320045 - PSSP - Planning, Simulation and Supervision of Industrial Processes

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2016
Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6 Teaching languages: English

Teaching staff
Coordinator: Albert Masip-Alvarez
Others: Albert Masip-Alvarez, Jordi Damunt Masip

Opening hours
Timetable: The office hours will be published in the Digital Campus at the beginning of the course

Prior skills
Basic programming. Control and Industrial Automation

Degree competences to which the subject contributes

Specific:
CE25. ELO: skills for The modelling and simulation of systems.
CE28. ELO: Applied knowledge of industrial computing and communications.
CE1. (ENG) Capacitat per a la resolució dels problemes matemàtics que puguin platenjar-se a l'enginyeria. Aptitud per aplicar els coneixements sobre: àlgebra lineal; geometria, geometria diferencial; càlcul diferencial i integral; equacions diferenciales i amb derivades parcials; mètodes numèrics; algorítmica numèrica; estadística i optimització.

Transversal:
04 COE N3. 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.
07 AAT N3. 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.
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Teaching methodology

- On-site lectures for the explanation of the contents. The lecturer introduces the theoretical basis of the subject during on-site lectures. Basic concepts, methodology and results are developed during the sessions, being illustrated by means of examples in order to make them more understandable.
- On-site sessions for practice. The students will aboard the tasks in the laboratory by means of a computer.
- Autonomous work and exercises solving. The students, autonomously, shall assimilate the main concepts and resolve the stated exercises.
- Preparation and implementation of evaluable group activities. Student groups will make two oral presentations on its resolution of certain exercises in order to contribute to the assessment of the oral part of generic competence Third Language (English). The assessment of these presentations will be carried out by means of peer-to-peer techniques under lecturer's supervision.

Learning objectives of the subject

Understanding and mastery on basic skills, principles and applications of systems planning, simulation and process monitoring and supervision. The ability for the analysis, synthesis and troubleshooting of planning, simulation and process monitoring and supervision. The ability for the selection of the elements involved in the process of planning, simulation and monitoring. Design and programming of planners, supervisors and process simulators. The ability to integrate planning systems, simulation and monitoring within the industrial production environments.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>30h</th>
<th>20.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>30h</td>
<td>20.00%</td>
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<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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### Content

<table>
<thead>
<tr>
<th>Process description. Petri Nets</th>
<th>Learning time: 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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<tr>
<td></td>
<td>Laboratory classes: 4h</td>
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**Description:**
Petri Nets, Dependencies, Conditions, Parallel Tasks, States and Transitions.

**Related activities:**
Classic Problem of the "Dining Philosophers"

<table>
<thead>
<tr>
<th>Modelling and Simulation. Discrete events models.</th>
<th>Learning time: 8h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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<td></td>
<td>Laboratory classes: 4h</td>
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</table>

**Description:**

**Related activities:**
Build discrete events models.

<table>
<thead>
<tr>
<th>Discrete Optimisation</th>
<th>Learning time: 14h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 7h</td>
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**Description:**

**Related activities:**
Workplace Assignment; Tasks Assignment; Automatic Solving of SUDOKUS.

<table>
<thead>
<tr>
<th>Planning</th>
<th>Learning time: 15h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
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<tr>
<td></td>
<td>Laboratory classes: 8h</td>
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</table>

**Description:**
Path planning. Production planning. Game theory.

**Related activities:**
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<table>
<thead>
<tr>
<th>Supervision</th>
<th>Learning time: 15h</th>
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<tr>
<td></td>
<td>Theory classes: 7h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 8h</td>
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</tbody>
</table>

**Description:**

**Related activities:**
Building of a Supervision System.

**Qualification system**
- Written exams (theoretical and laboratory contents): 55%
  - midterm: 25%
  - final: 30%
- Theoretical and laboratory deliverables: 35%
- Two video presentations: 5% each (5%+5%=10%)

**Regulations for carrying out activities**
Written exams will be individually resolved. The rest of activities that contribute to the assessment of the subject will be performed in groups; the marks obtained by the different group members may differ in those cases where their efforts and performances are manifestly different.

**Bibliography**

**Basic:**


**Others resources:**
Not defined

**Hyperl usk**
MATLAB. Creating Graphical User Interfaces