320044 - CGRM - Control and Guidance of Mobile Robots

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2018
Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING
(Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan

Teaching staff
Coordinator: Masip Alvarez, Albert
Others: Morcego Seix, Bernardo
         Perez Magrane, Ramon
         Masip Alvarez, Albert

Prior skills
Having passed the courses of Control and industrial automation, Industrial informatics, Industrial Robotics and Automated Manufacturing, Modeling and analysis of dynamic systems and Control engineering.

Degree competences to which the subject contributes
Specific:
   CE30. (ENG) ELO: Coneixements i capacitats per aprofundir en tecnologies específiques de l’àmbit.

Teaching methodology
- Theoretical sessions.
- Sessions of practical work.
- Individual work
- Group activities and evaluation

Learning objectives of the subject
Apply theory and control technology to a particular system.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 30h</th>
<th>20.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
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<tr>
<td></td>
<td>Hours small group: 30h</td>
<td>20.00%</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
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</table>
# Content

## TOPIC 1: Mobile Robots

**Learning time:** 25h  
**Theory classes:** 5h  
**Laboratory classes:** 5h  
**Self study:** 15h

**Description:**  
- Sensors.  
- Actuators.  
- Hardware and Software Architecture.  
- The programming interface.

## TOPIC 2: Wheel Control

**Learning time:** 32h  
**Theory classes:** 7h  
**Laboratory classes:** 7h  
**Self study:** 18h

**Description:**  
- Modeling, identification and simulation of wheel dynamics and kinematics.  
- Wheel velocity control.

## TOPIC 3: Computer vision oriented to control

**Learning time:** 53h  
**Theory classes:** 10h  
**Laboratory classes:** 10h  
**Self study:** 33h

**Description:**  
- Technology of image acquisition.  
- Camera modeling.  
- Vision techniques to control.

## TOPIC 4: Trajectory control

**Learning time:** 40h  
**Theory classes:** 8h  
**Laboratory classes:** 8h  
**Self study:** 24h

**Description:**  
- Modeling and simulation of robot kinematics.  
- Multivariable control.  
- Trajectory control.
### Planning of activities

<table>
<thead>
<tr>
<th></th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>EXAMS</strong></td>
<td>4h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
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<tr>
<td><strong>LECTURES</strong></td>
<td>30h</td>
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<tr>
<td></td>
<td>Theory classes: 30h</td>
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<tr>
<td><strong>LABORATORY SESSIONS</strong></td>
<td>26h</td>
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<tr>
<td></td>
<td>Laboratory classes: 26h</td>
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<tr>
<td><strong>SELF STUDY</strong></td>
<td>90h</td>
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<tr>
<td></td>
<td>Self study: 90h</td>
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</tbody>
</table>

### Qualification system
- Exams: 60 % (30% midterm exam, 30% final exam)
- Assessment during lab sessions: 40 %

The entire subject is included within the final exam in such a way that the grade of this final exam will replace that obtained in the first part if it is higher, in order to return the unsatisfactory results of the midterm exam. All students can take part in this modality.

### Regulations for carrying out activities

Students must attend and perform laboratory sessions.
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Bibliography

Basic:


Complementary:


