

## 19393 - UAV - Unmanned Aerial Vehicles

Coordinating unit:	300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering		
Teaching unit:	701 - AC - Department of Computer Architecture		
Academic year:	2018		
Degree:	MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2015). (Teaching unit Optional)		
ECTS credits:	5	Teaching languages:	English

### Teaching staff

Coordinator: Defined in the course webpage at the EETAC website.

Others: Defined in the course webpage at the EETAC website.

### Opening hours

Timetable: Defined in the course webpage at the EETAC website.

### Prior skills

Operability with the basic concepts of operation of an aircraft  
Operability with the basic concepts behind the air traffic management systems  
Ability to perform application programs in Matlab / Octave or C # language or similar.

### Degree competences to which the subject contributes

#### Basic:

CB7. (ENG) CB7 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.

CB8. (ENG) CB8 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios.

#### Specific:

CE5 MAST. (ENG) CE5: Aplicar la ingeniería de sistemas en el entorno aeroespacial para el diseño y la gestión de los distintos aspectos tecnológicos asociados a una misión.

#### General:

CG1 MAST. (ENG) CG1: Identificar y conocer las principales actividades de I+D+i en el campo aeroespacial que se llevan a cabo actualmente a nivel internacional en el ámbito académico, la industria y las mayores agencias espaciales.

CG3 MAST. (ENG) CG3: Identificar y gestionar, de forma consistente, los diferentes tipos de vehículos aeroespaciales y los aspectos tecnológicos, de diseño e implementación de cargas útiles para misiones científicas.

#### Transversal:

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

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### Teaching methodology

The classes of the subject will be presential and expositive. Teaching material will be composed of PowerPoint presentations (which can be obtained from the first day) and links to pages of special relevance. The software will also be used such as RAISE and X-Plane -for the full simulation of UAV operations. Group work will be one of the essential characteristics of the subject since the students will have to develop a project designing at the basic level the phases of a UAS mission and doing their exposition at the end of the course.

In particular, the teaching methodologies applied during the course will be:

MD1: Master class

MD2: Participatory expositive class

MD5: Autonomous work

MD6: Cooperative work

### Learning objectives of the subject

- 1- Understand what is a UAV, its components, basic operation and potential benefits in science and commercial missions.
- 2- Learn about the operation of UAV within NASA, its global surveillance objectives and types of UAS platforms: the Ihnana, the Global Hawk and the Sierra.
- 3- Understand the complexity of the UAS integration problem in non-segregated airspace: separation provision and collision avoidance.
- 4- Development of complex UAS simulation infrastructures, the RAISE System Architecture.
- 5- Flight planning for UAS, autopilots and the main requirements for mission automation.
- 6- UAS contingency management.
- 7- UAS regulation worldwide.

### Study load

Total learning time: 125h	Hours large group:	45h	36.00%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	80h	64.00%

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### Content

<p>Introduction to UAS</p>	<p>Learning time: 4h Theory classes: 2h Self study : 2h</p>
<p>Description: Understand what is a UAV, its components, basic operation and potential benefits in science and commercial missions.</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> <li>- UAS history</li> <li>- Types of UAS vehicles</li> <li>- Components in a UAS</li> <li>- Examples of successful operations</li> </ul>	
<p>NASA UAS Operation History</p>	<p>Learning time: 6h Theory classes: 4h Self study : 2h</p>
<p>Description: Learn about the operation of UAV within NASA, its global surveillance objectives and types of UAS platforms: the Ikhana, the Global Hawk and the Sierra.</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> <li>- The NASA Earth surveillance strategy</li> <li>- The Ikhana vehicle and the wildfire monitoring missions</li> <li>- The Global Hawk vehicle and the hurricane monitoring missions</li> <li>- The Sierra vehicle and the ice monitoring missions</li> </ul>	
<p>UAS Integration in non-segregated airspace</p>	<p>Learning time: 9h Theory classes: 6h Self study : 3h</p>
<p>Description: Understand the complexity of the UAS integration problem in non-segregated airspace: separation provision and collision avoidance.</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> <li>- The airspace structure and the automated operation of UAS</li> <li>- The separation provision and the ATC controller / UAS interaction</li> <li>- Collision avoidance implemented by TCAS-II and its automation in UAS</li> </ul>	

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<p>The RAISE simulation system</p>	<p>Learning time: 6h Theory classes: 6h</p>
<p>Description: Development of complex UAS simulation infrastructures, the RAISE System Architecture.</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> <li>- System overview and X-plane interaction</li> <li>- Design of flight trajectories</li> <li>- Real-time UAS simulation interface</li> <li>- Data-logging interfaces</li> </ul>	
<p>UAS Flight Plan Design</p>	<p>Learning time: 9h Theory classes: 6h Self study : 3h</p>
<p>Description: Flight planning for UAS, autopilots and the main requirements for mission automation.</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> <li>- Flight plan components and interaction with the airspace</li> <li>- Impact of performance on flight plans</li> <li>- UAS autopilots and its level of automation</li> </ul>	
<p>UAS contingency management.</p>	<p>Learning time: 6h Theory classes: 4h Self study : 2h</p>
<p>Description: Elements that define the implementation of flight plans to support UAS contingencies.</p> <p>Specific objectives:</p> <ul style="list-style-type: none"> <li>- Engine contingencies</li> <li>- Lost-link contingencies</li> <li>- UAS - ATM interaction during the contingency management</li> <li>- Automation of the UAS contingency</li> </ul>	

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UAS regulation worldwide.	Learning time: 5h Theory classes: 3h Self study : 2h
<p>Description: Analysis of the UAS regulation and its current developments.</p> <p>Specific objectives:</p> <ul style="list-style-type: none"><li>- The impact of ICAO on UAS regulations.</li><li>- The evolution of regulations in the EU and USA environments.</li><li>- Open aspects of the UAS regulatory scenario.</li></ul>	

### Qualification system

Defined in the course webpage at the EETAC website.

### Bibliography

Others resources:

Defined in the course webpage at the EETAC website.