[MHG202] INTRODUCTION TO THE FINITE ELEMENT METHOD

GENERAL INFORMATION

Studies	UNIVERSITY MASTER IN INDUSTRIAL ENGINEERING			**Subject**	?
Semester	1	**Course**	2	**Mention / Field of specialisation**	???
Character	OPTIONAL				
Plan	2022	**Modality**	Face-to-face	**Language**	ENGLISH
Credits	3	**Hours/week**	1.83	**Total hours**	33 class hours + 42 non-class hours = **75 total hours**

PROFESSORS

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REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	Fundamentals of Mathematics Fundamentals of Physics Material's Resistance and Elasticity Mechanical Design CAD 3D

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MHME01 - To design and carry out machine tests considering the mechanical behavior of the material		x		0,6
MHME04 - To demonstrate knowledge and capabilities for the calculation and design of structures using finite elements		x		1,8
MHRA22 - To demonstrate knowledge and capabilities to carry out verification and control of facilities, processes and products		x		0,08
MHRA23 - To demonstrate knowledge and capabilities to carry out certifications, audits, verifications, tests and reports		x		0,12
MHRA27 - To demonstrate the ability to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social, health and safety, environmental, economic and industrial implications and responsibilities		x		0,08
MHRA28 - To communicate your conclusions and the knowledge and ultimate reasons that support them to specialized and non-specialized audiences in a clear and unambiguous way		x		0,16
MHR126 - To apply the knowledge acquired and your problem-solving skills in new, little-known or changing environments within broader (or multidisciplinary) contexts related to your area of study		x		0,08
MHR129 - To possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous		x		0,08
			Total:	3

KC: Knowledge or Content / SK: Skills / AB: Abilities

ENAEE LEARNING RESULTS	ECTS
ENA123 - Knowledge and comprehension: Deep knowledge and comprehension of mathematics and other basic sciences inherent in their engineering speciality, allowing them to achieve the other competencies of the degree.	0,5
ENA131 - Engineering projects: Ability to project, develop and design new complex products (parts, components, finished products, etc.), processes and systems with specifications defined incompletely and/or with conflicts, which require the integration of knowledge from different disciplines, and consider social, health and safety, environmental, economic and industrial aspects; to select and apply the appropriate methodologies or employ creativity to develop new project methodologies.	0,5
ENA134 - Research and innovation: Ability to carry out bibliographic searches and consult and use databases and other information sources with discretion, in order to carry out simulations with the aim of conducting research on complex topics of their speciality.	0,5
ENA138 - Practical application of engineering: Complete knowledge of the applicable techniques and methods of analysis, project and research, as well as their limitations.	0,4
ENA145 - Preparation of judgements: Ability to manage complex technical or professional activities or projects that require new approach approaches, assuming responsibility for the decisions made.	0,6
ENA146 - Communication and Teamwork: Ability to employ different methods to communicate their conclusions, clearly and unambiguously, and the knowledge and logical foundations that support them, to audiences specialised and not specialised in the issue, in domestic and international contexts.	0,5
Total:	3

SECONDARY LEARNING RESULTS

RMH153 **[!]** ***Elabora modelos estructurales y de procesos mediante elementos finitos acorde con sus características, efectúa***

las simulaciones y analiza sus resultados.

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning	5 h.	19 h.	24 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	3 h.		3 h.
Computer simulation exercises, individually and/or in teams	9 h.	23 h.	32 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	16 h.		16 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	20%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems
Individual written and/or oral tests or individual coding/programming tests	80%	Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 33 h.
NCH - Non-class hours: 42 h.
TH - Total hours: 75 h.

CONTENTS

1. Introduction
2. Simulation procedure map
3. Geometry adaptation
4. Discretization
5. Material modeling
6. Interactions and constraints
7. Loads and boundary conditions
8. Solver
9. Post-processing

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Slides of the subject
Moodle Platform
Specific Master Software
Computer practical training

Bibliography

Oñate, E. (2009). Structural Analysis with the Finite Element Method. Linear Statics. Volume 1. Basis and Solids. CIMNE

Chandrupatla, T. R. et al. (2012). Introduction to finite elements in engineering. Pearson Education.

Zienkiewicz, O. C. and Taylor, R. L. (1995). El método de los elementos finitos. Vol 1. McGraw Hill.

Liu, G. R. and Quek, S. (2003). Finite element method. A practical course. Butterworth-Heinemann.