



Universitat de Lleida

DEGREE CURRICULUM **MANUFACTURING TECHNOLOGIES**

Coordination: PIJUAN CASES, JORDI

Academic year 2023-24

Subject's general information

| | | | | |
|---|--|---------------|------------------|------------------|
| Subject name | MANUFACTURING TECHNOLOGIES | | | |
| Code | 102309 | | | |
| Semester | 2nd Q(SEMESTER) CONTINUED EVALUATION | | | |
| Typology | Degree | Course | Character | Modality |
| | Bachelor's Degree in Mechanical Engineering | 3 | COMPULSORY | Attendance-based |
| | Double bachelor's degree: Degree in Mechanical Engineering and Degree in Energy and Sustainability Engineering | 4 | COMPULSORY | Attendance-based |
| Course number of credits (ECTS) | 6 | | | |
| Type of activity, credits, and groups | Activity type | PRALAB | PRAULA | TEORIA |
| | Number of credits | 0.4 | 2.6 | 3 |
| | Number of groups | 4 | 2 | 1 |
| Coordination | PIJUAN CASES, JORDI | | | |
| Department | INDUSTRIAL AND BUILDING ENGINEERING | | | |
| Teaching load distribution between lectures and independent student work | 40% lectures in class 60% independent student work | | | |
| Important information on data processing | Consult this link for more information. | | | |
| Language | Catalan Also some material could be in Spanish or in English | | | |
| Distribution of credits | Jordi Pijuan Cases 3 Juan Jose Gonzalez Fabra 6,8 | | | |

| Teaching staff | E-mail addresses | Credits taught by teacher | Office and hour of attention |
|---------------------------|---------------------------|---------------------------|------------------------------|
| GONZALEZ FABRA, JUAN JOSE | juanjose.gonzalez@udl.cat | 6,8 | |
| PIJUAN CASES, JORDI | jordi.pijuancases@udl.cat | 3 | |

Subject's extra information

It is essential to have studied previously, and its advisable to have passed the following subjects:

- GRAPHICS EXPRESSION I.
- MATERIAL SCIENCE.
- THEORY OF MECHANISMS.
- ELASTICITY AND STRENGTH OF MATERIALS I.
- MATERIALS FOR MECHANICAL MANUFACTURING.

In relation to the safety rules established in laboratories, it is required to state

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Blue laboratory gown from UdL (unisex)
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos
Centre the Cultures i Cooperació Transfronterera

<http://www.publicacions.udl.cat/>

The use of other elements of protection (for example caps, masks, gloves of chemical or electrical risk, etc.) will depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI.

Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the **consequences in the evaluation** of the subject that are described in this course guide.

GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or short skirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.
- Keep the laboratory gown laced in order to be protected from spills of chemicals.
- Bangles, pendants or wide sleeves are not allowed as they can be trapped.
- Avoid the use of contact lenses, since the effect of the chemical products is much bigger if they enter between the contact lense and the cornea. Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.

- Wash your hands whenever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following information of the *Servei de Prevenció de Riscos Laborals de la UdL*:

- <http://www.prevencio.udl.cat/ca/integracio-a-la-docencia/>
- <http://www.sprl.udl.cat/ca/capsules-formatives/>

Learning objectives

Provide students with the basic knowledge and techniques, tools, skills and abilities to effectively develop professionals activities involved in manufacturing of metal parts, due to its relevance in the industrial world. For this reason, the topics considered to be developed are: metrology, sheet metal work, machining processes and material removal, numerical control programming and welding and brazing systems.

Competences

Cross-disciplinary competences

- **EPS1.** Capacity to solve problems and prepare and defence arguments inside the area of studies.
- **EPS6.** Capacity of analysis and synthesis.

Specific competences

- **GEM25.** Knowledge and capacity for the application of materials engineering.
- **GEM26.** Applied knowledge of manufacturing systems and processes, metrology and quality control.

Subject contents

Unit 1 - METROLOGY

Unit 2 - METAL FORMING PROCESSES.

Unit 3 - MACHINING PROCESSES AND MATERIAL REMOVAL.

Unit 4 - NUMERICAL CONTROL.

Unit 5 - WELDING TECHNOLOGIES

Unit 6 - RAPID PROTOTYPING

Unit 7 - UNCONVENCIONAL MACHINING PROCESSES.

Methodology

Lectures: theoretical contents and proposal and/or resolution of some practical examples. In the 2021-22 academic year, these sessions may be held online using the "Videoconferencia" tool of the virtual campus (SAKAI).

Problems: Presentation and discussion of problems that will eventually solve by the students in an individual way or in groups. In the 2021-22 academic year, these sessions may be held online using the "Videoconferencia" tool of the virtual campus (SAKAI).

Group work: Development of a study in groups on a set of different parts to be manufactured.

Practices: Several laboratory sessions will be done: metrology, sheet metal workshop, sheet metal design using

MANUFACTURING TECHNOLOGIES 2023-24

CAD, lathe and mill machines, CN simulation using CIMCO (3 sessions), CAD/CAM, and welding and brazing. Due to the pandemic situation, most of the lab sessions will be replaced by video sessions.

