uc3m | Universidad **Carlos III** de Madrid
Vicerrectorado de Estudios
Apoyo a la docencia y gestión del grado

COURSE: Technologies for Autonomous and Unmanned Systems		
DEGREE: Bachelor in Mobile and Space Communications Engineering	YEAR: 4	TERM: 2

WEEKLY PLANNING							
WEEK	**SESSION**	**DESCRIPTION**	**TEACHING (mark X)**		**SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room)**	**WEEKLY PROGRAMMING FOR STUDENT**		
			LECTURES	SEMINARS		DESCRIPTION	CLASS HOURS (1,66=50+50 min)	HOMEWORK HOURS (Max. Estim. 3,25h)
1	1	Unit 1. Introduction to Remotely Piloted Aircraft System (RPAS) and Unmmaned Air Systems (UAS) - History - Applications: missions - Systems: integration Normative: operation. Safety of Flight. Human Factors. - Socio-economic impact - Types and classification of UAS - Introduction to UAS Design and Construction				* Read the Documentation corresponding to Session 1	1,66	2
2	2	Unit 2. Basic Technologies - Airframe - Propulsion and Power * Battery Management Systems (BMS), Power Systems, Fuel Cells and Propellers. Solar Power Solutions.				* Review the concepts presented in Session 1. * Read the Documentation corresponding to Session 2	1,66	2
3	3	Unit 3. Basic Technologies - Guidance and Control * Autopilots - Actuations				* Review the concepts presented in Session 2. * Read the Documentation corresponding to Session 2.	1,66	2

4	4	Unit 4. Communication
		  * Command and Control
		  * Data links
		  * Ultra reliable low latency communications. Massive M2M Communications. IoT, 5G.
		  * Medium Access Control. Networking. Security
						* Review the concepts presented in Session 3.
						* Read the Documentation corresponding to Session 4.
							1,66	2

5	5	Lab. Session 1. Mission - Mission Planning and Configuration: Mission Planner + eCalc				* Prepare and complete Lab. Exercise 1	1,66	3,25
6	6	Lab. Session 2. Architecture and Components				* Prepare and complete Lab. Exercise 2	1,66	3,25
7	7	Lab. Session 3. Communications and Controller				* Prepare and complete Lab. Exercise 3	1,66	3,25

8	8	Unit 5. Payload
		Sensing
		  * Cameras, Imaging & Vision Systems
		  * Optic (Visible, IR). Range (RADAR, LiDAR, SONAR). Magnetic (MAD)
		Processing
		  * Data Storage
		  * Data Fusion. Information Extraction. Perception.
		  * Detection, classification, tracking. Decision Making. Learning.
		  * Edge and Fog Computing.
						* Review the concepts presented in Session 4.
						* Read the Documentation corresponding to Session 8.
							1,66	3,25

9	9	Unit 6. Design and Manufacturing * Materials * Automatic Design Software * 3D Printing				* Review the concepts presented in Session 8. * Read the Documentation corresponding to Session 9. * Prepare Lab. Exercise 4	1,66	3,25
10	10	Lab. Session 4. Payload 3D Printing				* Complete Lab. Exercise 4	1,66	3,25
11	11	Unit 7. RPAS/UAS Operation - Regulations - Human Factors. Safety - Localization, identification and Navigation systems. - Services, Agriculture and Industry: Aerial photography, filming and mapping, precision agriculture, asset and infrastructure inspection - Operational procedures (Flight and Mission planning, Emergency procedures, radio spectrum) * Mission control and management software				* Review the concepts presented in Sessions 1-10 * Read the Documentation corresponding to Session 11.	1,66	3,25
12	12	Lab. Session 5. Airborne Software Design				* Complete Lab. Exercise 5	1,66	3,25
13	13	Unit 8. Design Methodology: Systems Engineering - V&V: CONOPS, Requirements, Tests				* Review the concepts presented in Sessions 1-12. * Read the Documentation corresponding to Session 13. * Prepare Lab. Exercise 6	1,66	3,25
14	14	Lab. Session 6. Flight Tests				* Complete Lab. Exercise 5	1,66	3,25
	15	Additional session					1,66	3,25
						Subtotal 1	**25**	**44**
						Total 1 *(Hours of class plus student homework)*		**69**

| 15 | | Tutorials, handing in, etc | | | | | 1,8 | - |
| 16 | | | | | | | | |

			TEACHING (mark X)		SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room)	WEEKLY PROGRAMMING FOR STUDENT

<table>
<tr><td colspan="9" align="center">WEEKLY PLANNING</td></tr>
<tr><td rowspan="2">W E E K</td><td rowspan="2">S E S S I O N</td><td rowspan="2">DESCRIPTION</td><td colspan="2">TEACHING (mark X)</td><td rowspan="2">SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room)</td><td colspan="3">WEEKLY PROGRAMMING FOR STUDENT</td></tr>
<tr><td>L E C T U R E S</td><td>S E M I N A R S</td><td>DESCRIPTION</td><td>CLASS HOURS (1,66=50+50 min)</td><td>HOMEWORK HOURS (Max. Estim. 3,25h)</td></tr>
<tr><td>17</td><td rowspan="2"></td><td rowspan="2">Assessment</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">4</td><td rowspan="2">4</td></tr>
<tr><td>18</td></tr>
<tr><td colspan="6" align="right">Subtotal 2</td><td></td><td>6</td><td>4</td></tr>
<tr><td colspan="6" align="right">Total 2<i>(Hours of class plus student homework)</i></td><td colspan="3" align="center">10</td></tr>
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TOTAL *(Maximun 83 horas)*	**78**