabus 2012). (Teaching unit Optional)
ECTS credits: 4,5  Teaching languages: English

Teaching staff

Coordinator: PAU MARTI COLOM
Velasco Garcia, Manuel

Degree competences to which the subject contributes

Generical:
1. Ability to conduct research, development and innovation in the field of systems engineering, control and robotics, and as to direct the development of engineering solutions in new or unfamiliar environments, linking creativity, innovation and transfer of technology
2. Have adequate mathematical skills, analytical, scientific, instrumental, technological, and management information.

Transversal:
3. 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.
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.

Teaching methodology

- Magistral lecture
- Project-based learning, problems and real cases

Learning objectives of the subject

Students who have taken the subject should be able to:

- Explain the differences between physically distributed control and logically distributed control.
- Manage the effects each type of network print on a control loop.
- Consistently Explain the origin of the effects of the network on a control loop.
- Measure and evaluate the delays effects in the network transmissions.
- Derive and use mathematical models that represent physically or logically distributed control loops with network delays.
- Determine the dynamics of the control loops over networks.
- Assess the stability of control loops over networks.
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- Fix using different techniques the effects of the network on the control loop.
- Design control loops that are capable of functioning in a distributed manner on a network.
- Use basic compensation techniques to eliminate the effects of a network of distributed control loops.
- Select the most appropriate technique for each type of network control.
- Adopt a criterion to select a network based control loops to be implemented on it.
- Set priority policies in access control loops to the communications network.
- Understand and use the results of scientific publications related to this field.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours medium group:</th>
<th>27h</th>
<th>24.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>13h 30m</td>
<td>12.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>72h</td>
<td>64.00%</td>
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</tbody>
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# Content

1. **Introduction to networked control systems**

   Degree competences to which the content contributes:

2. **Characteristics of networked control systems**

   Degree competences to which the content contributes:

3. **Communication protocols for networked control systems**

   Degree competences to which the content contributes:

4. **Modeling, simulation and implementation of networked control systems**

   Degree competences to which the content contributes:

5. **Networked control systems triggered by time**

   Degree competences to which the content contributes:

6. **Networked control systems triggered by events**

   Degree competences to which the content contributes:

7. **Design of network controllers**

   Degree competences to which the content contributes:

8. **Stability of networked control systems**

   Degree competences to which the content contributes:
Planning of activities

AF1. MASTER CLASS

AF2. PARTICIPATIVE CLASS

AF3. LAB

AF4. THEORY-PRACTICAL WORK

AF5. PROJECTS

AF6. EVALUATION ACTIVITIES

AF7. TUTORIALS

Qualification system

Written exams (30%)
Questions, problems, practices (50%)
Oral presentations (20%)

Bibliography