Last update: 23-04-2019

220141 - Uav Guidance & Autonomous Control

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

Teaching unit: 707 - ESAII - Department of Automatic Control

Academic year: 2019

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)

ECTS credits: 3 Teaching languages: English

Teaching staff

Coordinator: Fatiha Nejjari

Others: Bernardo Morcego ; Vicenç Puig

Teaching methodology

The course is divided into the following parts:
Theory classes
Laboratory sessions

Learning objectives of the subject

This course covers the guidance and control principles that are common to many small unmanned aerial vehicles (UAVs). Building upon classical control systems and modelling theory, students will learn how to mathematically model UAV flight characteristics and sensors, develop and tune feedback control autopilot algorithms to enable stable flight control, and fuse sensor measurements using extended Kalman filter techniques to estimate the UAV position and orientation. Students will realize these concepts through both simulation and interaction with actual UAV hardware.

Study load

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

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Content

Module 1: UAV Modelling

Learning time: 14h
Theory classes: 6h
Self study : 8h

Description:
1.1 Autonomous UAV description
1.2 UAV dynamics
1.3 UAV non linear modeling
1.4 UAV simulation

Related activities:
A1, A2 and A3

Module 2: UAV Flight Control Loop

Learning time: 17h
Theory classes: 7h
Self study : 10h

Description:
2.1. Classical control design: PID controller...
2.2. Modern flight control design: LQR Controller, feedback linearization

Related activities:
A1, A2 and A3

Module 3: UAV Navigation system

Learning time: 22h
Theory classes: 8h
Self study : 14h

Description:
3.1. Navigation loop
3.2. Inertial navigation
3.3. Sensor fusion using Kalman filter

Related activities:
A1, A2 and A3

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Module 4: Guidance and flight control	Learning time: 22h Theory classes: 9h Self study : 13h

Description:
4.1. Overview of guidance techniques
4.2. Kinematic models for guidance
4.3. Way-point guidance
4.4. Path following for straight line and orbits5.

Related activities:
A1, A2 and A3

Planning of activities

A1. Theory lectures	Hours: 14h Self study: 2h Theory classes: 12h

A2. Laboratory project	Hours: 52h Theory classes: 16h Self study: 36h

3. Final exam	Hours: 9h Theory classes: 2h Self study: 7h

Qualification system

Final exam: 40%
Project assessment: 60%

Bibliography