Course guide
320174 - CM - Mechanical CAD

Last modified: 02/04/2024

Unit in charge:	Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit:	717 - DEGD - Department of Engineering Graphics and Design.

Degree:	BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Moisès Morón Soler

Others:

PRIOR SKILLS

Having obtained the knowledge of the courses Graphic Expression and Engineering Graphics.
In addition, other generic skills and qualities are required and applicable to any activity in academic level, as can be: the spirit of sacrifice, neatness, ability to synthesize, work in groups, respect for classmates and teacher, constance...

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
2. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
3. 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.

TEACHING METHODOLOGY

Lab based learning: sessions with presentation of concepts, techniques and procedures, combined with practical work solving exercises and computer-lab CAD.
- Individual study and preparation exercises.
- Project based cooperative learning, which focuses on problem solving and projects evaluated together.
The sessions of practical work in the classroom will be of three types:
a) Session that will consist of statements and practices guided process to get a result.
b) Practice sessions that consist only of statements without specifying the process for obtaining the solution. Free problems.

LEARNING OBJECTIVES OF THE SUBJECT

OAG1. Facilitate and enhance the capacity of abstraction.
OAG2. Develop the space imagination.
OAG3. Introduce concepts, techniques and methodologies in the area of Graphic Expression in Engineering.
OAG4. Familiarization and use technical graphic language

STUDY LOAD

Type	Hours	Percentage
Hours small group	60,0	40.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

TOPIC 1: Wheelbarrows

Description:
P1: CAD design of a wheelbarrow hand (tubular, sheet, wheel axles, etc ...)
P2: Free CAD design of a wheelbarrow

Full-or-part-time: 8h
Laboratory classes: 8h

TOPIC 2: Transmission - Gears

Description:
Design theory of gears and transmissions using gear tolerances, surface signs, dimensional tolerances and annotations.
Review of Theory of gears and transmissions.

Specific objectives:
Understand the gears.
0 gears able to draw from.
Understanding the signs surface tolerances, geometric tolerances and annotations.

Full-or-part-time: 8h
Laboratory classes: 8h

TOPIC 3: Estructures and welding

Description:
Design with standardized profiles (IPN, etc ...)
3D design sketch
Cutting and welding profiles between them.
Theory of welding.

Full-or-part-time: 4h
Laboratory classes: 4h

TOPIC 4: Metal sheet

Description:
Review of transformation theory of metal sheet.
Design pieces of metal sheet transactions and corresponding 2D representation.

Full-or-part-time: 8h
Laboratory classes: 8h

TEMA 5: Surfaces and Nurbs

Description:
Theory of surfaces to understand the mathematics education and its variants.
Design with free surfaces
Design with NURBS surfaces

Full-or-part-time: 8h
Laboratory classes: 8h

TOPIC 6: design tables

Description:
Designing with tables and equations design sketches to facilitate generative model variants.

Full-or-part-time: 4h
Laboratory classes: 4h

TOPIC 7: Macros -API

Description:
Macros models to generate programs and associated SW facilitate the work of CAD modeling.

Full-or-part-time: 4h
Laboratory classes: 4h

TOPIC 8: Finite elements - mechanical simulation

Description:
Understand and know how to use the finite element mechanical simulation carried out by SW

Full-or-part-time: 4h
Laboratory classes: 4h

TOPIC 9: Finite Elements - thermal simulation

Description:
Understanding how to use thermal simulation for finite element SW.

Full-or-part-time: 8h
Laboratory classes: 8h

TOPIC 10: Final Project

Description:
To end the course will be a final project following bases but also established a design freedom to apply their knowledge.

Full-or-part-time: 12h
Laboratory classes: 12h

ACTIVITIES

P1: wheelbarrow

Full-or-part-time: 4h
Theory classes: 4h

P2: Free wheelbarrow

Full-or-part-time: 4h
Theory classes: 4h

P3: Gear assembly

Full-or-part-time: 4h
Theory classes: 4h

P4: Free transmision

Full-or-part-time: 4h
Theory classes: 4h

P5: table with standard profiles

Full-or-part-time: 2h
Theory classes: 2h

P6: Free structure with standard profiles

Full-or-part-time: 2h
Theory classes: 2h

P7: Electrical box design

Full-or-part-time: 1h
Theory classes: 1h

P8: Vent cap

Full-or-part-time: 1h
Theory classes: 1h

P9: Metal sheet operations

Full-or-part-time: 1h
Theory classes: 1h

P10: Sheet metal forming

Full-or-part-time: 1h
Theory classes: 1h

P11: Metal sheet of CD drive

Full-or-part-time: 2h
Theory classes: 2h

P12: Bin body and free stand

Full-or-part-time: 2h
Theory classes: 2h

P13: Body and support of hair dryer

Full-or-part-time: 4h
Theory classes: 4h

P14: Free hand support

Full-or-part-time: 4h
Theory classes: 4h

P15: design tables

Full-or-part-time: 4h
Theory classes: 4h

P16: Macros API

Full-or-part-time: 4h
Theory classes: 4h

P17: Navier vs Von Mises

Full-or-part-time: 1h
Theory classes: 1h

P18: Contact analysis

Full-or-part-time: 1h
Theory classes: 1h

P19: Static analysis and fatigue test

Full-or-part-time: 2h
Theory classes: 2h

P20: Thermal simulation

Full-or-part-time: 2h
Theory classes: 2h

P21: free simulation work

Full-or-part-time: 2h
Theory classes: 2h

Final project

Full-or-part-time: 8h
Theory classes: 8h

GRADING SYSTEM

The evaluation acquisition of knowledge, skills and abilities is calculated following the percentage:
- Problem deliveries per topic...80%
- Final Work 20%

BIBLIOGRAPHY

Basic:
- Cobos Gutiérrez, Carlos; Río Cidoncha, María Gloria del. Ejercicios de dibujo técnico I : resueltos y comentados. Albacete: Tébar Flores, 1996. ISBN 8473601602.
- Auria Apilluelo, José M; Ubieto Artur, Pedro; Ibáñez Carabantes, Pedro. Dibujo industrial : conjuntos y despieces. Madrid [etc.]: Paraninfo, cop. 2000. ISBN 84-283-2729-7.
- Félez, Jesús; Martínez, María Luisa. Dibujo industrial. 2ª ed. revisada. Madrid: Síntesis, DL 1996. ISBN 8477383316.
- Giesecke, Frederick E. Technical drawing. 13th ed. Upper Saddle River, NJ: Prentice Hall, cop. 2009. ISBN 9780135135273.
- Ramos Barbero, B.; García Maté, E. Dibujo técnico [on line]. 3ª ed. Madrid: AENOR, 2016 [Consultation: 03/04/2023]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6774114. ISBN 9788417891237.
- Gómez González, Sergio. SolidWorks: Office Professional [on line]. Barcelona [etc.]: Marcombo [etc.], 2008 [Consultation: 03/10/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=3175366. ISBN 9788426714589.
- Gómez González, Sergio. SolidWorks simulation. Paracuellos de Jarama, Madrid: Ra-Ma, cop. 2010. ISBN 978-84-9964-006-8.