820228 - REGA - Automatic Regulation

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2019
Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: BEATRIZ FABIOLA GIRALDO GIRALDO
Others: Primer quadrimestre:
BEATRIZ FABIOLA GIRALDO GIRALDO - M11, M12, M13, M14, M15, M16
JOSÉ MARÍA HUERTA SÁNCHEZ - M11, M12, M13, M14, M15, M16
ABEL TORRES CEBRIAN - M13, M14, M15, M16
Segon quadrimestre:
JOSÉ MARÍA HUERTA SÁNCHEZ - T11, T12, T13, T14

Opening hours
Timetable: To be determined at the beginning of the semester. It will be made public to all students during the first week.

Prior skills
Electrical systems, mechanical systems, Mathematics

Degree competences to which the subject contributes
Specific:
CEEIA-25. Model and simulate systems.

Transversal:
2. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
3. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

Teaching methodology
The course uses expositive methodology by 20%, an individual class work (problems) by 10%, teamwork (laboratory) by 10%, and individual and group work non-attendance by 60%.

Learning objectives of the subject
At the end of the course the student will be able to:
1. To acquire basic skills in modeling dynamic systems.
2. To define and know how to apply the general methods of systems analysis.
3. To define and know how to apply the general methods of designing control systems in continuous time.
4. To know how to configure and tune different types of controllers used in the industry.
5. Teamwork.
6. Manage information resources in the field of control systems.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h</th>
<th>30.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
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<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>10.00%</td>
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<td></td>
<td>Guided activities: 0h</td>
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<td>Self study: 90h</td>
<td>60.00%</td>
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### Content

<table>
<thead>
<tr>
<th>1. Introduction to feedback control systems</th>
<th>Learning time: 10h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
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<tr>
<td></td>
<td>Practical classes: 2h</td>
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<td>Self study : 5h</td>
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</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th>2. Models of dynamic systems</th>
<th>Learning time: 30h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 7h 30m</td>
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<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<td>Self study : 20h 30m</td>
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**Description:**

<table>
<thead>
<tr>
<th>3. Analysis of time domain systems</th>
<th>Learning time: 30h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 9h</td>
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<tr>
<td></td>
<td>Laboratory classes: 3h</td>
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<td></td>
<td>Self study : 18h</td>
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**Description:**
### 4. Stability of linear systems

**Learning time:** 20h
- Theory classes: 6h
- Laboratory classes: 2h
- Self study: 12h

**Description:**

### 5. Root locus method

**Learning time:** 10h
- Theory classes: 3h
- Laboratory classes: 2h
- Self study: 5h

**Description:**
Concept of the root locus. Application of the root locus method to the analysis and design of control systems.

### 6. Controllers

**Learning time:** 40h
- Theory classes: 10h 30m
- Laboratory classes: 3h
- Self study: 26h 30m

**Description:**
Integral action "antiwindup". Controllers with two degrees of freedom: PI-D and I-PD controller.
Empirical and analytical tuning of controllers.
Controller by state vector feedback: controllability concept.

### Qualification system

Partial controls (2): 30%
Last control: 40%
Practices: 15%
Others test/projects: 10%
Generic competition "Teamwork": 5%

In this subject will schedule a reassessment. The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)
### Regulations for carrying out activities

The written tests take place within the class schedule.  
Practical tests carried out in the laboratory.

### Bibliography

**Basic:**


**Complementary:**
