820230 - TCEIA - Control Techniques

Degree competences to which the subject contributes

1. To know and apply the frequencial methods in order to determine the stability and to design compensators.
2. To present the tools for modeling and analysis of discrete time systems.
3. To present methods for design of discrete time systems.
4. To show the possibilities and limitations of computers in the control algorithms implementation.

Others:
Beatriz Giraldo Giraldo

Coordinator:
José Mª Huerta Sánchez

Teaching staff

Teaching languages:
Spanish

Prior skills

Automatic regulation

Requirements

Automatic regulation

Degree competences to which the subject contributes

Specific:
CEEIA-26. Understand automatic regulation and control techniques and their application to industrial automation.

Transversal:
1. 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.

Teaching methodology

The methodologies used are:
Theoretical sessions (20%), individual working problems (10%) and team-working in laboratory sessions (10%).

Learning objectives of the subject

1. To know and apply the frequencial methods in order to determine the stability and to design compensators.
2. To present the tools for modeling and analysis of discrete time systems.
3. To present methods for design of discrete time systems.
4. To show the possibilities and limitations of computers in the control algorithms implementation.
## Study load

<table>
<thead>
<tr>
<th></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></td>
<td>150h</td>
<td>0h</td>
<td>15h</td>
<td>0h</td>
<td>90h</td>
</tr>
<tr>
<td></td>
<td>45h</td>
<td>0h</td>
<td>15h</td>
<td>0h</td>
<td>90h</td>
</tr>
<tr>
<td></td>
<td>30.00%</td>
<td>0.00%</td>
<td>10.00%</td>
<td>0.00%</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## 1. Stability in frequency domain of continuous time systems.

**Description:**
To know all the graphical methods concerned with frequency response, in order to apply the general stability criterion.

**Related activities:**
Problem solving sessions.

**Specific objectives:**

**Learning time:** 25h
- Theory classes: 7h 30m
- Laboratory classes: 2h 30m
- Self study: 15h

## 2. Design and compensation of control systems by frequency methods.

**Description:**
Design of lead compensators and lag compensators using frequency methods.

**Related activities:**
Problem solving sessions.

**Specific objectives:**
To apply the lag and lead compensation techniques.
To know the advantages and drawbacks of this compensation techniques.

**Learning time:** 10h
- Theory classes: 3h
- Laboratory classes: 1h
- Self study: 6h
### 3. Introduction to digital control of dynamic systems.

**Description:**
To describe the functions and characteristics of the elements and signals belonging to a computer controlled system.

**Related activities:**
Problem solving sessions.

**Specific objectives:**
To consider the effect of the presence of sampled data signals in the control loop and to know the problems associated with the choice of the sampling period, and Shannons theorem.

**Learning time:** 10h
- Theory classes: 3h
- Laboratory classes: 1h
- Self study: 6h

### 4. The z-transform.

**Description:**
Introduction to the z-transform in order to represent signals of sampled data systems.

**Learning time:** 15h
- Theory classes: 4h 30m
- Laboratory classes: 1h 30m
- Self study: 9h

### 5. Stability of sampled data systems.

**Description:**
Study of the stability of sampled data systems.

**Specific objectives:**

**Learning time:** 10h
- Theory classes: 3h
- Laboratory classes: 1h
- Self study: 6h

### 6. Design of digital controllers.

**Specific objectives:**

**Learning time:** 30h
- Theory classes: 9h
- Laboratory classes: 3h
- Self study: 18h
### 7. State model of discrete systems.

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

**Description:**  
To obtain models of discrete time systems in the state space.

**Specific objectives:**  
State model of discrete systems. Discrete time state equation solution. Discretization of the state equation of continuous time systems.

### 8. State space control.

**Learning time:** 30h  
Theory classes: 9h  
Laboratory classes: 3h  
Self study: 18h

**Specific objectives:**  

---

### Qualification system

- Partial controls (2): 30%
- Last control: 40%
- Practices: 15%
- Exercises / problems: 15%
- Other tests / projects: 35%

Generic competition, self-directed learning, represents 15% of the global evaluation.
Bibliography

**Basic:**


**Complementary:**
