Course guide
240617 - 240617 - Engineering Design Validation

Last modified: 16/05/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 717 - DEGD - Department of Engineering Graphics and Design.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** English

LECTURER

Coordinating lecturer: Ramos Cabal, Alba

Others: Ramos Cabal, Alba

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
3. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.
4. Knowledge on applied thermodynamics and heat transfer. Basic principles and their application to solve engineering problems.
5. Knowledge of basic principles of mechanical fluids and their application to solve engineering problems. Calculation of pipes, channels and systems of fluids.
6. Knowledge and use of electric machines and circuit theory principles.
7. Thermal engineering applied knowledge.
8. Basic knowledge on the use and programming of computers, operative systems, data bases and computer software with an engineering application.
9. Knowledge and capacity to calculate and design industrial structures and buildings.
10. Knowledge and capacities to apply fundaments of materials' elasticity and resistance to the behaviour of real solids.
11. Knowledge and capacities to apply in materials engineering.

Transversal:
1. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
2. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

TEACHING METHODOLOGY

This is a face-to-face course(*) and eminently practical, with expository and participatory classes with learning and subsequent completion of different application exercises, carried out on the computer and supported by a commercial C.A.D. program.
The classes are given in a computer room, with a capacity of 32 students, one weekly session of 3 hours. One student per computer.
The statements of the exercises to be carried out are in the notes PRACTICES OF THE COURSE, on the website of the Department YIN-DEGE-SGO or on the UPC Drive, and on the ATENEA Virtual Campus.

(*) As an exception, and as a consequence of the health crisis caused by the Covid19, the course will be online as long as the sanitary conditions do not allow to conduct face-to-face sessions.

LEARNING OBJECTIVES OF THE SUBJECT

Identify and evaluate tools capable of applying and visualizing content, representing and simulating processes and designs. Through the Solid Works program and its complementary modules: Simulation, FloXpress, Routing.
The objective is to never replace the content of previous subjects, but to give continuity to the student's knowledge of the program, relating it to concepts learned later.
With the applications, the student will be able to incorporate these concepts and tests in their designs and calculate and modify their shapes, dimensions, properties and types of materials, optimizing the design process. Finally, it is about validating engineering designs.
Give continuity to the student's knowledge of the program, relating it to previously learned processes and concepts.

STUDY LOAD

Type	Hours	Percentage
Self study	67,5	60.00
Hours medium group	45,0	40.00

Total learning time: 112.5 h

CONTENTS

Simulation. Static analysis. Buckling analysis, beams and structures.

Description:
Buckling analysis. Stages of analysis. Structural members. Creation of structures. Armor heads.

Related competencies :
CETI3. Knowledge and capacities to apply fundaments of materials' elasticity and resistance to the behaviour of real solids.
CE3. Basic knowledge on the use and programming of computers, operative systems, data bases and computer software with an engineering application.
CETI5. Knowledge and capacities to apply in materials engineering.
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

Full-or-part-time: 25h 30m
Practical classes: 10h
Self study : 15h 30m

Static analysis. Stages of analysis. Connectors and welding.

Description:
F.E.M Introduction. Mechanical properties. Stages of an analysis. Materials. Fasteners. External loads. Tights. Adaptive solutions. Paths. Diagrams Security factor. Contacts. Welding.

Related competencies :
CETI3. Knowledge and capacities to apply fundaments of materials' elasticity and resistance to the behaviour of real solids.
CEM4. Knowledge and capacity to calculate and design industrial structures and buildings.
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.
CETI5. Knowledge and capacities to apply in materials engineering.
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

Full-or-part-time: 20h
Practical classes: 8h
Self study : 12h

Fall analysis, fatigue. Design studio.

Description:
Fall study. Stages of analysis. Fatigue study. Stages of analysis. Axle fatigue. Fatigue from various events. Definition of properties and variables. Optimization process. Results visualization.