Development plan

| Week | Methodology | Unit | Attendance hours | Autonomous work hours |
|-------|---------------------------------|--|------------------|-----------------------|
| 1 | Lectures | Unit1: Theory Unit 1: Problems | 2 0 | 0 0 |
| 2 | Lectures Problems | Unit1: Theory Unit 1: Problems | 2 2 | 3 3 |
| 3 | Lectures Practice | Unit2: Theory Practice Metrology | 2 2 | 3 3 |
| 4 | Lectures Practice | Unit 2: Theory Practice sheet metal workshop | 2 2 | 3 3 |
| 5 | Lectures Problems | Unit 3: Theory Unit 2: Problems | 2 2 | 3 3 |
| 6 | Lectures Problems / Practice | Unit 3: Theory Unit 2: Problems Practice: design sheet metal parts using CAD | 2 2 | 3 3 |
| 7 | Lectures Practice | Unit 3: Theory Practice: lathe & mill machines | 2 2 | 3 3 |
| 8 | Lectures Problems | Unit 3: Theory Unit 3: Problems | 2 2 | 3 3 |
| 9 | Evaluation | Exam 1 | 2 | 4 |
| 10 | Lectures Problems | Unit 4: Theory Unit 3: Problems | 2 2 | 3 3 |
| 11 | Lectures Practice | Unit 4: Theory Practice: CIMCO (I) | 2 2 | 3 3 |
| 12 | Lectures Practice | Unit 5: Theory Practice: CIMCO (I) | 2 2 | 3 3 |
| 13 | Lectures Practice | Unit 5: Theory Practice: CIMCO (I) | 2 2 | 3 3 |
| 14 | Lectures Practice | Unit 6: Theory Practice CAD/CAM | 2 1 | 3 3 |
| 15 | Lectures Practice | Unit 7: Theory Practice welding & brazing | 2 2 | 3 3 |
| 16-17 | Evaluation | Exam 2 | 2 | 4 |

Evaluation

Several evaluation activities will be carried out:

- 1st Individual written exam focused on theory/practical work developed along of the midterm. The test will be done on the date scheduled in the academic calendar (approx. week 9th).
- 2nd individual written exam will assess the part related with the problems carried out until the midterm. The exam will be done just after the 1st exam.
- Attendance at laboratory and experimental parts is mandatory. The student could only get in the laboratory if he/she is wearing the corresponding PPE indicated in the laboratory exercise guidance.
- Several works in groups will be proposed, which must be delivered in the period scheduled for evaluation.
- 3rd individual written exam which will be focused on the theory/practical work developed in the second quarter. The exam will be done on the scheduled date in the academic calendar (approx. week 17th or 18th).
- 4th individual written exam will assess the part related with the problems carried out in the second part of the term. The exam will be done just after the 3rd exam.
- In case that the weighted grade of the written exams, based on the relative weight of each of them, is less than 3,5, the student will not pass the subject, and its grade will be the minimum of the average percentage based on the relative weight of each of exam (which are shown in the table) or 3,5.
- Recovery exam (week 20th), In order to attend to these exam, it will be required that the weighted note based on the 4 written exams must be equal to or greater than 3,5. This exam will assess all the theory and work developed throughout the term. The exam will have both theoretical and problems resolution. If a student attends to this exam, the grade achieved replaces the previous grades from written exams, whether is higher or lower. In case the grade of recovery exam is less than 3,5, the student will not pass the subject, and the grade will be the minimum between the recovery exam grade and 3,5.

The weight established to each evaluation activity, out of a total of 100, is as follows:

| Activity | Weight |
|-----------------|--------|
| 1a written exam | 20 |
| 2a written exam | 20 |
| 3a written exam | 20 |
| 4a written exam | 20 |
| Work in groups | 10 |
| Lab exercises | 10 |

For those who request it, the alternative evaluation will be carried out in a single exam at the end of the semester that will be 100% of the grade for the subject.

Bibliography

GROOVER, M.P. "Fundamentos de manufacturamoderna". Ed. Mc GrawHill 2007

KALPAKJIAN, S. "Manufactura: Ingeniería y Tecnología". Ed. PearsonEducación 2002

SCHEY, J."Introduction to manufacturing processes".Ed. Mc GrawHill 2000

Singh, R."Applied Welding Engineering". Ed. Elsevier Inc. 2012

SALUEÑA X. i NÁPOLES A. " Tecnología Mecánica". Ed.CPDA-ETSEIB. 2000

VIVANCOS, J. "Procesos mecanizado". Tomo I. Ed. CPDA-ETSEIB. 1999.

VIVANCOS, J. "Control Numèric". Ed. UPC Barcelona 1996.

COMPLEMENTARY BIBLIOGRAPHY

COCA, P. i ROSIQUE, J. "Tecnología Mecánica i Metrotècnia". Ed. Piràmide 1984.

LASHERAS ESTEBAN, J.M. "Tecnologia mecànica i Metrotècnia". Ed. Donostiarra. 1987.

Falk, D. i Gockel, H. "Metrotècnia Fundamental". Ed. Reverté, 1986.