Course guides
250476 - AVAREDRSIS - Seismic Risk Assessment and Reduction

Last modified: 06/10/2020

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

Degree: MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2009). (Optional subject).
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN GEOTECHNICAL AND EARTHQUAKE ENGINEERING (Syllabus 2009). (Optional subject).
DOCTORAL DEGREE IN EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN GEOTECHNICAL ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2020 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: MARTHA LILIANA CARREÑO TIBADUIZA

Others: 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.

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 3 hours per week of classroom activity.

The 3 hours are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

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.

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

Introduction to natural disaster risk analisys. Calculus concepts seismic structures. Seismic hazard and risk evaluation. Multi-hazard risk evaluation. Disaster risk evaluation and reduction.

STUDY LOAD

Type	Hours	Percentage
Hours small group	9,8	7.83
Guided activities	6,0	4.80
Self study	80,0	63.95
Hours large group	19,5	15.59
Hours medium group	9,8	7.83

Total learning time: 125.1 h

CONTENTS

Introduction. ¿What is disaster risk? ¿Why should we know it?

Description:
Introduction to the course. Introduction to seismic risk, earthquake damage

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Risk Assessment Theory (Part 1)

Description:
Engineering models. Loss occurrence processes. Components of a model (threat, exposure and vulnerability)

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Risk Assessment Theory (Part 2)

Description:
Risk assessment for a single structure. Risk assessment for a portfolio of structures. Risk metrics and their interpretation.

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Modeling of exposed elements

Description:
Dimensions of vulnerability. Direct, indirect losses, injuries, deaths, business interruption, etc. Methodologies for the development of exposure databases. What is the exhibition and what are you interested in capturing?

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Seismic hazard assessment

Description:
Session 5

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Probabilistic assessment of seismic risk.

Description:
Session 6

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Practical session: Probabilistic evaluation of the seismic hazard and risk

Description:
Session 7

Full-or-part-time: 7h 11m
Practical classes: 3h
Self study : 4h 11m

Hurricane Risk Modeling

Description:
Session 8

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Practical session: Multi-hazard risk assessment

Description:
Multi-threat risk assessment

Full-or-part-time: 7h 11m
Practical classes: 3h
Self study : 4h 11m

Applications of risk assessment in insurance and reinsurance

Description:
Session 10

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Ex-post evaluation of damage in buildings

Description:
Assessment of habitability and damage in buildings affected by an earthquake.

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Disaster risk management

Description:
Ex-post evaluation. Indicators of disaster risk management.

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Evaluation

Full-or-part-time: 7h 11m
Laboratory classes: 3h
Self study : 4h 11m

GRADING 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%)

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:
- Canet, J.M.; Barbat, A.H. Estructuras sometidas a acciones sísmicas: cálculo por ordenador. Barcelona: Centro Internacional de Métodos Numéricos en Ingeniería, 1994. ISBN 8487867103.
- Barbat, A.H.; Oller, S.; Vielma, J.C. Cálculo y diseño sismorresistente de edificios: aplicación de la norma NCSE-02 [on line]. Barcelona: CIMNE, 2005 [Consultation: 23/04/2020]. Available on: http://hdl.handle.net/2117/28500. ISBN 8495999897.
- Salgado-Gálvez, M.A.; Cardona, O:D.; Carreño, M.L.; Barbat, A.H. Probabilistic seismic hazard and risk assessment in Spain [on line]. Barcelona: Centro Internacional de Métodos Numéricos en Ingeniería, 2015 [Consultation: 17/04/2020]. Available on: http://hdl.handle.net/2117/26289. ISBN 9788494330773.
- Indicadores de riesgo de desastre y de gestión de riesgos: Informe técnico principal. Manizales, Colombia: Instituto de Estudios Ambientales - IDEA & Banco Interamericano de Desarrollo - BID, 2005.
- Chopra, A.K. Dynamics of structures: theory and applications to earthquake engineering [on line]. 5th ed. Harlow: Pearson Education Limited, 2020 [Consultation: 09/11/2020]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=5811586. ISBN 9781292249209.