Related competencies :
CETI3. Knowledge and capacities to apply fundaments of materials' elasticity and resistance to the behaviour of real solids.
CE3. Basic knowledge on the use and programming of computers, operative systems, data bases and computer software with an engineering application.
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.
CETI5. Knowledge and capacities to apply in materials engineering.
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

Full-or-part-time: 34h 30m
Practical classes: 14h 30m
Self study : 20h

FloXpress. Pressure vessels. Temperature.

Description:
Static study. Internal pressure. Gravity. Thermal study. FlowXpress. Fluid inlets and outlets. Idoineity of geometry. Boundary conditions. Simulation.

Related competencies :
CETI3. Knowledge and capacities to apply fundaments of materials' elasticity and resistance to the behaviour of real solids.
CE3. Basic knowledge on the use and programming of computers, operative systems, data bases and computer software with an engineering application.
CETI2. Thermal engineering applied knowledge.
CE8. Knowledge of basic principles of mechanical fluids and their application to solve engineering problems. Calculation of pipes, channels and systems of fluids.
CE7. Knowledge on applied thermodynamics and heat transfer. Basic principles and their application to solve engineering problems.
CETI5. Knowledge and capacities to apply in materials engineering.
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

Full-or-part-time: 16h
Practical classes: 6h
Self study : 10h

Routing electric. Pipping. Advanced surfaces.

Description:
Insertion of standard electrical elements. Type of wiring. Forks. Create piping systems. Edition. Insertion of elements.

Related competencies :
CETI3. Knowledge and capacities to apply fundaments of materials' elasticity and resistance to the behaviour of real solids.
CE3. Basic knowledge on the use and programming of computers, operative systems, data bases and computer software with an engineering application.
CE10. Knowledge and use of electric machines and circuit theory principles.
CE8. Knowledge of basic principles of mechanical fluids and their application to solve engineering problems. Calculation of pipes, channels and systems of fluids.
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.
CETI5. Knowledge and capacities to apply in materials engineering.
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

Full-or-part-time: 16h
Practical classes: 6h
Self study : 10h

GRADING SYSTEM

Course grade = 0.4 Average weekly exercises grade + 0.6 Final report and presentation grade.
The pass grade will be > or = 4.95

EXAMINATION RULES.

The student has a week of time after the corresponding class, to send the session files through the tasks, created within the course at the Athena Virtual Campus, taking into account that only one submission fits in each task. If the file is very large it can be compressed (zip, rar).
Each student will select an engineering design and complete the design analysis and validation process. This work will be presented in REPORT and POWER POINT format at the end of the course.
The non-presentation of the practices carried out or the final work and if the work is not strictly personal, will imply that the Grade course be = 0.

BIBLIOGRAPHY

Basic:
- Gómez González Sergio, Sergio. Solid Works Práctico II. 1a. Barcelona: Marcombo, 2008. ISBN 9788426718013.
- Félez, Jesús [et al.]. Ingeniería gráfica y de diseño. Madrid: Síntesis, 2008. ISBN 9788497564991.
- Bertoline, Gary R. Technical graphics communication. 3rd ed. Boston: McGraw-Hill, 2003. ISBN 0073655988.
- Gómez González Sergio. Solid Works Simulation. Madrid: Ra-Ma, 2010. ISBN 9788499640068.

Complementary:
- AENOR. Normas UNE Dibujo Técnico. 4a. Madrid: AENOR, 1997. ISBN 8481430528.
- Sergio, Gómez, González. SolidWorks Office Professional. Barcelona: Marcombo, 2008. ISBN 9788426714589.
- Chevalier, A. Dibujo Industrial. 1a. Barcelona: Montaner y Simón, 1979. ISBN 8427404425.
- Bogoliubov, S. Dibujo Técnico. Moscú: Mir, 1988. ISBN 5036079.

RESOURCES

Computer material:
- S.G.O.

Hyperlink:
- PRACTIQUES DEL CURS

Other resources:
SolidWorks Simulation Training. Dassault Systèmes SW Corp. Concord, MA, 2011. Nº SERIE:2480966140-ESP0002