Course guide
240753 - 240753 - Manufacturing

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

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGIES AND ECONOMIC ANALYSIS (Syllabus 2018).
(Compulsory subject).

Academic year: 2022  ECTS Credits: 3.0  Languages: English

LECTURER

Coordinating lecturer: Irene Buj Corral

Others:

PRIOR SKILLS

Basic knowledge about industrial technologies.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEGTI11. (ENG) Coneixements de teoria de màquines i mecanismes, sistemes de fabricació de càlcul, disseny i assaig de màquines, metrologia i control de qualitat.

Generical:
CGGTI25. (ENG) Identificar els factors clau d'un problema.

Transversal:
CT4. (ENG) TREBALL EN EQUIP: Ser capaç de treballar com a membre d’un equip interdisciplinar, ja sigui com un membre més, o realitzant tasques de direcció, amb la finalitat de contribuir a desenvolupar projectes amb pragmatisme i sentit de la responsabilitat, assumint compromisos tenint en compte els recursos disponibles.
CT7. (ENG) TERCERA LLENGUA: Conèixer una tercera llengua, preferentment l'anglès, amb un nivell adequat oral i escrit, i en consonància amb les necessitats que indran els titulats i titulades.

Basic:
CBGTI1. (ENG) Que els estudiants hagin demostrat poseir i comprés coneixements en una àrea d’estudi que parteix de la base de l’educació secundària general, i se sol trobar a un nivell que, si bé es recolça em llibres de text avançats. inclou també alguns aspectes que impliquen coneixements procedents de la vanguàrdia del seu camp d'estudi.
TEACHING METHODOLOGY

In-person teaching load of the subject is 4.5 credits, from which 1.88 are theoretical and 1.12 are practical. Among the practical credits, 0.46 credits correspond to exercises, while 0.66 credits correspond to the practical sessions at the laboratory. Along the week there is one class sesión of 2 h, in which both the theory and the exercises are done, without distinguishing between theory and problems class. Throughout the quadrimester each laboratory group has 4 laboratory sessions.

In the theory and exercises classes the different lessons are introduced, illustrated with examples and, in many cases, specific problems are raised and solved, in order to help to understand the concepts. Regarding the problems, in class standard exercises or problems of each lesson are raised and solved. Afterwards, some more exercises or problems are raised to be answered by the students at home, so that students can practice and assimilate the content. In practical laboratory sessions equipment, machines and elements corresponding to the topics of the course are observed in order to assimilate the content. In many laboratory sessions multimedia material is used so as to introduce the subject to be treated. There are five sessions in the Laboratory:

1. Metrology and verification of workpieces. (2h)
2. Turning and grinding of cylindrical surfaces. (2h)
3. Basic Programming of Computerized Numerical Control Machine Tools. (2h)
4. Milling, drilling and grinding of flat surfaces. (2h)

The laboratory sessions are done in the Manufacturing Technologies Laboratory, pavilion D, floor -1. At the end of each laboratory session, the students, in working groups, answer a questionnaire related to the content of each session, which is evaluated.

LEARNING OBJECTIVES OF THE SUBJECT

The objective of the subject is to provide the students with knowledge and skills that are necessary to identify, evaluate, compare and select different elements that allow designing the most suitable manufacturing and verification process as a function of the parts to be manufactured.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>23,0</td>
<td>30.67</td>
</tr>
<tr>
<td>Hours small group</td>
<td>7,0</td>
<td>9.33</td>
</tr>
<tr>
<td>Self study</td>
<td>45,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

**Total learning time:** 75 h
1- Introduction to manufacturing systems

**Description:**
1.1 Concept of manufacturing process. Its situation within organization of the company.
1.2 Types of processes.
1.3 Technologies used for manufacturing workpieces.
1.4 Interrelations between product, function, shape, material and process.

**Specific objectives:**
To provide the students with knowledge and skills that are necessary to identify different types of basic manufacturing processes and their evolution.

**Related activities:**
Application exercises.

**Related competencies:**
CEGTI11. (ENG) Coneixements de teoria de màquines i mecanismes, sistemes de fabricació còm càlcul, disseny i assaig de màquines, metrologia i control de qualitat.
CT7. (ENG) TERCERA LLÈNGUA: Conèixer una tercera llengua, preferentment l'anglès, amb un nivell adequat oral i escrit, i en consonància amb les necessitats que indran els titultats i titulades.

**Full-or-part-time: 3h**
Theory classes: 1h
Self study: 2h
2 - Metrology and quality

Description:
2.1 Introduction.
2.2 Normalization.
2.3 ISO tolerance system.
2.4 Fittings.
2.5 Operations with dimensions.
2.6 Measuring methods. Measuring instruments, devices and machines.
2.7 Verification of parts. Callipers.
2.8 Quality control in the manufacturing process. Self-check.

