Last update: 23-04-2019

# 220073 - Mechanics of Robotic Manipulation

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

Teaching unit: 712 - EM - Department of Mechanical Engineering

Academic year: 2019

Degree: BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)

ECTS credits: 3 Teaching languages: English

## Teaching staff

Coordinator: Francisco Javier Freire Venegas

## Teaching methodology

This course is self-study oriented. Every week will be proposed on ATENEA net:
a) a theoretical matter to self-study using easily reached multimedia documentation.
b) some questions to be answered before the practical classes.
c) some problems to be done at practical classes using MAPLE software at ESEIAAT premises.

At the end of the course a 6 d.o.f. robot model project, using MAPLE, will be delivered.

In the practical classes (in the classroom with PCs), teachers will guide the 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 simulate robotic systems in a group-based term project.

## Study load

| | | | |
|---|---|---|---|
| Total learning time: 75h | Hours large group: | 30h | 40.00% |
| | Self study: | 45h | 60.00% |

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## Content

### Module 1: Spatial Descriptions and Transformations

Learning time: 15h
Theory classes: 6h
Self study : 9h

Description:
Transformation matrices

### Module 2: Kinematics. Inverse Kinematics

Learning time: 20h
Theory classes: 8h
Self study : 12h

Description:
Robot Kinematics

### Module 3: Jacobians. Singularities. Static Forces

Learning time: 20h
Theory classes: 8h
Self study : 12h

Description:
Jacobian utility and computation.

### Module 4: Introduction to Robot Dynamic

Learning time: 20h
Theory classes: 8h
Self study : 12h

Description:
Introduction to Robot Dynamic

## Qualification system

theoretical questions 10%
practical work at practical classes 50% (every work will have the same weight)
robot model project 40%

Every student that will want to improve his grade may try it at the exam planned at the end of the course. The best note will be conserved.

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## Bibliography

Basic:

Craig, John J. Introduction to robotics: mechanics and control. 3rd ed. Upper Saddle Hall: Pearson Educacion Internacional, cop. 2005. ISBN 0131236296.

Others resources:

Hyperlink

Introduction to Robotics

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