



FICHA TÉCNICA DE LA ASIGNATURA

Datos de la asignatura

Nombre completo	Simulación Multifísica
Código	DIM-MII-612
Nivel	Postgrado Oficial Master
Cuatrimestre	Semestral
Créditos	6,0 ECTS
Carácter	Obligatoria
Departamento / Área	Departamento de Ingeniería Mecánica

Datos del profesorado

Profesor

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Profesor

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DATOS ESPECÍFICOS DE LA ASIGNATURA

Contextualización de la asignatura

Aportación al perfil profesional de la titulación

After the course students will have a good overview about current simulation capabilities

Prerrequisitos

Knowledge of basic courses of algebra, fluid dynamics and mechanics of materials

Competencias - Objetivos

Resultados de Aprendizaje



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GUÍA DOCENTE

2025 - 2026

This course will be an introduction of the different analysis can be done in the ANSYS workbench environment and the coupling among them.

At the end of the course, students have fundamental skills in all the analyses available in Ansys Workbench environment.

BLOQUES TEMÁTICOS Y CONTENIDOS

Contenidos – Bloques Temáticos

- Introduction to finite elements and workbench environment. Analysis type and workbench workflow. Materials definition.
 - Static structural analysis of plane cases. Parameters.
 - Static structural analysis of beam and link and shell elements
 - 3D models. Boundary conditions. Mesh generation.
 - 3D models. Postprocess result. Submodelling
 - Load cases and load steps. Pseudo static analysis.
 - Thermal analysis. Coupled thermal-structural analysis
 - Modal and harmonic analysis. Linear buckling analysis
 - Fundamentals of nonlinear analysis. Non-linear materials and geometric non-linearities
 - Fundamentals of contact non-linearities. Types of contact models.
 - Basic of rigid solid dynamics
 - Transient analysis. Implicit integration
 - Transient analysis. Explicit integration
- Introduction to CFD
 - Geometry and Meshing
 - Domains, Boundary Conditions and Sources
 - Turbulence models and solver settings
 - Post-processing (Ansys Fluent and CFD post)
 - Internal Flows
 - External Flows
 - Heat transfer
 - Transient flows
- Fluid-Structure Interaction (FSI)

METODOLOGÍA DOCENTE

Aspectos metodológicos generales de la asignatura

Each session is scheduled as a specific seminar. Practical use of the ANSYS workbench program takes prevalence over theoretical concepts.

EVALUACIÓN Y CRITERIOS DE CALIFICACIÓN

Final Exam

Individual/group assignments

The use of Artificial Intelligence is permitted exclusively for the completion of ASSIGNMENTS. Therefore, [Level 2 of the Perkins et al. \(2024\)](#).



[Evaluation Scale](#) is established: AI may be used for pre-task activities such as brainstorming, outlining, and initial research. This level focuses on the effective use of AI for planning, synthesis, and ideation, but assessments should emphasize the ability to develop and refine these ideas independently.

Calificaciones

Standard evaluation at the end of the term:

- 40% Final Exam
- 60 % individual/group assignments

Additional evaluation during June (Retake):

- 40% Final Exam
- 60% individual assignments

Failure to attend more than 15% of the classroom hours scheduled for this course may result in disqualification from taking the regular exam.

PLAN DE TRABAJO Y CRONOGRAMA

Actividades		Fecha de realización	Fecha de entrega
Session	Topic		
PRE_00	Presentation		
CFD_01	Introduction to CFD		
CFD_02	Geometry and Meshing		
CFD_03	Domains, Boundary Conditions and Sources		
CFD_04	Turbulence, solver settings and post-processing.		
CFD_05	Complete CFD workflow		
CFD_06	Heat transfer 1/2		
CFD_07	Heat transfer 2/2		
CFD_08	Internal Flows		
CFD_09	External Flows		
CFD_10	Transient flows and functions		
CFD_11	Applications: Rotating machinery, Multiphase flows and Reacting Flows		
CFD_12	Fluid-structure interaction 1		
CFD_13	Fluid-structure interaction 2		
STR_01	Intro.to finite elements and workbench env. An. type and workbench workflow. Mat. def.		
STR_02	Static structural analysis of plane cases. Parameters.		
STR_03	3D models. Boundary conditions. Mesh generation.		
STR_04	3D models. Postprocess result. Submodelling		
STR_05	Static structural analysis of beam and link and		



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	shells elements		
STR_06	Load cases and load steps. Pseudo static analysis.		
STR_07	Thermal analysis. Coupled thermal-structural analysis		
STR_08	Fundamentals of nonlinear analysis. Non-linear materials and geometric non-linearities		
STR_09	Fundamentals of contact non-linearities. Types of contact models.		
STR_10	Modal and harmonic analysis. Linear buckling analysis.		
STR_11	Transient analysis. Implicit integration		
STR_12	Transient analysis. Explicit integration		
STR_13	Basic of rigid solid dynamics		

BIBLIOGRAFÍA Y RECURSOS

Bibliografía Básica

- Finite Element Simulations with ANSYS Workbench 18. Huei-Huang Lee. ISBN 978-1630571733.
- Engineering Analysis with ANSYS Workbench 18. Guangming Zhang. ISBN-13: 978-1935673385
- Engineering Analysis with ANSYS Software. Tadeusz Stolarski Y. Nakasone S. Yoshimoto. ISBN: 9780081021644