250451 - PLAEXOXACA - Road Network Planning and Operation

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional)
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Spanish

Teaching staff

Coordinator: JOSE RODRIGO MIRO RECASENS
Others: ADRIANA HAYDEE MARTINEZ REGUERO, JOSE RODRIGO MIRO RECASENS

Degree competences to which the subject contributes

Specific:
8169. The ability to plan, manage and operate civil engineering infrastructure.

Transversal:
8559. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.
8560. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
8561. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

Teaching methodology

The course consists of 1,5 hours per week of classroom activity (large size group) and 0,8 hours weekly with half the students (medium size group).

The 1,5 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 0,8 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

Learning objectives of the subject

The course consists of 1,5 hours per week of classroom activity (large size group) and 0,8 hours weekly with half the students (medium size group).

The 1,5 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

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Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.
Specialization subject in which knowledge on specific competences is intensified.

Knowledge and skills at specialization level that permit the development and application of techniques and methodologies at advanced level.

Contents of specialization at master level related to research or innovation in the field of engineering.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Theory classes: 19h 30m</th>
<th>15.60%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 9h 45m</td>
<td>7.80%</td>
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<tr>
<td></td>
<td>Laboratory classes: 9h 45m</td>
<td>7.80%</td>
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<tr>
<td></td>
<td>Guided activities: 6h</td>
<td>4.80%</td>
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<tr>
<td></td>
<td>Self study: 80h</td>
<td>64.00%</td>
</tr>
</tbody>
</table>
## Content


**Learning time:** 2h 24m  
Theory classes: 1h  
Self study: 1h 24m

**Description:**  
Introduction  
The Spanish road network. Organization, financing and management

### 2. Pavements. Basic principles.

**Learning time:** 4h 48m  
Theory classes: 2h  
Self study: 2h 48m

**Description:**  
Road pavements. Types and characteristics  
Distress mechanisms and factors  
Pavement types and distress modes

### 3. Pavement surface characteristics

**Learning time:** 10h 48m  
Theory classes: 3h 30m  
Laboratory classes: 1h  
Self study: 6h 18m

**Description:**  
Introduction  
Adherence  
Noise produced by vehicle circulation  
Surface roughness  
Optical characteristics

### 4. Pavement design

**Learning time:** 21h 36m  
Theory classes: 2h  
Practical classes: 4h  
Laboratory classes: 3h  
Self study: 12h 36m

**Description:**  
Structural pavement design  
Experimental and analytical methods  
Exercises of flexible and rigid pavement design
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Learning time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Pavement auscultation</td>
<td>Description: Auscultation, Visual inspection, Determination of pavement surface characteristics, Determination of pavement mechanical characteristics</td>
<td>Learning time: 6h</td>
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<tr>
<td></td>
<td></td>
<td>Theory classes: 2h 30m</td>
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<tr>
<td></td>
<td></td>
<td>Self study: 3h 30m</td>
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<tr>
<td>6. Maintenance of flexible pavements</td>
<td>Description: Pavement condition, diagnosis and decision making, Ordinary conservation, Local repairs and small failures, Pavement reinforcement exercises</td>
<td>Learning time: 19h 12m</td>
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<tr>
<td></td>
<td></td>
<td>Theory classes: 2h</td>
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<tr>
<td></td>
<td></td>
<td>Practical classes: 3h</td>
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<tr>
<td></td>
<td></td>
<td>Laboratory classes: 3h</td>
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<tr>
<td></td>
<td></td>
<td>Self study: 11h 12m</td>
</tr>
<tr>
<td>7. Maintenance of rigid pavements</td>
<td>Description: Introduction, Repair of local failures, Surface rehabilitation, Reinforcement and structural rehabilitation</td>
<td>Learning time: 4h 48m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Theory classes: 2h</td>
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<tr>
<td></td>
<td></td>
<td>Self study: 2h 48m</td>
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<tr>
<td>8. Pavement recycling</td>
<td>Description: Introduction, Cold in place recycling, Hot mix asphalt in plant recycling</td>
<td>Learning time: 3h 35m</td>
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<td></td>
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<td>Theory classes: 1h 30m</td>
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<td>Self study: 2h 05m</td>
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9. Pavement management systems

<table>
<thead>
<tr>
<th>Learning time: 20h 24m</th>
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<tbody>
<tr>
<td>Theory classes: 2h 30m</td>
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<tr>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td>Laboratory classes: 3h</td>
</tr>
<tr>
<td>Self study: 11h 54m</td>
</tr>
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Description:
- Pavement management systems
- Structure of a management system
- Benefits of implementation
- Exercises of management systems

Qualification system

The mark of the course will be obtained from the marks from both the continuous assessment and the supervised activity carried out during the semester.

Continuous assessment will consist in several tests about concepts associated with the learning objectives of the course with regard to knowledge or understanding.

The supervised activity, which can be individually or in group, of additive and training characteristics, will be carried out during the semester (both in and out of the classroom).

The final mark of the course will be obtained weighting the continuous assessment as 80% and the supervised activity as 20%. Students who do not attend any of the evaluation activities of the subject will not have a numerical mark and their qualification will be NP.

Regulations for carrying out activities

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

Bibliography

Basic:
- Huang, Y.. Pavement analysis.

Complementary: