Last update: 13-02-2014

300318 - SD-OA - 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; electrotecnia; 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

300318 - SD-OA - Discrete Simulation

academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

Teaching methodology

This course combines the following teaching metologies:
- 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

Total learning time: 150h	Hours large group:	26h	17.33%
	Hours medium group:	16h	10.67%
	Guided activities:	24h	16.00%
	Self study:	84h	56.00%

Last update: 13-02-2014

300318 - SD-OA - Discrete Simulation

Content

(ENG) Cadenes de Markov	Learning time: 30h 30m Theory classes: 5h Practical classes: 3h 30m Guided activities: 5h Self study : 17h
(ENG) Tests d'hipòtesis	Learning time: 19h 30m Theory classes: 3h Practical classes: 2h 30m Guided activities: 3h Self study : 11h
(ENG) Ampliació de Teoria de Cues	Learning time: 53h 30m Theory classes: 10h Practical classes: 5h Guided activities: 8h 30m Self study : 30h
(ENG) Xarxes de Petri	Learning time: 46h 30m Theory classes: 8h Practical classes: 5h Guided activities: 7h 30m Self study : 26h

Last update: 13-02-2014

300318 - SD-OA - Discrete Simulation

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

(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

(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

(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

(ENG) LAB DELIVERIES

Description:
Different deliveries of lab sessions on Markov Chains, Data Statistical Analysis and Simulation of different Models of Queues.

300318 - SD-OA - Discrete Simulation

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

(ENG) DELIVERIES

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

Qualification system

Public on the NetArea

Bibliography

Basic:

Bause, F.; Kritzinger, P.S. Stochastic Petri Nets: an introduction to the theory. Heidelberg: Ed. Springer Verlag, 2002. ISBN 9783528155353.

Jorba i Monte, Angel; Masdemont Soler, Josep. Introducció a la simulació [on line]. Barcelona: Ed. UPC, 1995Available on: <http://bibliotecnica.upc.es/EdUPC/locate4.asp?codi=FI006XXX>. ISBN 8476535724.

Jorba i Monte, A.;Masdemont Soler, Josep. Introducció a la simulació [Recurs electrònic] [on line]. Barcelona: Ed. UPC, 1995Available on: <http://bibliotecnica.upc.es/EdUPC/locate4.asp?codi=FI006XXX>. ISBN 8476535724.

Complementary:

Banks, Jerry. Discrete-event system simulation. 4th ed. Upper Saddle River: Ed. Prentice Hall, 2005. ISBN 0131446797.