Course guides
220044 - OIP - Optimization of Industrial Processes

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.
Degree: BACHELOR’S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR’S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2021  ECTS Credits: 3.0  Languages: English

LECTURER
Coordinating lecturer: ANTONIO GUASCH PETIT
Others: VICENÇ PUIG CAYUELA - JAUME FIGUERAS JOVE

TEACHING METHODOLOGY
The course is developed by the use of:

- Lecture sessions.
- Problem-solving classes (case studies and exercises).
- Self-study which includes exercises and activities.
- A project

LEARNING OBJECTIVES OF THE SUBJECT
Optimization is the art and science of allocating scarce resources to the best possible effect. Optimization techniques are called into play every day in industrial planning problems, industrial design, resource allocation, scheduling, decision-making, etc. For example: how does an airliner know how to route its planes and schedule its crews at minimum cost; while meeting constraints on airplane flight hours between maintenance and maximum flight time for crews? Another example could be how to schedule body cars into a painting line such as the planned production can be achieved?

The main goals of this course will be:

1. recognize problems that can be tackled using the tools of applied optimization,
2. formulate optimization problems correctly and appropriately,
3. solve optimization problems, primarily by selecting and applying the correct solvers.

These abilities will be especially useful as the world becomes more complex and computer-focused.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>45,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>40.00</td>
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</tbody>
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Total learning time: 75 h
CONTENTS

**Introduction to Optimization of Industrial Processes**

**Description:**
Optimization application areas. Introduction to methods, models and tools for the optimization of industrial processes.

**Full-or-part-time:** 15h  
Theory classes: 5h  
Self study: 10h

**Introduction to the AMPL mathematical programming language**

**Description:**
AMPL (A Mathematical Programming Language) is an algebraic modeling language to describe and solve high-complexity problems for large-scale mathematical computing (i.e., large-scale optimization and scheduling-type problems). The AMPL basic programming structures will be analyzed using optimization problems.

**Full-or-part-time:** 25h  
Theory classes: 10h  
Self study: 15h

**Modeling and optimization of industrial processes**

**Description:**
Explores a variety of models for the solution of airline, supply chain, transportation and manufacturing optimization problems.

**Full-or-part-time:** 35h  
Theory classes: 15h  
Self study: 20h

**GRADING SYSTEM**

The final grade depends on the following evaluation criteria

\[
N_{\text{final}} = 0.4 \times \text{Ex} + 0.35 \times \text{Pr} + 0.25 \times \text{Cl}
\]

- Ex: individual and group exercises  
- Pr: group project  
- Cl: participation in class activities

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**