

[MHE203] LABORATORY OF STRUCTURAL INTEGRITY I

GENERAL INFORMATION

Studies	UNIVERSITY MASTER IN INDUSTRIAL ENGINEERING		Subject	?
Semester	1	Course	1	Mention / Field of specialisation
Character	OPTIONAL		Language	EUSKARA/CASTELLANO/ENGLISH
Plan	2022	Modality	Face-to-face	Total hours 34 class hours + 41 non-class hours = 75 total hours
Credits	3	Hours/week	1.89	

2030 AGENDA GOALS



PROFESSORS

ESNAOLA RAMOS, JON ANDER
MCCLOSKEY GOMEZ, ALEX

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	[!] Fundamentos de Vibraciones [!] Fundamentos de Elementos Finitos

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MHME02 - To design and perform machine tests including their dynamic behavior		x		1,12
MHME04 - To demonstrate knowledge and capabilities for the calculation and design of structures using finite elements		x		1,08
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		0,16
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
MHRA30 - To work with people, involving and directing them in a dynamic aimed at a common objective that includes reflection on their ethical and social responsibility, with a global vision of the work to be carried out and the characteristics that it requires (quality, deadlines,...), assuming responsibility for the decisions made		x		0,08
MHR125 - Having and understanding knowledge providing a basis or opportunity to be original in developing and/or applying ideas, often in a research context.		x		0,08
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

ENAE LEARNING RESULTS

ENAE 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.	0,3
ENA124 - Knowledge and comprehension: Deep knowledge and comprehension of the engineering disciplines of their speciality, at the level necessary to acquire the rest of the competencies of the degree.	0,25
ENA127 - Analysis in engineering: Ability to analyse new and complex engineering products, processes and systems within a broader multidisciplinary context; select and apply the most appropriate analysis, calculation and experimental methods already established, as well as innovative methods; and critically interpret the results of such analyses.	0,3
ENA128 - Analysis in engineering: Ability to conceive new products, processes, and systems.	0,35
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.	0,25
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.	0,25
ENA135 - Research and innovation: Ability to consult and apply codes of good practices and security in their speciality.	0,25

ENA136 - Research and innovation: High-level capacity and ability to project and carry out experimental investigations, interpret data with criteria, and draw conclusions.	0,25
ENA138 - Practical application of engineering: Complete knowledge of the applicable techniques and methods of analysis, project and research, as well as their limitations.	0,25
ENA141 - Practical application of engineering: Ability to apply standards of engineering practice.	0,25
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.	0,3

Total: 3

SECONDARY LEARNING RESULTS

RMH158 [!] *Conoce y aplica, en casos reales, los conceptos del método de los elementos finitos en dinámica estructural*

LEARNING ACTIVITIES

	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		4 h.	4 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints		1 h.	1 h.
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		16 h.	16 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	4 h.		4 h.
Tutoring sessions and monitoring of training activities	13 h.		13 h.

EVALUATION SYSTEM

	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	60%
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	40%

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 17 h.

NCH - Non-class hours: 21 h.

TH - Total hours: 38 h.

RMH157 [!] *Conoce y aplica los conceptos de vibraciones en sistemas reales con n gdl considerando vibraciones aleatorias*

LEARNING ACTIVITIES

	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		4 h.	4 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	1 h.		1 h.
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		16 h.	16 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	3 h.		3 h.
Tutoring sessions and monitoring of training activities	13 h.		13 h.

EVALUATION SYSTEM

	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	60%
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	40%

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CONTENTS

Development and validation of numerical and analytical models for the characterization of the dynamic response and verification of the structural integrity of a complex mechanical system:

1. Definition of the modeling strategy for both models including the identification of the geometric model to be used, system parameters, resolution algorithms, field variables to be monitored... in order to obtain the optimal results/computational-cost ratio.
2. Development of the numerical model for the characterization of both the dynamic response of the system and the structural integrity of the components and joints that make up the system.
3. Development of the analytical model for the characterization of the dynamic response.
4. Experimental validation of the developed models by means of bench tests.

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Slides of the subject	Oñate, E. (2009). Structural Analysis with the Finite Element Method. Linear Statics. Volume 1. Basis and Solids. CIMNE.
Moodle Platform	Chandrupatla, T. R. et al. (2012). Introduction to finite elements in engineering. Pearson Education.
Labs	Zienkiewicz, O. C. and Taylor, R. L. (1995). El método de los elementos finitos. Vol 1. McGraw Hill.
Computer practical training	Liu, G. R. and Quek, S. (2003). Finite element method. A practical course. Butterworth-Heinemann
Class presentations	S. Rao, Mechanical Vibrations, Addison-Wesley, 1995.
Specific Master Software	B.Balanchandran,E.Magrab, Vibrations,Thomson,2004.
	S.G. Kelly, Mechanical Vibrations: Theory and Applications, SI Edition, Cengage learning, 2011.
	S.G. Kelly, Schaum's Outline of Mechanical Vibrations , McGrawHill, 1996.