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250476 - AVAREDRSIS - Seismic Risk Assessment and Reduction

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 (RESEARCH TRACK) (Syllabus 2007). (Teaching unit Optional)
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)
DOCTORAL DEGREE IN EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS (Syllabus 2012). (Teaching unit Optional)
MASTER'S DEGREE IN GEOTECHNICAL AND EARTHQUAKE ENGINEERING (Syllabus 2009). (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 GEOTECHNICAL ENGINEERING (Syllabus 2015). (Teaching unit Optional)

ECTS credits: 5 Teaching languages: Spanish

Teaching staff

Coordinator: HORIA ALEJANDRO BARBAT BARBAT

Others: HORIA ALEJANDRO BARBAT BARBAT, MARTHA LILIANA CARREÑO TIBADUIZA

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.

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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.

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

Introduction to dynamic analysis of structures. Calculus concepts seismic structures. Project earthquake resistant structures: the rules governing their design. Concept of seismic hazard evaluation. Mechanisms of seismic risk reduction in urban areas.

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

Introduction to the course. Seismic actions and their effect on structures. The seismic risk

Learning time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Description:
Introduction to the course. Seismic actions and their effect on structures. The seismic risk.

Systems with one degree of freedom

Learning time: 21h 36m
Theory classes: 6h
Practical classes: 3h
Self study : 12h 36m

Description:
Undamped systems
Systems with proportional damping
Systems under harmonic vibrations
Response to general actions. Response spectra.
Systems problems with one degree of freedom

Systems with n-degrees-of-freedom

Learning time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Description:
Undamped systems. Systems with proportional damping

Seismic analysis of buildings. Seismic design codes

Learning time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Description:
Calculating building seismic. Seismic design standard

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Conceptual design principles: structural configuration. Details of earthquake resistant design	Learning time: 7h 11m Practical classes: 3h Self study : 4h 11m

Description:
Conceptual design principles: structural configuration. Details of earthquake resistant design

Vulnerability and seismic risk in urban areas	Learning time: 7h 11m Theory classes: 3h Self study : 4h 11m

Description:
Vulnerability and seismic risk in urban areas

Probabilistic assessment of the seismic risk. Seismic risk management.	Learning time: 7h 11m Practical classes: 3h Self study : 4h 11m

Description:
Evaluation of probabilistic seismic risk. Mechanisms of reduction of the seismic risk.

Oral presentations of the students about a topic related to the course	Learning time: 28h 47m Laboratory classes: 12h Self study : 16h 47m

Qualification system

Presentación oral: Cada alumno hará una presentación oral en la que trate un tema relacionado con la temática de la asignatura. (30%)
Trabajo final: Consiste en realizar el análisis sísmico de una estructura a elegir por el estudiante aplicando una norma de diseño de su elección. (40%)
Evaluaciones: Los alumnos realizarán en clase ejercicios prácticos puntuables sobre los temas explicados. (30%)

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.

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Bibliography

Basic:

Alex H. Barbat y Juan Miquel Canet. Estructuras sometidas a acciones sísmicas. 2. Barcelona: CIMNE, 1994. ISBN 84-87867-10-3.

A.H. Barbat, S. Oller, J.C. Vielma. Cálculo y diseño sismorresistente de edificios.. Barcelona: CIMNE, 2005. ISBN 84-95999-89-7.