250ST2025 - Railway Transport

Coordinator unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN SUPPLY CHAIN, TRANSPORT AND MOBILITY MANAGEMENT (Syllabus 2014).
(Teaching unit Optional)
ECTS credits: 5  Teaching languages: English

Teaching staff
Coordinator: Casas Esplugas, Carles
Others: Bachiller Saña, Adrina

Learning objectives of the subject
This course aims to present the basic principles of rail transport operation and provide the students with the basic tools in order to understand the capacities and limitations rail transport within a transport system.

Study load

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

### Main principles of rail operation

**Description:**
As an introduction, the physical specificities linked to rail movement are presented: among other aspects, are presented the advance resistance factor, adherence, traction power, the role of infrastructure and braking. Also are presented the particular characteristics of high-speed lines and the current situation and different approaches taken by different countries and world areas.

**Learning time:** 12h  
Theory classes: 4h  
Self study: 8h

### Rail traction systems

**Description:**
The different traction systems used in railways are presented. Advantages and disadvantages of each one of them and its capabilities according to the desired specificities of the intended rail operation.

**Learning time:** 7h  
Theory classes: 2h  
Self study: 5h

### Electric Traction in rail. Typologies of railway electrification systems

**Description:**
The different railway electrification systems used in existing rail lines are presented. The criteria to decide on line electrification: implication and technical & economic considerations. Characteristics that the systems must fulfill. Interaction Catenary – Panthograph. The case of high speed and its particular challenges.

**Learning time:** 8h  
Theory classes: 4h  
Self study: 4h

### Rail safety systems

**Description:**
Principles of rail signaling systems: track sections, track circuits. Lateral signaling, cabin signalling. Existing systems in different countries. High speed signaling (ERTMS and its levels of deployment).

**Learning time:** 16h  
Theory classes: 4h  
Self study: 12h
### Operation (exploitation) systems

**Learning time:** 10h  
- Theory classes: 2h  
- Self study: 8h  

**Description:**  
Requirements and objectives of a rail exploitation system. Evolution of the systems and limitations. Existing and advanced systems in current lines. The case of networks near Barcelona.

### Planning of train movements

**Learning time:** 16h  
- Theory classes: 4h  
- Self study: 12h  

**Description:**  
As the more generic and complex case, are presented the methodologies and tools to organize the exploitation of a multi-operator rail network, with different commercial services (the case of Adif).

### Capacity of a rail line

**Learning time:** 9h  
- Theory classes: 2h  
- Self study: 7h  

**Description:**  
Concept of line capacity. Different systems to establish the capacity. Standard train. Limitations. Options to increase or improve the capacity of a line. Situation in different real cases.

### Railway stations & terminals

**Learning time:** 8h  
- Theory classes: 2h  
- Self study: 6h  

**Description:**  
The singular characteristics and specificities that must be taken into account on the design of a railway station to fulfill its purpose are presented. Stations classification and differential characteristics. Definition of the elements within a railway station and the principles for their dimensioning.
## Organization of Passenger Transport

**Learning time:** 13h  
Theory classes: 4h  
Self study: 9h

**Description:**  
Provide knowledge on how the main passenger services are organized describing the different kinds of services and their implications on the operation. Service indicators, technical and commercial performance indicators, etc. Urban, Suburban, Regional, long distance, high speed, night trains, etc. The concept of quality of rail services.

## Organization of Freight Transport

**Learning time:** 11h  
Theory classes: 2h  
Self study: 9h

**Description:**  

## Bibliography

**Basic:**

