

Course guide

220207 - 220207 - Machine Design and Manufacturing Technologies

Last modified: 19/04/2023

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.

Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 7.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JASMINA CASALS TERRE

Others: LAURA CARRION LOPEZ
Farré Lladós, Josep

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Knowledge and ability to design and calculate integrated manufacturing.

TEACHING METHODOLOGY

The teaching methodology is divided in three parts:

Theoretical content sessions.

Lab sessions or Problem solving sessions

Autonomous work and homeworks

In the theoretical content sessions, teachers will introduce the theoretical foundations of the subject, concepts, methods and results illustrated with suitable examples to facilitate understanding.

In the problem solving sessions, the teacher will guide the student in the application of theoretical concepts for troubleshooting. Exercises will be proposed and solved in the classroom and outside the classroom, to promote contact and use of the basic tools necessary for the troubleshooting.

Students, independently, have to work the material provided by the teacher and the result of the sessions to assimilate and fix problem concepts. The faculty will provide a curriculum and activity tracking (ATHENA).

LEARNING OBJECTIVES OF THE SUBJECT

The basic objectives of this subject are the following:

Machine elements design and manufacturing processes of metallic materials. Capacity to choose a particular manufacturing method for a part type, according to their properties and characteristics, number of parts to be manufactured ...

Calculation procedures for designing different machine elements, based on the most common failure criteria, and the implications of material fatigue.

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	24.00
Self study	120,0	64.00
Hours small group	22,5	12.00

Total learning time: 187.5 h

CONTENTS

Module 1: Introduction to the design and manufacturing of mechanical elements

Description:

- Relation between the design and the manufacturing process.
- Flexible and Concurrent engineering

Related activities:

Activity 3: Midterm
Activity 4: Final

Full-or-part-time: 4h

Theory classes: 2h
Self study : 2h

Module 2: Machine element design

Description:

- Theory of mechanical fatigue and union.
- Design, selection and calculation of non-permanent fasteners.
- Design, selection and calculation of permanent fasteners.
- Design, selection and calculation of transmission elements.
- Design, selection and calculation of suspension elements

Related activities:

- Activity 1: Homework
- Activity 2: Lab report
- Activity 3: Midterm
- Activity 4: Final

Full-or-part-time: 73h 30m

Theory classes: 15h
Laboratory classes: 8h 30m
Self study : 50h

Module 3: Manufacturing Quality Control

Description:

- Process measurement and quality control in manufacturing.
- Dimensional and geometric tolerances
- Uncertainty of measurement
- Functional Dimension
- Surface Finish and Hardness

Related activities:

- Activity 1: Homework
- Activity 2: Lab report
- Activity 3: Midterm
- Activity 4: Final

Full-or-part-time: 32h

Theory classes: 8h
Laboratory classes: 6h
Self study : 18h

Module 4 Manufacturing processes

Description:

- Design, calculation and molding tool manufacturing.
- Design and fabrication of matrix calculation of hot metal deformation.
- Design and fabrication of matrix calculation of cold metal forming.
- Design, symbols and welding processes.
- Machining Processes.
- Prototyping Processes.

Related activities:

- Activity 1: Homework
- Activity 2: Lab report
- Activity 3: Midterm
- Activity 4: Final

Full-or-part-time: 78h

Theory classes: 20h

Laboratory classes: 8h

Self study : 50h

GRADING SYSTEM

The final grade depends on the following activities:

- Activity 1: Homeworks weight: 10%
- Activity 2: Lab reports, weight: 15%
- Activity 3: Midterm Exam, weight: 25%
- Activity 4: Final Exam, weight: 50%

All students unable to attend the third activity (midterm exam), or not pass, will have the option to retrieve the mark during the fourth activity (final exam). Students with a mark less than 5 can do this new exam. The mark achieved is higher it will replace the previous one.

BIBLIOGRAPHY

Basic:

- Budynas, R. G.; Nisbett, J. K. Diseño en ingeniería mecánica de Shigley [on line]. 10ª ed. México: McGraw-Hill, 2019 [Consultation: 15/06/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pg-origsite=primo&docID=5485813>. ISBN 9781456267568.
- Salueña, Xavier; Nápoles, Amelia. Tecnología mecánica [on line]. 2ª ed. Barcelona: Edicions UPC, 2001 [Consultation: 08/01/2016]. Available on: <http://hdl.handle.net/2099.3/36437>. ISBN 8483014491.
- Kalpakjian, S.; Schmid, Steven R. Manufactura, ingeniería y tecnología [on line]. 7ª ed. México [etc.]: Pearson Educación, 2014 [Consultation: 20/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5323.

Complementary:

- Gómez González, Sergio. Control de calidad en fabricación mecánica. Barcelona: Ceysa, 2002. ISBN 8486108217.
- Fernández, J. Mª; Garrandés, C.Mª. Metrología en las PYMES: guía práctica. Llanera: Instituto Tecnológico de Materiales, 2003.