

Course guide

220044 - OIP - Optimization of Industrial Processes

Last modified: 11/04/2025

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: 2025 **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

Type	Hours	Percentage
Hours large group	30,0	40.00
Self study	45,0	60.00

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

$$N_{\text{final}} = 0.4 \cdot Ex + 0.35 \cdot Pr + 0.25 \cdot Cl$$

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

BIBLIOGRAPHY

Basic:

- Bazargan, Massoud. Airline operations and scheduling [on line]. 2nd ed. Burlington, VT: Ashgate, 2010 [Consultation: 14/07/2025]. Available on: <https://doi-org.recursos.biblioteca.upc.edu/10.4324/9781315566474>. ISBN 9780754697725.

Complementary:

- Shapiro, Jeremy F. Modeling the supply chain. 2nd ed. Belmont: Thomson Brooks/Cole, 2007. ISBN 049512611X.