Course guides
250440 - ENGCOMPREX - Computational Engineering for Design and Operation

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 CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).
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Academic year: 2020 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: GUILLERMO VILANOVA CAICOYA

Others: NATIVITAT PASTOR TORRENTE, GUILLERMO VILANOVA CAICOYA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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

Taught module delivery: thirteen weeks of teaching, coursework and self-study. Apart from the 3 hours per week in the classroom, self-study must last an average of 4.5 hours per week.

At least a half of the classroom hours are devoted to work in small groups (computer laboratory, evaluations, etc.)

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.

Tutored weekly class where case studies and practical examples are reproduced by the students. Topics in computational engineering are reviewed and worked in depth using commercial software

STUDY LOAD

Type	Hours	Percentage
Theory classes	19,5	15.59
Practical classes	9,8	7.83
Guided activities	6,0	4.80
Self study	80,0	63.95
Laboratory classes	9,8	7.83

Total learning time: 125.1 h

CONTENTS

Introduction

Description:
Basic steps in computer modeling
Modeling exercise with pdetools. Error measures, convergence.

Full-or-part-time: 7h 11m
Theory classes: 2h
Laboratory classes: 1h
Self study : 4h 11m

Governing physics

Description:
Balance equations: solids, fluids. Thermal balance. Transport equation

Exercise on heat transfer.

Full-or-part-time: 7h 11m
Theory classes: 2h
Laboratory classes: 1h
Self study : 4h 11m

Discretization methods

Description:
Finite elements
Abaqus. SAP. Other commercial software.

Full-or-part-time: 7h 11m
Theory classes: 2h
Laboratory classes: 1h
Self study : 4h 11m

Linear Elasticity

Description:
Bulk and structural elements.
Introduction to SAP
Exercise with SAP

Full-or-part-time: 21h 36m
Theory classes: 1h
Laboratory classes: 8h
Self study : 12h 36m

Dynamics

Description:
Modal and direct time-integration algorithms, explicit, implicit, stability.
Introduction to Abaqus

Full-or-part-time: 12h
Theory classes: 2h
Laboratory classes: 3h
Self study : 7h

Evaluation

Full-or-part-time: 16h 48m
Laboratory classes: 7h
Self study : 9h 48m

Non-linearities

Description:
Non-linear elasticity. Plasticity. Viscoelasticity. Damage.
Exercise with Abaqus

Full-or-part-time: 14h 23m
Theory classes: 1h
Laboratory classes: 5h
Self study : 8h 23m

Buckling

Description:
Linear and non-linear Buckling
Exercise

Full-or-part-time: 7h 11m
Theory classes: 1h
Laboratory classes: 2h
Self study : 4h 11m

GRADING SYSTEM

The mark of the course is obtained as follows:

Mark = Q*0.2 + A*0.3 + P*0.5

where
Q is the mark of the in-class written exam
A is the average of the marks of the three assignments
P is the mark of the final project

EXAMINATION RULES.

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:

- Zienkiewicz, O.C.; Morgan, K. Finite elements and approximation. New York: John Wiley and Sons, 1983. ISBN 0471982407.