Universidad Zaragoza

Academic Year/course: 2021/22

29720 - Manufacturing Technology I

Syllabus Information

Academic Year: 2021/22
Subject: 29720 - Manufacturing Technology I
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 330 - Complementos de formación Máster/Doctorado
434 - Bachelor's Degree in Mechanical Engineering
ECTS: 6.0
Year: 434 - Bachelor's Degree in Mechanical Engineering: 3
330 - Complementos de formación Máster/Doctorado: XX

Semester: First semester
Subject Type: 434 - Compulsory
330 - ENG/Complementos de Formación
Module:

1. General information

1.1. Aims of the course

The different manufacturing processes (forming, material handling, inspection) aim to obtain products from preforms or raw materials, carried out by a certain method in systems of manufacturing, more or less automated, supported by various production resources, and in accordance with certain known laws or rules and subject to non-dominated laws.
The objective of the course is learning aspects related to the machining, metrology and control processes of quality involved in the production of mechanical components. That is, the design and development of the manufacture of products according to design specifications and within the requirements of quality, costs and delivery times, as well as the equipment (systems) to carry out these processes at different levels automation and flexibility.
This course focuses on the planning of the machining processes, so present in the final conformation of products and means of production, and in the models of industrial quality, in which the functions of manufacturing and measurement.
In this sense, the subject intends for the student to know the fundamentals of the different machining processes (conventional, high speed and unconventional processes), with sufficient capacity to analyze the influence of mechanical principles that govern them and plan machines, tools, tools, machining operations and systems of metrological control, planning a? process sheet ?. Sufficient knowledge must also be acquired to develop simple CNC programs using different machine tool programming systems (programming ISO, CAD / CAM).
It is also about providing the student with a global vision of the quality management techniques applied to control of processes and products throughout their life cycle. The use of quality management techniques is essential to guarantee the efficiency of industrial production processes, which has led to the implementation and improvement of Systems of Quality Management standardized, generalized in the industrial environment. These systems pursue compliance with the product requirements (including customer requirements and applicable regulatory requirements) without which no its presence in the market would be viable.

1.3. Recommendations to take this course

This subject has no prerequisites.
It is recommended to have a computer, preferably a laptop with Windows 10 to install the application CAD / CAM with which you will work in class and at home (NX). It is necessary to have a telematic connection to access the license server and monitoring of classes in case non-face-to-face teaching is required.

2. Learning goals

2.2. Learning goals

Student...

1. Identifies different manufacturing processes and systems, including advantages and disadvantages, and defects that can submit your application.
2. Plan the most appropriate machining processes based on knowledge of the capabilities and limitations of these and

according to the technological, technical and economic requirements of both the product and the market.

3. Interpret the metrological control guidelines used to ensure the quality of products and processes.
4. Learn about industrial quality models and be able to integrate manufacturing and measurement functions into them and relate them to other management systems.

2.3. Importance of learning goals

The professional who has completed the degree in Mechanical Engineering must be trained to perform multiple activities in the industry, including the design and production of consumer goods and equipment. He Knowledge of Manufacturing Technologies is essential for the development of the mechanical components that integrate these products. You must know how to select and plan the most appropriate manufacturing processes at the Technological and economic in order to design viable components. You should also know how to implement the metrology techniques and quality control tools in manufacturing systems, to ensure the productivity and competitiveness of companies. In this way, the proper analysis and optimization of the Manufacturing is a determining factor in the overall success of productive organizations.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Gradual evaluation:
The monitoring of the subject is recommended and in this sense a gradual evaluation system is offered. Thus, during the During the course, the student will be able to demonstrate that he has achieved some theoretical learning results - practical required. The tests of the gradual evaluation release matter in any of the two official calls.

1) Evaluation of the practical sessions on metrology and quality.

It represents 15% of the final grade.
This block consists of preparing a set of reports and questionnaires in the ADD related to the practical sessions. These evaluation tests will have a deadline, indicated in the ADD. Non-delivery of reports on date and / or obtaining grades below 4.0 in any report or questionnaire, will suppose a negative evaluation of said test. In this case, you will be able to recover in the global practice exam.
Npract = average of qualifications of questionnaires and reports related to practices if all exceed the minimum grade of 4/10

2) Control about Metrology / Quality.

It represents 30% of the final grade. A minimum grade of 4/10 must be obtained, with a minimum of 3/10 in the problem. It will be done in the global test.