Specific objectives:
To provide the students with knowledge and skills that are necessary to identify and explain all information in the drawings that is related to parts manufacturing and verifying, especially with regard to dimensional tolerances, geometric tolerances, and surface finish tolerances, regarding fittings and operations with dimensions. Providing the students with knowledge and skills that are necessary to identify, evaluate, compare and select: most usual metrology and verification instruments, and their functions, features and possibilities. To provide the students with knowledge and skills that are necessary to identify, evaluate, compare and select the most suitable quality control system as a function of the manufacturing process, and the functions, features and possibilities of above mentioned most suitable quality control system.

Related activities:
Practical exercises, application exercises, problems and videos. Laboratory session 1 in the Manufacturing Technology Laboratory of ETSEIB.

Related competencies:
CGGTI25. (ENG) Identificar els factors clau d'un problema.
CEGTI11. (ENG) Coneixements de teoria de màquines i mecanismes, sistemes de fabricació còmic càlcul, disseny i assaig de màquines, metrologia i control de qualitat.
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CBGTI1. (ENG) Que els estudiants hagin demostrat poseir i comprés coneixements en una àrea d'estudi que parteix de la base de l'educació secundària general, i se sol trobar a un nivell què, si bé es recolça en llibres de text avançats. inclou també alguns aspectes que impliquen coneixements procedents de la vanguàrdia del seu camp d'estudi.

Full-or-part-time: 14h
Theory classes: 4h
Laboratory classes: 2h
Self study : 8h
3 - Manufacture of parts by means of chip cutting processes

Description:
3.1 Introduction.
3.2 Cutting tools.
3.3 Turning.
3.4 Milling.
3.5 Drilling.
3.6 Grinding.

Specific objectives:
To provide the students with knowledge and skills that are necessary to identify, evaluate, compare and select: different most appropriate elements that allow designing most suitable metal cutting process, as a function of type of workpieces, and functions, features and possibilities of above mentioned elements.

Related activities:
Practical exercises, application exercises, problems and videos. Laboratory sessions 2, 3 and 4 at the Manufacturing Technology Laboratory of ETSEIB.

Full-or-part-time: 40h
Theory classes: 12h
Laboratory classes: 4h
Self study: 24h

4 - Other manufacturing processes

Description:
4.1 Introduction.
4.2 Moulding processes.
4.3 Plastic forming processes.

Specific objectives:
To provide the students with knowledge and skills that are necessary to identify, evaluate, compare and select: different most appropriate elements that allow designing most suitable moulding, plastic forming or alternative process, as a function of type of workpieces, and functions, features and possibilities of above mentioned elements.

Related activities:
Practical exercises, application exercises, problems and videos.

Full-or-part-time: 18h
Theory classes: 9h
Self study: 9h
GRADING SYSTEM

Qualification is based on four types of evaluations: a partial test, a final exam, evaluation of questionnaires of laboratory sessions in groups and a final individual test about knowledge acquired in the laboratory sessions. In the partial test as well as in the final exam both theoretical and practical knowledge acquired in the classes as well as application knowledge from the rest of the sessions are evaluated. The laboratory sessions are evaluated by means of the questionnaire at the end of each session. At the final individual test about the laboratory sessions corresponding knowledge and skills acquired in the laboratory sessions are individually evaluated. Algorithm for calculation of final qualification is as follows:

\[ N_{\text{final}} = 0.1 \cdot N_{\text{SL}} + 0.1 \cdot N_{\text{IPL}} + 0.8 \cdot \text{Max}\{N_{\text{EF}}; 0.6 \cdot N_{\text{EF}} + 0.4 \cdot N_{\text{PP}}\} \]


Reassessment:
The Reassessment Exam corresponds to the content of theory and exercises of the subject. The obtained mark of the Reevaluation Exam NER replaces the marks NPP of the Partial Exam and NEF of the Final Exam.

\[ N_{\text{final}} = 0.1 \cdot N_{\text{SL}} + 0.1 \cdot N_{\text{IPL}} + 0.8 \cdot \text{NER} \]

In order to be able to attend the reevaluation exam it is mandatory to previously attend the final exam of the subject. Failure to attend the final exam of the subject implies a qualification of ABSENT.

EXAMINATION RULES.

Other in the partial test and in the final exam there is a theory and an exercise or problem part. In the theory part nothing can be taken. In the exercise or problem part, if necessary, it is possible to use a non-programmable calculator and the metrology tables. Within the final exam the individual test about laboratory sessions will be conducted. The reevaluation exam will only contain theory and exercises, not the laboratory class.

BIBLIOGRAPHY

Basic:

Complementary:

RESOURCES

Other resources:
Presentations of the laboratory classes.