

Semester S8	ENSEA	New !
	UAVs / Drones	
US Credits : 3	Lecture : 36h, Laboratory 28h	Language: English

Summary

This course is an introduction to the design, realization, instrumentation and remote control of drones. These techniques could be generalized to other autonomous mechatronics systems.

Prerequisites

- Classical mechanics: Newton's law, concepts of kinetic energy, angular momentum, inertia...
- Control systems: modeling of dynamic systems, control system analysis and design, PID design
- Microcontroller programming and interfacing: C language, ADC, timers, PWM generation, interrupts

Contents

- Notions of mechanics
- Aerodynamics
- Motorization
- Sensor specifications (accelerometer, gyroscope, magnetometer, GPS...)
- Sensor data fusion (Complementary or Kalman filter)
- Control (PID, multivariable)
- Microcontroller (STM32 family)

Laboratory project

- Testing a pre-built quadcopter drone
- Acquisition (I2C/SPI protocols) and processing of sensors data (accelerometer, gyroscope, magnetometer...)
- Generation of PMW control signals for motors
- Dynamic modeling and simulation with Matlab/Simulink
- Feedback and PID control

Textbook

Fundamentals of Inertial Navigation, Satellite-based Positioning and their Integration, A. Nouredin, T. Karamat, J. Georgy, **SPRINGER**

Similar to the following courses

- IIT Chicago
- University at Buffalo
- University of Pittsburgh
- University of Illinois at Urbana-Champaign
- Mississippi State University
- University of Michigan at AA
- Michigan Tech