FICHA TÉCNICA DE LA ASIGNATURA

Datos de la asignatura	
Nombre completo	Simulación Multifísica
Código	DIM-MII-612
Impartido en	Máster Universitario en Ingeniería Industrial [Segundo Curso]
Nivel	Postgrado Oficial Master
Cuatrimestre	Semestral
Créditos	6,0 ECTS
Carácter	Obligatoria
Departamento / Área	Departamento de Ingeniería Mecánica

Datos del profesorado	
Profesor	
Nombre	Fernando Martínez Domínguez
Departamento / Área	Departamento de Ingeniería Mecánica
Correo electrónico	fmdominguez@icai.comillas.edu
Profesor	
Nombre	Jesús Ángel García Matos
Departamento / Área	Departamento de Ingeniería Mecánica
Correo electrónico	jesus.garcia@iit.comillas.edu
Profesor	
Nombre	José Rubén Pérez Domínguez
Departamento / Área	Departamento de Ingeniería Mecánica
Correo electrónico	jrpdominguez@icai.comillas.edu

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

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 prevalance over theoretical concepts.

EVALUACIÓN Y CRITERIOS DE CALIFICACIÓN

Test

- Session test

- Final test

Homework in group or individual

Calificaciones

Standard evaluation at the end of the term:

30% test

- 20 % session test
- 80 % final test

70 % individual/group works

Additional evaluation during July (Retake):

- 40% Test
- 60% individual work

PLAN DE TRABAJO Y CRONOGRAMA

Actividades									Fecha de realización	
Semana	Sesión	Tema	Profesor	Lunes	Sesión	Tema	Profesor	Viernes		
1	1	Introduction to finite elements and workbench environment. Analysis type and workbench workflow. Materials definition.	JGM		2	Static structural analysis of plane cases. Parameters.	FMD			
2	16	Introduction to CFD	RPD		17	Geometry and Meshing	RPD			
3	3	3D models. Boundary conditions. Mesh generation.	FMD		18	Domains, Boundary Conditions and Sources	RPD			
4	19	Turbulence, solver settings and post-processing	RPD		4	3D models. Postprocess result. Submodelling	FMD			
5	5	Static structural analysis of beam and link and shells elements	FMD		20	Complete CFD workflow	RPD			
		Load cases and load								

6	6	steps. Pseudo static analysis.	FMD		Festivo		
7							
8	24	Heat transfer	RPD	7	Thermal analysis. Coupled thermal-structural analysis	FMD	
9	9	Fundamentals of nonlinear analysis. Non-linear materials and geometric non-linearities	JGM	23	Internal Flows	RPD	
10	10	Fundamentals of contact non-linearities. Types of contact models.	JGM	22	External Flows	RPD	
11	8+11	Modal and harmonic analysis. Linear buckling analysis. Basic of rigid solid dynamics	JGM	25	Transient flows	RPD	
12	28	Fluid-structure interaction	RPD	29	Applications	RPD	
13	12	Transient analysis. Implicit integration	JGM	13	Transient analysis. Explicit integration	JGM	

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