220073 - Mechanics of Robotic Manipulation

Coordinating unit: 220 - ETSEIAT - Terrassa School of Industrial and Aeronautical Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2015
Degree: BACHELOR’S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR’S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: English

Teaching staff
Coordinator: Munir Khamashta Shahin, Francisco Javier Freire Venegas

Teaching methodology
The course is divided into parts:
Theory classes
Practical classes
Self-study for doing exercises and activities.
In the theory classes, teachers will introduce the theoretical basis of the concepts, methods and results and illustrate them with examples appropriate to facilitate their understanding.
In the practical classes (in the classroom), teachers guide students in applying theoretical concepts to solve problems, always using critical reasoning. We propose that students solve exercises in and outside the classroom, to promote contact and use the basic tools needed to solve problems.
Students, independently, need to work on the materials provided by teachers and the outcomes of the sessions of exercises/problems, in order to fix and assimilate the concepts.
The teachers provide the syllabus and monitoring of activities (by ATENEA).

Learning objectives of the subject
This course provides an overview of robot mechanisms, kinematics and dynamics. Topics include spatial kinematics and multi-rigid-body dynamics. Students will design and simulate robotic systems in a group-based term project.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group: 30h</th>
<th>40.00%</th>
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</thead>
<tbody>
<tr>
<td>Self study:</td>
<td>45h</td>
<td>60.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
<th>Learning time</th>
<th>Theory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1: Spatial Descriptions and Transformations</td>
<td>content english</td>
<td>Learning time: 15h</td>
<td>Theory classes: 6h</td>
<td>Self study : 9h</td>
</tr>
<tr>
<td>Module 2: Kinematics. Inverse Kinematics</td>
<td>content english</td>
<td>Learning time: 20h</td>
<td>Theory classes: 8h</td>
<td>Self study : 12h</td>
</tr>
<tr>
<td>Module 3: Jacobians. Singularities. Static Forces</td>
<td>content english</td>
<td>Learning time: 20h</td>
<td>Theory classes: 8h</td>
<td>Self study : 12h</td>
</tr>
<tr>
<td>Module 4: Dynamics</td>
<td>content english</td>
<td>Learning time: 20h</td>
<td>Theory classes: 8h</td>
<td>Self study : 12h</td>
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## Qualification system

- Simulate a 6 d.o.f. Robot 30%
- Final exam 70%

A recuperation exam is planned at the end of the course.
Bibliography

Basic:


Others resources:

Hyperlink

Resource name
http://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/