

## 250472 - ANPROESTAC - Analysis and Design of Steel Structures

Coordinating unit:	250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit:	751 - DECA - Department of Civil and Environmental Engineering
Academic year:	2015
Degree:	MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional) MASTER'S DEGREE IN CIVIL ENGINEERING (RESEARCH TRACK) (Syllabus 2009). (Teaching unit Optional) MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2009). (Teaching unit Optional) MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits:	5
Teaching languages:	Catalan, Spanish

### Teaching staff

Coordinator:	ALFREDO BERNARDO ARNEDO PENA, ENRIQUE MIRAMBELL ARRIZABALAGA
Others:	ALFREDO BERNARDO ARNEDO PENA, ENRIQUE MIRAMBELL ARRIZABALAGA

### Degree competences to which the subject contributes

#### Specific:

8162. Knowledge of all kinds of structures and materials and the ability to design, execute and maintain structures and buildings for civil works.

8228. Knowledge of and competence in the application of advanced structural design and calculations for structural analysis, based on knowledge and understanding of forces and their application to civil engineering structures. The ability to assess structural integrity.

### Teaching methodology

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

The 1,8 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

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.

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

### Study load

Total learning time: 125h	Theory classes:	19h 30m	15.60%
	Practical classes:	9h 45m	7.80%
	Laboratory classes:	9h 45m	7.80%
	Guided activities:	6h	4.80%
	Self study:	80h	64.00%

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### Content

<p>1.The steel material.</p>	<p>Learning time: 7h 11m Theory classes: 3h Self study : 4h 11m</p>
<p>Description: Steel properties. Stress-strain relationship. Temperature effects. Strain rate. Plasticity. Ductility. Toughness. Fatigue.</p>	
<p>2.Design os structural elements in front of brittle fracture and fatigue.</p>	<p>Learning time: 14h 23m Theory classes: 3h Practical classes: 3h Self study : 8h 23m</p>
<p>Description: Treatment in Instrucción EAE and Eurocode. Exercises and problems. Exercises</p>	
<p>Ultimate Limit States</p>	<p>Learning time: 21h 36m Theory classes: 6h Practical classes: 3h Self study : 12h 36m</p>
<p>Description: Resistance of the cross sections. Cross section classification. Interacción. Plastic design. Buckling design. Cross sections class 4. Column buckling theory. Beam-column behaviour. Effective lengths. Desugn rules of EAE, Eurocode and AISC. Exercises and problems.</p>	
<p>Assessment 2</p>	<p>Learning time: 7h 11m Laboratory classes: 3h Self study : 4h 11m</p>

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<p>Joints</p>	<p>Learning time: 14h 23m Theory classes: 3h Practical classes: 3h Self study : 8h 23m</p>
<p>Description: Joints. Welding properties. Calculation of welded joints. Bolted joints. Base plates . Joint exercises</p>	
<p>Built-up elements</p>	<p>Learning time: 7h 11m Theory classes: 3h Self study : 4h 11m</p>
<p>Description: Built-up columns, lattice girders and trusses.</p>	
<p>Structural types</p>	<p>Learning time: 7h 11m Practical classes: 3h Self study : 4h 11m</p>
<p>Description: Design of multy-storey buildings and industrial buildings.</p>	
<p>Accidental actions</p>	<p>Learning time: 7h 11m Theory classes: 3h Self study : 4h 11m</p>
<p>Description: Fire resistance. Simplified Method. Seismic design based on ductility. Blast and impact.</p>	
<p>Assessment 3</p>	<p>Learning time: 7h 11m Laboratory classes: 3h Self study : 4h 11m</p>

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### Qualification system

The mark of the course is obtained from the ratings of continuous assessment.

The first assessment is 35 % and the second 65% of the total.

### Regulations for carrying out activities

Any exercise with conceptual errors in determining the internal forces will be assessed with 0.

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:

Comisión Permanente de Estructuras de Acero. EAE: instrucción de acero estructural: con comentarios de los miembros de la Comisión Permanente de Estructuras de Acero. Madrid: Ministerio de Fomento. Secretaría General Técnica, 2011. ISBN 978-84-498-0904-0.

CEN. UNE-EN 1993-1-1:2008 Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-1: Reglas generales y reglas para edificios.. AENOR, 2008.

CEN. UNE-EN 1993-1-3:2009 Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-3: Reglas generales. Reglas adicionales para perfiles y chapas de paredes delgadas conformadas en frío.. AENOR, 2009.

CEN. UNE-EN 1993-1-8:2011 Eurocódigo 3: Proyecto de estructuras de acero. Parte 1-8: Uniones. AENOR, 2011.

Alfredo Arnedo Pena. Naves industriales con acero.. Publicaciones APTA, 2009. ISBN 978-84-692-2274-4.