300247 - SEA - Sustainability of Aerospace Engineering

Coordinating unit: 300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2017
Degree: BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING/BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING - NETWORK ENGINEERING (AGRUPACIÓ DE SIMULTANÈITAT) (Syllabus 2015). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING (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: English

Teaching staff
Coordinator: Definit a la infoweb de l'assignatura.
Others: Definit a la infoweb de l'assignatura.

Degree competences to which the subject contributes

Specific:
CE 17 AERO. CE 22 AERON. Conocimiento adecuado y aplicado a la Ingeniería de: Los fundamentos de sostenibilidad, mantenibilidad y operatividad de los sistemas de navegación aérea. (CIN/308/2009, BOE 18.2.2009)

General:
CG7. (ENG) CG7 - Capacidad de analizar y valorar el impacto social y medioambiental de las soluciones técnicas.

Transversal:
03 TLG. 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.
02 SCS N1. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world¿s situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.
02 SCS N2. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.
05 TEQ N1. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

Teaching methodology
The course combines the following teaching (learning) methodologies:
- Autonomous learning, because students will work many self-learning materials at home.
- Cooperative learning, because students will solve many tasks in small groups.
We will make an experiment on "flipped classroom" methodology but it will depend on the group sizes

Learning objectives of the subject
Knowing the concept and conditions of unsustainability, and knowing how to apply techniques and procedures to approach sustainability
Knowing data about the current state of the world from the economic, environmental and social points of view. Having a historical idea about how we have arrived to the present situation.

Awareness of complexity and the need for the systemic approach.

Awareness of the engineering responsibility and especially of the aerospace engineering responsibility.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 75h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group:</td>
<td>31h 30m</td>
</tr>
<tr>
<td>Hours medium group:</td>
<td>0h</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>0h</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>1h 30m</td>
</tr>
<tr>
<td>Self study:</td>
<td>42h</td>
</tr>
</tbody>
</table>
## Content

| Chapter 1 - State of the World and Causes of Unsustainability | Learning time: 10h 14m  
| Theory classes: 4h 30m  
| Self study: 5h 44m |

**Description:**
1. Some ecological data
2. Some economic data
3. Some social data
4. Historical causes of unsustainability
5. Technology as a problem
6. Science, technology and politics as a solution

**Related activities:**
Theoretical and more practical questionnaires

**Specific objectives:**
Knowing data about the current state of the world from the economic, environmental and social points of view. Having a historical idea about how we have arrived to the present situation

| Chapter 2 - Sustainable Development | Learning time: 10h 12m  
| Theory classes: 4h 30m  
| Self study: 5h 42m |

**Description:**
1. Some basic concepts
2. History of the idea
3. Some counterexamples
4. Indicators and indexes

**Related activities:**
Theoretical questionnaires

**Specific objectives:**
Knowing the concept, evolution and conditions of unsustainability and also the tools to try measuring our distance from the ideal
<table>
<thead>
<tr>
<th>CHAPTER 3 - SYSTEMICS AND COMPLEXITY</th>
<th>Learning time: 11h 22m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 4h 30m</td>
</tr>
<tr>
<td>1 Reductionism, systemic approach and complex systems</td>
<td>Guided activities: 0h 30m</td>
</tr>
<tr>
<td>2 Linear and nonlinear behavior</td>
<td>Self study: 6h 22m</td>
</tr>
<tr>
<td>3 Deterministic chaos</td>
<td><strong>Related activities:</strong></td>
</tr>
<tr>
<td>4 Chaotic life</td>
<td>Theoretical and practical questionnaires</td>
</tr>
<tr>
<td>5 Networks</td>
<td><strong>Specific objectives:</strong></td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Awareness of complexity and the need for the systemic approach</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 4 - GLOBALIZACION</th>
<th>Learning time: 10h 14m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 4h 30m</td>
</tr>
<tr>
<td>1 Concept and reality</td>
<td>Self study: 5h 44m</td>
</tr>
<tr>
<td>2 Who is who in globalization?</td>
<td><strong>Related activities:</strong></td>
</tr>
<tr>
<td>3 Human rights</td>
<td>Theoretical questionnaires</td>
</tr>
<tr>
<td>4 The welfare state</td>
<td><strong>Specific objectives:</strong></td>
</tr>
<tr>
<td>5 Globalization of safety and justice</td>
<td>Knowing the current globalization process and its main agents</td>
</tr>
<tr>
<td>6 Globalization of health and education</td>
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</tbody>
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### CHAPTER 5 - HUMAN VALUES

**Description:**

0. Does engineering need human values?
1. Science and engineering
2. Reasons not to harm the others
3. Game of Cooperation and Desertion
4. Human values in engineering

**Related activities:**
Theoretical and practical questionnaires

**Specific objectives:**
Awareness of the need for human values and their analysis from the engineering point of view

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<tbody>
<tr>
<td>Theory classes: 4h 30m</td>
</tr>
<tr>
<td>Guided activities: 0h 30m</td>
</tr>
<tr>
<td>Self study: 6h 22m</td>
</tr>
</tbody>
</table>

### CHAPTER 6 - TOOLS FOR SUSTAINABILITY

**Description:**

1. Approach: Life Cycle Analysis
   1.1 to 1.5 different stages
2. Environmental norms and directives
   2.1 Environmental Impact Assessment
3. Corporate social responsibility and sustainability norms
   3.1 Global Reporting Initiative
   3.1 ISO 26000
4. Technological tools for sustainability

**Related activities:**
Theoretical and more practical questionnaires

**Specific objectives:**
Knowing how to apply techniques and procedures to approach sustainability

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<td>Theory classes: 4h 30m</td>
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<tr>
<td>Self study: 5h 44m</td>
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CHAPTER 7 - IMPACT OF AEROSPACE ENGINEERING

Description:
1 Economic impact of aerospace engineering
2 Environmental impact of aerospace engineering
3 Social impact of aerospace engineering
4 Specific administrative tools
5 Involved organizations
6 Developing technologies

Related activities:
Theoretical and more practical questionnaires

Specific objectives:
Awareness of the engineering responsibility and especially of the aerospace engineering responsibility

Learning time: 11h 22m
Theory classes: 4h 30m
Guided activities: 0h 30m
Self study: 6h 22m

Qualification system
Defined at the course infoweb.

Bibliography

Basic:


Complementary: