

Course guide

240IME34 - 240IME34 - Machine Design Methodology

Last modified: 16/05/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.

Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN RESEARCH IN MECHANICAL ENGINEERING (Syllabus 2021). (Optional subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Blanco Romero, Elena

Others: Domènech Mestres, Carles
Blanco Romero, Elena

PRIOR SKILLS

Knowledge of machine design

TEACHING METHODOLOGY

The teaching methodology is based on two types of activities.

Classes in which the teacher provides concepts and knowledge and through practical exercises illustrates how to apply knowledge exposed to situations and solving real problems. It is a class of 1,5 hours each week.

Practical sessions in small groups in which students perform activities under the supervision of a teacher.

There are practical sessions where the students become familiar with various aspects of machine design methodology guided by the teacher in the perspective of the job done for the course. It is a session of 1,5 hours every week.

The work of the course is delivered at the end of the course.

LEARNING OBJECTIVES OF THE SUBJECT

Objective: To ensure that students acquire knowledge of machine design methodology and its different stages. To integrate the tools and the knowledge acquired in other subjects in the development of projects.

STUDY LOAD

Type	Hours	Percentage
Hours large group	20,3	18.03
Hours small group	20,3	18.03
Self study	72,0	63.94

Total learning time: 112.6 h

CONTENTS

Engineering design methodologies. Phase's methodology

Description:

Includes:

1. Introduction Types of methodologies
2. Phase methodologies. General structure
3. Definition and specifications
4. Conceptual design
5. Materialization design
6. Selection of materials in mechanical design: metals, sheet metal forming, plastics.
7. Selection of actuators
8. Calculation of components: shafts, welding, springs.

Specific objectives:

Understand the importance of following a methodology in the design process.

To know the different methodologies emerging in the design of machines.

Understand the basic structure of the phases methodology and apply it to a machine design project.

Expand knowledge about tools for calculating machine elements.

Related activities:

Theoretical sessions in which teachers provide concepts and knowledge about these aspects.

Practical sessions where the main lines of project development are traced throughout the course, applying the described phase methodology.

Directed work where this project is developed in detail.

Full-or-part-time: 44h 15m

Theory classes: 6h

Laboratory classes: 3h

Guided activities: 15h

Self study : 20h 15m

Design support tools

Description:

Includes:

1. Materials in design. Metals and plastics: characteristics, good design practices. Specific sheet metal forming session
2. Motor selection: general vision for selection, types, control, characteristic curves, quick drives.
3. Transmissions and shafts calculation. Critical speeds and other characteristics
4. Welding: features, good practices, calculation and fatigue
5. Springs: type, selection and calculation
6. Architecture of the machine, design for manufacture and assembly (DFMA), design for the environment (DFE)

Specific objectives:

Integrate all the knowledge acquired in other subjects.

Related activities:

Theoretical sessions in which teachers provide concepts and knowledge about these aspects.

Practical sessions where the main lines of project development are traced throughout the course, applying the described phase methodology.

Directed work where this project is developed in detail.

Full-or-part-time: 68h 15m

Theory classes: 15h

Laboratory classes: 7h 30m

Guided activities: 25h

Self study : 20h 45m



GRADING SYSTEM

The rating system is:

Work the subject: 4/10 points

Final exam: 6/10 points

BIBLIOGRAPHY

Basic:

- Riba i Romeva, Carles. Diseño concurrente [on line]. Barcelona: Edicions UPC, 2002 [Consultation: 11/06/2018]. Available on: <http://hdl.handle.net/2099.3/36754>. ISBN 8483015986.
- Riba i Romeva, C. Selección de materiales en el diseño de máquinas [on line]. Barcelona: Edicions UPC, 2008 [Consultation: 13/09/2022]. Available on: <https://upcommons.upc.edu/handle/2099.3/36844>. ISBN 9788483017388.
- Riba Romeva, Carles. Disseny de màquines. Vol. 5 Metodologia [on line]. Barcelona: Edicions UPC, 1994-2002 [Consultation: 03/09/2015]. Available on: <http://hdl.handle.net/2099.3/36686>. ISBN 8483011905.
- Riba i Romeva, Carles. Disseny i càlcul de molles [on line]. Barcelona: Servei de Publicacions de la UPC, 1993 [Consultation: 29/05/2020]. Available on: <http://hdl.handle.net/2099.3/36327>. ISBN 8476532628.
- Niemann, G. Elementos de máquinas. Barcelona: Labor, 1987. ISBN 8433563262.

Complementary:

- Riba, Carles ; Molina, Arturo. Ingeniería concurrente : una metodología integradora. Barcelona: Edicions UPC, 2006. ISBN 9788483018996.
- Riba i Romeva, Carles. Recursos energètics i crisi: la fi de 200 anys irrepetibles. Barcelona: Octaedro, 2012. ISBN 9788499212661.