220274 - Tools for Decision Analysis

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 732 - OE - Department of Management
Academic year: 2018
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Ferrer Ferrer, Carles
Fernandez Alarcon, Vicenç

Degree competences to which the subject contributes

Specific:
1. Acquire concepts and techniques relating to quantitative and experimental methods for analysis and decision making.

General:
3. Ability to apply knowledge to solve problems in new environments or unfamiliar environments within broader contexts (or multidisciplinary) related to engineering.
4. Ability to integrate knowledge and formulate judgments with the aim of making decisions based on information that, with incomplete or limited include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.
5. Self-learning capacity to independent continuous training.
The course Quantitative Methods in Management introduces students to the concepts, principles and fundamentals of combinatorial problems, graph theory and queue theory for analysis and decision making in different contexts.

**Teaching methodology**

The course is divided into three parts:

Theory classes

Practical classes

Self-study for doing exercises and activities.

In the theory classes, teachers will introduce the theoretical basis of the concepts, methods and results and illustrate them with examples appropriate to facilitate their understanding.

In the practical classes (in the classroom), teachers guide students in applying theoretical concepts to solve problems, always using critical reasoning. We propose that students solve exercises in and outside the classroom, to promote contact and use the basic tools needed to solve problems.

Students, independently, need to work on the materials provided by teachers and the outcomes of the sessions of exercises/problems, in order to fix and assimilate the concepts.

The teachers provide the curriculum and monitoring of activities (by ATENEA).

**Learning objectives of the subject**

The course Quantitative Methods in Management introduces students to the concepts, principles and fundamentals of combinatorial problems, graph theory and queue theory for analysis and decision making in different contexts.

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group:</th>
<th>30h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>12.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>80h</td>
<td>64.00%</td>
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</tbody>
</table>
# Content

## Module 1: Combinatorial problems

**Learning time:** 76h  
Theory classes: 17h  
Laboratory classes: 9h  
Self study: 50h

**Description:**  
Foundations of combinatorial problems  
Heuristics for combinatorial problems  
Targeted screening procedures.

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## Module 2: Graph theory

**Learning time:** 24h  
Theory classes: 6h  
Laboratory classes: 3h  
Self study: 15h

**Description:**  
Graph basics  
Graph topology  
Modeling using graphs  
Road problems  
Flow problems.

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## Module 3: Queue theory

**Learning time:** 25h  
Theory classes: 7h  
Laboratory classes: 3h  
Self study: 15h

**Description:**  
Fundamentals of queue models  
Birth and death processes  
Models based on birth and death processes  
Costs of a waiting line
The final grade depends on the following assessment criteria:

- Mid-semester exam, weight: 35%
- Final exam, weight: 35%
- Project 1, weight: 10%
- Project 2, weight: 10%
- Activity, weight: 10%

All students unable to attend the mid-semester exam, or failing it, will have the option of repeating it with the final exam.

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.

**Bibliography**

- **Basic:**