3) Teamwork on component mechanization

It represents 30% of the final grade. A minimum grade of 5/10 must be obtained.
The work consists of planning the machining of 2 components (one more focused on turning processes and another in milling processes), including the sequencing of operations, selection of tools and tools, clamping scheme on the machine tool and CAM programming. It will be done preferably in teams of 4 students, who must make a report, deliver the CAM files and a final presentation. The evaluation It will contain a fixed group part and an individual part, which will be assigned based on the answers in the presentation and opinion of the team members.
The deadline for delivery of the work will be set at the beginning of the course. In the first weeks they will settle the work groups and the parts will be assigned, being able to request the approval to change them by components mechanics developed in other subjects. Telematic access to the program's license server will be provided CAD / CAM.
The mechanized practices are oriented to the learning necessary to carry out the work of the subject. It is available of self-assessment questionnaires in the ADD, which do not count in the grade of the subject.

4) Control about Machining

It represents 25% of the final grade. A minimum grade of 4/10 must also be earned. It will take place during the course, setting its date at the beginning of the course.

Final grade = 0.15 Npract + 0.3 Control Metr / Quality + 0.3 Work Mechanized + 0.25 Control Mechanized

Overall evaluation:
To be carried out, on the date set by the center, by students who have not exceeded the minimum of the evaluation gradual.

- Global practice exam: Assumes 15% of the final grade. You can choose to do only part no passed during graded assessment. A minimum grade of 4/10 must be obtained in each exercise.
- Written test on theoretical-practical questions, problems and technical cases related to the metrology part and quality (30%). A minimum grade of 4/10 must be obtained to average, with a minimum of 3/10 in the problem.
- Written test on theoretical-practical questions, problems and technical cases related to machining plus one CAM programming test (55%). It must be done if a grade lower than 4/10 has been obtained in the Control on Machining and the score in the Teamwork on machining of components is less than 5/10. In case of not having passed the minimum grade in one of the two tests during the gradual evaluation, the student can choose to do only the part not passed.

Final grade = 0.15 Npract + 0.3 Metr / Quality Test + 0.55 Mechanized Test

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It is based on participation and the active role of the student favors the development of communication and decision-making skills. A wide range of teaching and learning tasks are implemented, such as lectures, guided assignments, laboratory sessions, autonomous work, and tutorials.

Students are expected to participate actively in the class throughout the semester.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.68 ECTS): 42 hours.
- Laboratory sessions (0.72 ECTS): 18 hours.
- Autonomous work and work group (3.4 ECTS): 85 hours.
- Evaluation (0.2 ECTS): 5 hours
- Tutorials.

Lectures: the professor will explain the theoretical contents of the course and solve illustrative applied problems. These problems and exercises can be found in the problem set provided at the beginning of the semester. Lectures run for 3 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended.

Laboratory sessions: sessions will take place every 2 weeks (6 sessions in total) and last 3.0 hours each. Students will work together in groups actively doing tasks such as practical demonstrations, measurements, calculations, and the use of graphical and analytical methods.

Guided assignments: students will complete assignments, problems and exercises related to concepts seen in laboratory sessions and lectures. They will be submitted at the beginning of every laboratory session to be discussed and analyzed. If assignments are submitted later, students will not be able to take the assessment test.

Autonomous work and Work group: students are expected to spend about 85 hours to study theory, solve problems, prepare lab sessions, and take exams. The planification of the machining of two mechanical components will be developed in teams of 4 students, with a final presentation.

Tutorials: the professor's office hours will be posted on the degree website to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

4.3. Syllabus

The course will address the following topics:

1) Classification of manufacturing processes.
2) Fundamentals of machining processes.
    1. Technological aspects of common machining processes: turning, drilling, milling.
    2. Tools: materials, geometry and selection criteria.
    3. Abrasive machining processes.
    4. Unconventional machining processes: EDM
3) Fundamentals of metal-cutting
    1. Mechanics of metal-cutting.
    2. Temperatures in metal-cutting.
    3. Tool life.
    4. Cutting fluids.
    5. High speed machining.
    6. Economics of metal-cutting operations.
4) Machining systems.
    1. Manufacturing systems and automation.
    2. Jig & Fixtures.
    3. Programming tool machines.
5) Manufacturing process planning.
6) Metrology
    1. Inspection and industrial metrology.

2. Systems and methods of measurement.
3. Measurement assurance.

7) Quality

1. Fundamental concepts of quality.
2. Quality management
3. Quality planning.
4. Quality in product design and process.
5. Manufacturing quality.

Laboratory sessions:

1. Turning and grinding processes
2. Drilling, milling and EDM processes.
3. CNC / CAM programming of machine tools.
4. Geometric measurement with conventional systems and with three coordinate measuring systems.
5. Measurement and calibration in dimensional metrology.
6. QFD and AMFE.

4.4. Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course, please refer to the "Escuela de Ingeniería y Arquitectura " website (https://eina.unizar.es/)