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820060 - VD - Design Validation

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering

Teaching unit: 717 - EGE - Department of Engineering Presentation

Academic year: 2018

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN BIOMEDICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Optional)

ECTS credits: 6 Teaching languages: Spanish

Teaching staff

Coordinator: MIGUEL ANGEL BRIGOS HERMIDA

Others: MIGUEL ANGEL BRIGOS HERMIDA

Degree competences to which the subject contributes

Specific:

1. Model and simulate systems.

2. Understand and apply materials engineering techniques.

3. Understand the basics behind the use and programming of PCs, operating systems, databases and software with applications in engineering.
4. Understand and apply graphic engineering techniques.

Transversal:

5. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
6. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

Teaching methodology

The course uses the methodology exhibition by 5%, individual work by 60%, work in groups by 35%.
Computation of total project-based learning represents 30%.

Learning objectives of the subject

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Ability to verify the design of parts and mechanisms through simulation techniques SolidWorks.
Knowledge of SolidWorks Simulation components for practical work and projects.
Ability to use motion simulation techniques for time and events, as well as simulation techniques using Finite Element Analysis.
Ability to use the Motion Simulation and Animation parameters for acceleration, speed and strength.
Ability to use techniques Static Finite Element Analysis.

Study load

Total learning time: 150h	Hours large group:	0h	0.00%
	Hours medium group:	0h	0.00%
	Hours small group:	45h	30.00%
	Guided activities:	15h	10.00%
	Self study:	90h	60.00%

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Content

Kinematic and dynamic analysis of mechanisms.	Learning time: 50h Theory classes: 5h Laboratory classes: 10h Self study (distance learning): 16h 40m Group work (distance learning): 13h 20r Guided activities: 5h

Description:
It in-depth study and practice the techniques of motion simulation of mechanisms by SolidWorks Motion.

Specific objectives:

Topic1- Speeds, accelerations, forces, rigid contacts, friction, damping.

- Use the range of motion of an assembly to generate animations
- Use SW Motion to simulate the operation of a manual mechanism and determine the required torque.
- Build models to simulate kinematics.
- Create local relations to a study of movement.
- Create and modify diagrams of results (post-processing)
- Check the interference of the components.
- Apply Contact the components.
- Specify Contacts Friction of solid bodies.
- Add springs with damping assembly.

Topic2- Contacts advanced, cams, flexible joints. Using expressions to prescribe magnitudes.

- Understand the definition and description of contacts
- Learn about the flexible connections "sockets" (bushings) vs. rigid.
- Create the path that a point for the profile of a cam.
- Use expressions for forces and motors
- Use a spline to control the motor

Topic3- Study of redundancies, based on simulation events Export to Finite Element Analysis.

- Understand the redundancies and how they affect the simulation.
- Use flexible relations to automatically eliminate redundancies in a mechanism.
- Assign the stiffness of each relationship individually.
- Know how to build assemblies without redundancies.
- Understand the event-based simulation.
- Applying Servo Motors.
- Create events with timing and specific logic.
- Define a Single Moment of Action.
- Export loads from SW to SW Motion Simulation.
- Perform a structural analysis in SW Simulation.

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Simulation of the static structural behavior of parts and assemblies.

Learning time: 50h

Theory classes: 5h
Laboratory classes: 10h
Self study (distance learning): 16h 40m
Group work (distance learning): 13h 20r
Guided activities: 5h

Description:
As an application of the results obtained by simulation techniques of movement, is made a basic study of the static structural simulation techniques of SolidWorks Simulation.

Specific objectives:
Topic 1 - Basic study, environmental conditions.
· Run a linear static analysis with solid elements.
· Understand the influence of mesh density on the results of stresses and displacements.
· Use various methods to present the results of FEA.

Topic 2 - Sets and mesh refinement.
· To illustrate the differences between modeling errors and individualization.
· Use the control mesh.
· Understand stress concentrations.
· Perform simple structural assemblies.

Topic 3 - Adaptive meshing.
· Analyze assemblies with different connectors and contact conditions.
· Apply and define contact conditions.
· Understand the mesh compatibility with different contact conditions.

Definition and validation of design on a real project.

Learning time: 50h

Theory classes: 5h
Laboratory classes: 10h
Self study (distance learning): 16h 40m
Group work (distance learning): 13h 20r
Guided activities: 5h

Description:
Based on project designed, depending on their characteristics, each group of students can perform the tasks required to achieve the objectives:

Specific objectives:
· Describe the parameters that you want to verify and validate.
· Make decisions about which elements are important for the simulation.
· Simplify the Assemblies to generate simulations that can be implemented and to obtain the desired values¿¿.
· Perform the simulation of movement, obtaining the animation and the values ¿¿of the parameters.
· Perform the simulation of loads on a piece critical of the values ¿¿obtained.

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Qualification system

Continuous evaluation of student work.
Deliveries are evaluated weekly issues raised and the work done in the project.
- Delivery of the exercises conducted 50%
- Individual assessment of Project 30%
- Assessment Project Group 20%

The specific weight in the final of transversal competences is about 5% each.
This subject has no re-evaluation

Bibliography

Basic:

Dassault Systèmes SolidWorks Corporation. Manual SolidWorks motion: SW 2013. Massachusetts: Dassault Systèmes SolidWorks Corporation, 2013.

Dassault Systèmes SolidWorks Corporation. Manual SolidWorks simulation : SW 2013. Massachusetts: Dassault Systèmes SolidWorks Corporation, 2013.

Dassault Systèmes SolidWorks Corporation. Manual SolidWorks simulation professional : SW 2011. Massacgusetts: [Dassault Systèmes SolidWorks Corporation], [2011].

Complementary:

Dassault Systèmes SolidWorks Corporation. Manual SolidWorks simulation premium : nonlinear SW 2011. [s.l.]: [Dassault Systèmes SolidWorks Corporation], [2011].

Dassault Systèmes SolidWorks Corporation. Manual SolidWorks simulation premium : dynamics SW 2011. [s.l.]: [Dassault Systèmes SolidWorks Corporation], [2011].