340033 - FOAU-F4O07 - Fundamentals of Automatic Control

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2018
Degree: Bachelor's Degree in Electrical Engineering (Syllabus 2009). (Teaching unit Compulsory)
Bachelor's Degree in Mechanical Engineering (Syllabus 2009). (Teaching unit Compulsory)
Bachelor's Degree in Industrial Electronics and Automatic Control Engineering (Syllabus 2009). (Teaching unit Compulsory)
Bachelor's Degree in Industrial Design and Product Development Engineering (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: FRANCISCO JAVIER RUIZ VEGAS
Others: FRANCISCO JAVIER RUIZ VEGAS
CRISTÓBAL RAYA GINER
XAVIER LLANAS PARRA
ALBERT SAMÀ MONSONÍS
RAMON GUZMAN SOLA
ANDREU CATALA MALLOFRE
LUIS MIGUEL MUÑOZ MORGADO

Opening hours

Timetable: See schedule consultation in ATENEA.

Prior skills

Prerequisites: basic Calculus and Algebra course, with complex numbers and a basic course on Physics.

Degree competences to which the subject contributes

Specific:

Transversal:
1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
2. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

Teaching methodology

theoretical classes, practical classes and laboratory

Learning objectives of the subject
1. To understand the concept of linear dynamic system invariant in time and its representation through its transfer function.
2. To be able to model some mechanical and electrical systems using the formalism of the transfer functions.
3. To determine the characteristics that may hold the responses to first and second order systems where standard inputs (impulse, step or ramp) are applied.
4. To understand the advantages of closed loop system.
5. To be able to represent by Bode and Nyquist diagrams frequency responses of first and second order systems, as well as higher order systems.
6. To know how to interpret frequency diagrams.
7. To learn to select in some cases the best controller to reach the given specifications relating to stability, steady-state error and characteristics of the stationary response.
8. To be able to simulate the behavior of linear systems using MATLAB and Simulink.

| Study load |
|-----------------|-----------------|--------|
| **Total learning time:** 150h | Hours large group: 22h 30m | 15.00% |
| | Hours medium group: 0h | 0.00% |
| | Hours small group: 37h 30m | 25.00% |
| | Guided activities: 0h | 0.00% |
| | Self study: 90h | 60.00% |
### Content

<table>
<thead>
<tr>
<th>Unit</th>
<th>Learning time:</th>
<th>Theory classes:</th>
<th>Practical classes:</th>
<th>Laboratory classes:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit 0: Automation and Robotics fundamentals</strong></td>
<td>22h</td>
<td>2h</td>
<td>2h</td>
<td>12h</td>
<td>3h</td>
<td>3h</td>
</tr>
<tr>
<td><strong>Unit 1: Transfer Functions</strong></td>
<td>17h</td>
<td>2h</td>
<td>2h</td>
<td>1h</td>
<td>12h</td>
<td></td>
</tr>
<tr>
<td><strong>Unit 2: Physical systems modeling</strong></td>
<td>17h</td>
<td>2h</td>
<td>2h</td>
<td>1h</td>
<td>12h</td>
<td></td>
</tr>
<tr>
<td><strong>Unit 3: Time response analysis</strong></td>
<td>17h</td>
<td>2h</td>
<td>2h</td>
<td>1h</td>
<td>12h</td>
<td></td>
</tr>
<tr>
<td><strong>Unit 4: Properties of feedback systems</strong></td>
<td>17h</td>
<td>2h</td>
<td>2h</td>
<td>1h</td>
<td>12h</td>
<td></td>
</tr>
</tbody>
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Unit 5: Frequency response analysis  
Learning time: 20h  
Theory classes: 2h  
Practical classes: 2h  
Laboratory classes: 4h  
Self study: 12h

Unit 6: Stability analysis using frequency response  
Learning time: 20h  
Theory classes: 2h  
Practical classes: 2h  
Laboratory classes: 4h  
Self study: 12h

Unit 7: Control systems design  
Learning time: 20h  
Theory classes: 2h  
Practical classes: 2h  
Laboratory classes: 4h  
Self study: 12h

Qualification system

partial exams: E1 and E2  
Laboratory controls: P1 and P2  
oral presentation: O  

final grade:  
max(0.65 · T + 0.25 · P + 0.1 · O, 0.7 · T + 0.3 · P), where:  
T = max(E2, (E1 + E2)/2) and P = (0.5 · P1 + 0.5 · P2)

Re-assessment is possible if final grade ≥ 3  
In this case,  
final grade = min(5, max(0.65 · TR + 0.25 · P + 0.1 · O, 0.7 · TR + 0.3 · P)), where:  
TR = max(R, (E1 + R)/2)
**Bibliography**

**Basic:**