220600 - Optimization and Simulation

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2018
Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012).
(Teaching unit Compulsory)
ECTS credits: 5
Teaching languages: Catalan

Teaching staff
Coordinator: JAUME FIGUERAS JOVE
Others: JORDI ZARAGOZA BERTOMEU - ANTONI ARIAS PUJOL - ANTONI GUASCH PETIT

Degree competences to which the subject contributes

Specific:
1. Learn the concepts involved in decision taking quantitative and experimental methods.
4. Research, design, development and implementation of simulation methods for electronics, control and robotics systems.
5. Improve technical communication of results.

Transversal:
6. ENTREPRENEURSHIP AND INNOVATION: Knowing about and understanding how businesses are run and the sciences that govern their activity. Having the ability to understand labor laws and how planning, industrial and marketing strategies, quality and profits relate to each other.
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. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

Teaching methodology
In the theory sessions, the teacher will introduce the theoretical basis of the concepts motivating all its content and linking up with the themes of the earlier and later subjects. The development of the different concepts and their should be made clearly and concisely all illustrated with examples to facilitate understanding. Students will work and adapt examples of theory in order to cope with applications of simulation performed in the laboratory.

In the laboratory, must ensure that students review the concepts covered in the theory sessions. In depth analysis and critical thinking to problems and consistent results will be assured. Also demonstrative sessions with real applications will be carried on.

Learning objectives of the subject
The course is divided into two parts.
In the first part we will study the discrete event oriented systems. At the end of the course students should have learnt to model, simulate and optimize such systems that are fundamental to the analysis and improvement of processes, logistics and transport.

These processes are modeled using Petri Nets, the use of statistical analysis tools and models for implementing a discrete event simulator. The student will use an industrial simulator for analysis and optimum decision making on resources of the systems studied.

In the second part, the student to pass the course, must know how to analyze, design and simulate control for applications where the actuators are electric machines.

It aims to give special emphasis to the conversion efficiency and therefore optimum mechanical energy to electricity (generators) and electrical mechanics (engines), pointing to the cutting-edge applications such as renewable energy (wind power) and electric vehicles (motors).

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group:</th>
<th>31h</th>
<th>24.80%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>14h</td>
<td>11.20%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>80h</td>
<td>64.00%</td>
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</tbody>
</table>
### Content

<table>
<thead>
<tr>
<th>(ENG) Modelat de sistemes orientats a esdeveniments discrets</th>
<th>Learning time: 21h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
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<tr>
<td></td>
<td>Laboratory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study : 12h</td>
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</tbody>
</table>

**Description:**
Descripció de la part de Teoria

Els continguts d'aquest mòdul pretenen formar a l'estudiant en la metodologia de modelat de sistemes d'esdeveniments discrets amb l'objectiu de disposar d'una eina de representació independent del paquet de simulació per ordinador amb la que es pugui treballar, facilitant el diàleg entre les diferents parts que integren un estudi de simulació. Es mostraran els conceptes:

- Formalització de models conceptuals
- Xarxes de Petri
- Xarxes de Petri Acolorides

Descripció de la part de Laboratori

- Model de Simulació d'un sistema Job-Shop

<table>
<thead>
<tr>
<th>(ENG) Models estadístics en simulació</th>
<th>Learning time: 14h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
<td></td>
<td>Self study : 8h</td>
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<table>
<thead>
<tr>
<th>(ENG) Disseny d'experiments i anàlisi de resultats</th>
<th>Learning time: 27h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 5h 30m</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study : 20h</td>
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</table>

<table>
<thead>
<tr>
<th>(ENG) EINES PEL MODELAT I SIMULACIÓ DE MÀQUINES ELÈCTRIQUES</th>
<th>Learning time: 12h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study : 8h</td>
</tr>
</tbody>
</table>
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**Qualification system**

By performing two exams and lab sessions.
Exam of Part 1 (Activity 2): 33%
Laboratory ED (Activity 3): 17%
Exam of Part 2 (Activity 4): 33%
Laboratory SOCE (Activity 5): 17%

The unsatisfactory results of the 1st Partial can be redone through a written test to be done on the day set for the final exam. This test can be accessed by all enrolled students. The mark obtained by the application of the conversion will replace the initial qualification as long as it is superior.

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.
If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

**Regulations for carrying out activities**

No unusual normative in exams

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**Table: APLICACIONES DE CONTROL AMB MÀQUINES ELÈCTRIQUES**

- **Learning time:** 30h
- Theory classes: 8h
- Laboratory classes: 2h
- Self study: 20h

**Table: ENERGIA EÓLICA**

- **Learning time:** 20h 30m
- Theory classes: 5h 30m
- Laboratory classes: 3h
- Self study: 12h
Bibliography

Basic:


Complementary:


