

## 300277 - MV - Flight Mechanics

Coordinating unit:	300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit:	748 - FIS - Department of Physics
Academic year:	2018
Degree:	BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING (Syllabus 2015). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERINGS/BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING - NETWORK ENGINEERING (AGRUPACIÓ DE SIMULTANEÏTAT) (Syllabus 2015). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING/BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2015). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING/BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2015). (Teaching unit Compulsory)
ECTS credits:	3
Teaching languages:	Spanish, English

### Teaching staff

Coordinator:	Arias Calderón, Santiago
Others:	Definit a la infoweb de l'assignatura

### Opening hours

Timetable:	Defined in the Infoweb of the corresponding teacher
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### Prior skills

- FONAMENTS DE FÍSICA
- CÀLCUL
- TECNOLOGIA AEROESPACIAL I TRANSPORT AERI
- MECÀNICA
- AMPLIACIÓ DE MATEMÀTIQUES
- AMPLIACIÓ DE MATEMÀTIQUES 2

### Degree competences to which the subject contributes

#### Specific:

1. CE 10 AERO. Comprender como las fuerzas aerodinámicas determinan la dinámica del vuelo y el papel de las distintas variables involucradas en el fenómeno del vuelo. (CIN/308/2009, BOE 18.2.2009)
2. CE 19 AERO. Conocimiento aplicado de: la ciencia y tecnología de los materiales; mecánica y termodinámica; mecánica de fluidos; aerodinámica y mecánica del vuelo; sistemas de navegación y circulación aérea; tecnología aeroespacial; teoría de estructuras; transporte aéreo; economía y producción; proyectos; impacto ambiental. (CIN/308/2009, BOE 18.2.2009)
3. CE 24 AERON. Conocimiento adecuado y aplicado a la Ingeniería de: Los métodos de cálculo y de desarrollo de la navegación aérea; el cálculo de los sistemas específicos de la aeronavegación y sus infraestructuras; las actuaciones, maniobras y control de las aeronaves; la normativa aplicable; el funcionamiento y la gestión del transporte aéreo; los sistemas de navegación y circulación aérea; los sistemas de comunicación y vigilancia aérea. (CIN/308/2009, BOE 18.2.2009)
4. CE 25 AERON. Conocimiento aplicado de: Transmisores y receptores; Líneas de transmisión y sistemas radiantes de señales para la navegación aérea; Sistemas de navegación; Instalaciones eléctricas en el sector tierra y sector aire; Mecánica del Vuelo; Cartografía; Cosmografía; Meteorología; Distribución, gestión y economía del transporte aéreo.

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(CIN/308/2009, BOE 18.2.2009)

Transversal:

5. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
6. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
7. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
8. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
9. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

### Teaching methodology

- Theory classes in which the theory is explained and detailed
- Theoretical explanations combined with brief exercises and real practical cases
- Guided activities in reduced groups
- Guided readings and resolution of individual exercises in an autonomous way
- Tutorials classes

### Learning objectives of the subject

Identify and define:

- the interaction between aerodynamics and flight mechanics
- the reference frames to be used in the study of flight mechanics
- the general equations of the movement of an airplane, considered as a rigid solid
- the characteristics that determine a given flight mission
- the performances of a glider
- the influence of the wind on an aircraft's performances
- the performances of aircraft with turbojets
- the take-off and landing performances
- the control and stability performances of an aircraft

### Study load

Total learning time: 75h	Hours large group:	24h	32.00%
	Guided activities:	9h	12.00%
	Self study:	42h	56.00%

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### Content

<p>Introduction to flight mechanics</p>	<p>Learning time: 20h 30m Theory classes: 6h 30m Guided activities: 2h Self study : 12h</p>
<p>Description:</p> <ul style="list-style-type: none"> <li>- Performances of an aircraft</li> <li>- Basic reference frames</li> <li>- General equations</li> <li>- Special cases</li> </ul> <p>Related activities:</p> <ul style="list-style-type: none"> <li>- Midterm exam</li> <li>- Final exam</li> <li>- Guided activities</li> </ul>	
<p>Glider' s performances</p>	<p>Learning time: 15h 30m Theory classes: 5h 30m Guided activities: 1h Self study : 9h</p>
<p>Description:</p> <ul style="list-style-type: none"> <li>- General equations of a glider's flight</li> <li>- Flight characteristics</li> <li>- Range and endurance</li> <li>- Effect of an uniform wind of the trajectory</li> </ul> <p>Related activities:</p> <ul style="list-style-type: none"> <li>- Midterm exam</li> <li>- Final exam</li> <li>- Guided activities</li> </ul>	
<p>Performances of aircraft with turbojets</p>	<p>Learning time: 6h 30m Theory classes: 2h 30m Self study : 4h</p>
<p>Description:</p> <p>Performances of aircraft with turbojets</p> <p>Related activities:</p> <ul style="list-style-type: none"> <li>- Midterm exam</li> <li>- Final exam</li> <li>- Guided activities</li> </ul>	

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Take-off and landing performances	Learning time: 7h 30m Theory classes: 2h 30m Guided activities: 1h Self study : 4h
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Description: <ul style="list-style-type: none"> <li>- Take-off performances</li> <li>- Landing performances</li> </ul> Related activities: <ul style="list-style-type: none"> <li>- Midterm exam</li> <li>- Final exam</li> <li>- Guided activities</li> </ul>	
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Stability and control of an aircraft	Learning time: 22h Theory classes: 7h Guided activities: 2h Self study : 13h
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Description: <ul style="list-style-type: none"> <li>- Introduction to stability and control</li> <li>- Longitudinal static stability and control</li> <li>- Lateral-directional static stability and control</li> <li>- Dynamic stability and control</li> </ul> Related activities: <ul style="list-style-type: none"> <li>- Midterm exam</li> <li>- Final exam</li> <li>- Guided activities</li> </ul>	
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### Planning of activities

Midterm exam	Hours: 2h Theory classes: 2h
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Final exam	Hours: 2h Theory classes: 2h
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### Qualification system

Evaluation criteria defined in the Infoweb of the subject

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### Regulations for carrying out activities

Have the appropriate documentation previously indicated by the teaching staff

### Bibliography

#### Basic:

Gómez Tierno, Miguel Ángel; Pérez Cortés, Manuel; Puentes Márquez, César. Mecánica del vuelo. 2a ed. Madrid: Ibergaceta, 2012. ISBN 9788415452010.

Anderson, John David. Introduction to flight. 6th ed. Boston [etc.]: McGraw-Hill, 2008. ISBN 9780073529394.

#### Complementary:

Isidoro Carmona, Anibal. Aerodinámica y actuaciones del avión. 12ª ed. Madrid: International Thomson Paraninfo, 2004. ISBN 8428328889.

Anderson, John David. Fundamentals of aerodynamics. 3rd ed. Boston [etc.]: McGraw-Hill, 2001. ISBN 0072373350.

Monserrat Martínez-Merello, Jose Joaquín. Análisis y evaluación del vuelo de las aeronaves. Madrid: Ibergaceta, 2017. ISBN 9788416228652.

#### Others resources:

- Presentations in ppt. format
- Collection of exercises
- Multimedia material extracted from the Internet