

60801 - Design and testing of machines and Integrated manufacturing systems

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	532 - Master's in Industrial Engineering
ECTS	6.0
Course	1
Period	Half-yearly
Subject Type	Compulsory
Module	---

1. Basic info

1.1. Recommendations to take this course

1.2. Activities and key dates for the course

2. Initiation

2.1. Learning outcomes that define the subject

2.2. Introduction

3. Context and competences

3.1. Goals

3.2. Context and meaning of the subject in the degree

3.3. Competences

3.4. Importance of learning outcomes

4. Evaluation

5. Activities and resources

5.1. General methodological presentation

The learning process designed for this course is based on the following:

Theoretical lectures on the foundations of the subject will be provided and student participation will be encouraged.

Classes of problems in which practical applications of the fundamentals presented in lectures will be held.

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Practical classes in workshop or laboratory will be a training series related to the subject and will be developed in small groups.

Personalized attention to students through tutorials.

Possibility of carrying out any other activities that the teacher deems appropriate (such as exercises, oral presentations by students, company visits, participation of outside guests experts) to achieve the learning objectives.

5.2.Learning activities

The program offered to the students to help them to obtain the expected learning outcomes includes the following activities:

Activity Type I : A lecturing program based on 27 hours of lectures in class covering most of the contents of the subject. Its aim is to present the knowledge and skills that must be acquired by the student and facilitate their assimilation, so that their monitoring is essential for the consolidation and development of programmed learning topics.

Activity Type II : Classes of problems (approximately 15 hours with the complete set of students). These kinds of problems are integrated with lectures to facilitate learning and provide a practical overview of knowledge.

Activity Type III : Practical sessions in workshop or laboratory (18 hours divided into 6 sessions of 3 hours with small groups of students). Complement those concepts of the subject for whose better understanding is necessary to use specific equipment or make complex computer calculation.

Activity type VII : Personal Study (approximately 85 hours of individual work).

Activity type VIII : Assessment tests / examination (approximately 5 hours)

Tutorials (about 5 hours)

5.3.Program

Contents

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1) Introduction to Machine Dimensioning

- Materials.
- Technical specifications.
- Notebook loads.
- Specifications.

2) Dimensioning Unions

- Mechanical joints: hooping, crimps, screws and rivets.
- No mechanical joints: Welding and adhesive.

3) Dimensioning of transmission elements.

- Dimensioning of shafts, pins and bearings.
- Dimensioning of couplings, belts and chains.
- Dimensioning of gear transmissions.

4) Flexible manufacturing systems: machine tools, material handling, monitoring and control systems.

- Principles for designing machine tools from components.
- Drives and motion transmission. Structures, interfaces and assembly.
- Diagnosis and control of manufacturing systems. Dynamics and vibrations

5) Geometric and Functional verification of production systems.

- Standardization. Modelling of production systems.
- Direct verification.
- Indirect verification.

6) Development of manufacturing cells.

- Rigid and flexible automated systems.
- Clustering methods for cell formation.
- Design of plant layout for cell manufacturing.

Practical sessions:

1. Dimensioning of a load cell, theoretical and practical analysis, experimental strain gauge application.
2. Analysis of photoelasticity stress concentrators and theoretical comparison by methods FEM.
3. Dimensioning of components using computer tools.
4. Experimental techniques for manufacturing systems verification.
5. Modeling and verification of machine tool.
6. Modeling and analysis of manufacturing cells.

5.4.Planning and scheduling

Schedule sessions and work presentations

The proposed methodology seeks to promote continued student work and focus on the more practical aspects related to design and testing of machines.

In whole group sessions the theoretical aspects are addressed in the form of master class and completed with the

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development of problems and technical case study.

The practical sessions take place in smaller groups to work with specialized applications and mechanical engineering equipment workshop and manufacturing and metrology laboratory. It aims is to promote hands-on learning, so the attendance is advised to practical sessions where direct experience is gained with the machines and manufacturing systems. At the end of each practical session, the immediate realization of a small control or script is required. In some cases, the practice session enables data collection for a more elaborate work that makes possible better assimilation of knowledge related to the subject. Such controls and work are required in case of choosing the gradual evaluation.

Planning and scheduling

6 ECTS: 150 hours / student distributed as follows:

The distribution of teaching (60 hours) is as follows:

- Lectures and development of technical cases and problem solving: 42 hours taught to the whole group, at 3 hours / week.
- Practical sessions in metrology laboratories and machining workshops: 18 hours spread over 6 sessions of 3 hours.

5.5. Bibliography and recommended resources

- Castany Valeri, Carlos Javierre Lardiés. Zaragoza: Prensas Universitarias de Zaragoza, 2002
- Marinescu, Ioan D. Handbook of Machine Tool Analysis (Ioan D. Marinescu. Marcel Dekker, 2002
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- Handbook of cellular manufacturing systems / edited by Shahrukh A. Irani New York [etc.]: John Wiley & Sons, cop. 1999
- Deutschman, Aaron D. Diseño de máquinas: teoría y práctica / Aaron D. Deutschman, Walter J. Michels, Charles E. Wilson. - 3a. reimp. México: Compañía Editorial Continental, cop. 1985 (imp. 1989)
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- Budynas, Richard G. Diseño en ingeniería mecánica de Shigley / Richard G. Budynas, J. Keith Nisbett ; revisión técnica, Jesús Manuel Dorador González ... [et al.] . - 9ª ed. México [etc.] : McGraw-Hill, cop. 2012
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