

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

Unit in charge: Teaching unit:	Barcelona School of Civil E 751 - DECA - Department	Last modified: 11/06/2024 ngineering of Civil and Environmental Engineering.
Degree:	MASTER'S DEGREE IN CIVI	IL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).
Academic year: 2024	ECTS Credits: 5.0	Languages: English

LECTURER

Coordinating lecturer:	NATIVITAT PASTOR TORRENTE
Others:	NATIVITAT PASTOR TORRENTE, ANTONIO RODRIGUEZ FERRAN

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 hours devoted to the course will be carried out in small work groups (computer laboratory, evaluations, etc.)

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

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

Туре	Hours	Percentage
Hours small group	9,8	7.83
Hours large group	25,5	20.38
Hours medium group	9,8	7.83
Self study	80,0	63.95

Total learning time: 125.1 h



CONTENTS

Introduction

Description: Basic steps in computer modeling Modeling exercise FE with pdetools.

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 for linear elasticity Introduction to SAP and exercise with SAP. Introduction to Abaqus.

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



Dynamics

Description:

Dynamic analysis: Modal and direct time-integration algorithms- explicit vs implicit, stability. Resolution of a dynamic example with Abaqus.

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

Evaluation

Description:

Evaluation will be carried out on the basis of tutorised assignments, evaluation test at class and a final project to be carried out in groups.

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 Practical exercise with Abaqus de linear vs. non-linear buckling.

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.

Complementary:

- Oliver Olivella, X.; Agelet de Saracíbar, C. Mecànica de medis continus per a enginyers [on line]. Barcelona: Edicions UPC, 2003 [Consultation: 29/04/2020]. Available on: <u>http://hdl.handle.net/2117/97013</u>. ISBN 8483017199.

- Bathe, K.-J. Finite element procedures. [S. I.]: l'autor, 2006. ISBN 9780979004902.

- Belytschko, T.; Liu, W.K.; Moran, B.; Elkhodary, K. Nonlinear finite elements for continua and structures [on line]. 2nd ed. Chichester: Wiley, 2014 [Consultation: 05/02/2020]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=1501634. ISBN 9781118632703.