Course guides
250ST2031 - 250ST2031 - Routes of Vehicles

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: MASTER'S DEGREE IN SUPPLY CHAIN, TRANSPORT AND MOBILITY MANAGEMENT (Syllabus 2014).
(Optional subject).

Academic year: 2021 ECTS Credits: 5.0 Languages: English

LECTURER

Coordinating lecturer: Javier Ortigosa Marin
Others: Javier Ortigosa Marin

PRIOR SKILLS

It is desirable to have a basic knowledge on transport operations and the fundamentals of numerical methods and programming.

TEACHING METHODOLOGY

The course has on average 3 lecture hours per week. Lectures will combine theoretical concepts with case studies and exercises. Students must do a course project and will be also evaluated with a written exam.

LEARNING OBJECTIVES OF THE SUBJECT

Students who register for this course should have some background on basic transport operation concepts and be familiar with the main tools and methodologies employed. In addition, they will need to have some basics on numerical methods and numerical programming (scripting).

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>12.00</td>
</tr>
</tbody>
</table>

Total learning time: 125 h
## CONTENTS

### Basics of graph mathematics

**Description:**
- a) Properties and definitions.
- b) Adjacency matrixes.
- c) Cycles, paths, and routes.

**Full-or-part-time:** 3h  
**Theory classes:** 3h

### Numerical methods and combinatorial optimization

**Description:**
- a. Basic concepts.
- b. Overview of the main problems.
- c. Heuristic approaches.
- d. Metaheuristics.

**Full-or-part-time:** 6h  
**Theory classes:** 6h

### Paths

**Description:**
- b. k-Shortest Path Algorithms.
- c. Minimum spanning tree.

**Full-or-part-time:** 6h  
**Theory classes:** 6h

### Routing problems

**Description:**
- a. Chinese Postman Problem
- b. Traveling Salesman Problem
- c. Vehicle Routing Problem
- d. Dial-A problem

**Full-or-part-time:** 12h  
**Theory classes:** 12h

### Applications

**Description:**
- a. Logistics and urban distribution.
- c. Fleet management and shared vehicles.

**Full-or-part-time:** 3h  
**Theory classes:** 3h
Basics of scripting and Python

Description:
content english

Full-or-part-time: 15h
Practical classes: 15h

GRADING SYSTEM

The final grade of the course will be averaged between the final exam and the course project.