300318 - SD - Discrete Simulation

Coordinating unit: 300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: 743 - MA IV - Department of Applied Mathematics IV
Academic year: 2013
Degree: BACHELOR'S DEGREE IN AIR NAVIGATION ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN AIRPORT ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 6

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

Prior skills
Students should know the mathematical concepts of random variables, confidence intervals, queues and graphs previously worked at the courses of Algebra, Probability and Statistics and Airport and Space Management and Operational Research.
Also, students should master the basic aspects of programming seen at the courses of Informatics I and II and Airport and Space Management and Operational Research.

Degree competences to which the subject contributes

Specific:
1. CE 1 AERO. Capacidad para la resolución de los problemas matemáticos que puedan plantearse en la ingeniería. Aptitud para aplicar los conocimientos sobre: álgebra lineal; geometría; geometría diferencial; cálculo diferencial e integral; ecuaciones diferenciales y en derivadas parciales; métodos numéricos; algorítmica numérica; estadística y optimización. (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 23 AEROP. Conocimiento aplicado de: edificación; electricidad; electrotécnia; electrónica; mecánica del vuelo; hidráulica; instalaciones aeroportuarias; ciencia y tecnología de los materiales; teoría de estructuras; mantenimiento y explotación de aeropuertos; transporte aéreo, cartografía, topografía, geotecnia y meteorología. (CIN/308/2009, BOE 18.2.2009)
4. CE 14 AERO. Comprender el sistema de transporte aéreo y la coordinación con otros modos de transporte. (CIN/308/2009, BOE 18.2.2009)
5. CE 13 AERO. Comprender la singularidad de las infraestructuras, edificaciones y funcionamiento de los aeropuertos. (CIN/308/2009, BOE 18.2.2009)

Transversal:
6. 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.
7. 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.
8. 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.
9. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
10. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an
After having taken this course, the student should be able, for basic problems applied to aeronautics engineering, to sketch the mathematical model, to determine the mathematical model of the operational research necessary for solving/optimizing it, and to use the computer in order to solve or to simulate the corresponding problems.

### Teaching methodology

This course combines the following teaching methodologies:
- Master classes that combine the board and detailed notes previously distributed to the students using ATENEA
- Autonomous learning, given that the student will work autolearning materials at home
- We will encourage students to present to the other students some problems and deliveries already solved at home

### Learning objectives of the subject

After having taken this course, the student should be able, for basic problems applied to aeronautics engineering, to sketch the mathematical model, to determine the mathematical model of the operational research necessary for solving/optimizing it, and to use the computer in order to solve or to simulate the corresponding problems.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 26h</th>
<th>17.33%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 16h</td>
<td>10.67%</td>
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<tr>
<td></td>
<td>Guided activities: 24h</td>
<td>16.00%</td>
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<tr>
<td></td>
<td>Self study: 84h</td>
<td>56.00%</td>
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</table>
## Content

<table>
<thead>
<tr>
<th>ENG) Cadenes de Markov</th>
<th>Learning time: 30h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h 30m</td>
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<tr>
<td></td>
<td>Guided activities: 5h</td>
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<td></td>
<td>Self study : 17h</td>
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<thead>
<tr>
<th>ENG) Tests d'hipòtesis</th>
<th>Learning time: 19h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
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<tr>
<td></td>
<td>Practical classes: 2h 30m</td>
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<tr>
<td></td>
<td>Guided activities: 3h</td>
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<td>Self study : 11h</td>
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<thead>
<tr>
<th>ENG) Ampliació de Teoria de Cues</th>
<th>Learning time: 53h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Practical classes: 5h</td>
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<td></td>
<td>Guided activities: 8h 30m</td>
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<td>Self study : 30h</td>
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<tr>
<th>ENG) Xarxes de Petri</th>
<th>Learning time: 46h 30m</th>
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<tr>
<td></td>
<td>Theory classes: 8h</td>
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<td></td>
<td>Practical classes: 5h</td>
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<td></td>
<td>Guided activities: 7h 30m</td>
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<td></td>
<td>Self study : 26h</td>
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### Planning of activities

#### (ENG) MIDTERM EXAM

**Description:**
Midterm exam about Markov Chains, Statistical Tests and Queueing Theory

**Descriptions of the assignments due and their relation to the assessment:**
Weight: 25% of the final mark

**Specific objectives:**
Test the acquired knowledge

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#### (ENG) FINAL EXAMEN

**Description:**
Final Exam about Queueing Theory (about the material given at class after the midterm exam) and Petri Nets

**Descriptions of the assignments due and their relation to the assessment:**
Weight: 20% of the final mark

**Specific objectives:**
Test the acquired knowledge

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#### (ENG) FIRST TEST

**Description:**
Test about Markov Chains, Statistical Tests and Exponential Queues

**Descriptions of the assignments due and their relation to the assessment:**
Weight: 15% of the final mark

**Specific objectives:**
Test the knowledge acquired in the 4 first weeks of class

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#### (ENG) SECOND TEST

**Description:**
Control about Petri Nets

**Descriptions of the assignments due and their relation to the assessment:**
Weight: 10% of the final mark

**Specific objectives:**
Test the knowledge acquired in the first 3 weeks of Petri Nets

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#### (ENG) LAB DELIVERIES

**Description:**
Different deliveries of lab sessions on Markov Chains, Data Statistical Analysis and Simulation of different Models of Queues.
**Descriptions of the assignments due and their relation to the assessment:**
Weight: 10% of the final mark

**Specific objectives:**
Solve Markov Chains using MATLAB, make hypothesis on collected data using MINITAB and simulate different models of Queues using MATLAB

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**Description:**
Different deliveries of solved problems of Petri Nets

**Descriptions of the assignments due and their relation to the assessment:**
Weight: 10% of the final mark

**Specific objectives:**
Test if the student knows how to apply the theory of Petri Nets

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**Qualification system**

Public on the NetArea

**Bibliography**

**Basic:**


**Complementary:**