



## Course guide

### 240753 - 240753 - Manufacturing

**Last modified:** 28/07/2023

**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:** 2023    **ECTS Credits:** 3.0    **Languages:** English

#### LECTURER

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**Coordinating lecturer:** JOAQUIM MINGUELLA CANELA

**Others:** Primer quadrimestre:  
MASSIMO CENCIARINI - Grup: 11, Grup: 12, Grup: 13, Grup: 21, Grup: 22, Grup: 23  
JOAQUIM MINGUELLA CANELA - Grup: 11, Grup: 12, Grup: 13, Grup: 21, Grup: 22, Grup: 23

#### PRIOR SKILLS

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Basic knowledge about industrial technologies.

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

CEGTI11. (ENG) Coneixements de teoria de màquines i mecanismes, sistemes de fabricaicòm 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 posseir 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 em llibres de text avançats. inclou també alguns aspectes que impliquen coneixements procedents de la vanguardia del seu camp d'estudi.

## TEACHING METHODOLOGY

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During the week there is a 2-hour class session, during which theoretical credits are taken and practical exercises are solved, without distinguishing between theory sessions and exercises sessions. Throughout the term, each small group has 3 laboratory sessions of 2 hours each. In the lectures, theory topics are introduced, illustrated with examples, and in many cases specific exercises are raised and solved, helping to understand the concepts. As for the exercises, typical problems for each topic are presented and solved in class, as well as some are proposed to be completed at home so that the student can practice and finish assimilating the content. In the laboratory practical sessions, the equipment is presented, in particular, machines and elements corresponding to the topics covered in the subject, in order to finish to assimilate the subject contents. Supporting multimedia material is available for most sessions.

Practical Laboratory sessions:

1. Metrology and verification of parts. (2 hours)
2. Basic Programming of Machine Tools with Computer Numerical Control. (2 hours)
3. Turning and rectification of cylindrical surfaces, milling, drilling and rectification of flat surfaces. (2 hours)

Practical Laboratory sessions 1. and 3. are scheduled to take place in the Manufacturing Technologies Laboratory, Hall D, Plant -1. Practical Laboratory Session 2 can be done in a general Computer Room.

At the end of each practical Laboratory session, there is an evaluation regarding its contents.

## LEARNING OBJECTIVES OF THE SUBJECT

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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

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Type	Hours	Percentage
Hours small group	7,0	9.33
Hours large group	23,0	30.67
Self study	45,0	60.00

**Total learning time:** 75 h



## CONTENTS

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### 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.
- 1.5 Evolution of manufacturing. Conventional Factory and Factory of the Future.

**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 fabricaicom càlcul, disseny i assaig de màquines, metrologia i control de qualitat.

CT7. (ENG) TERCERA LENGUA: 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.

**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 Verification of parts. Callipers.
- 2.7 Quality control in the manufacturing process. Self-check.
- 2.8 Measuring methods. Measuring instruments, devices and machines.

### 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 fabricaicom càlcul, disseny i assaig de màquines, metrologia i control de qualitat.
- CT7. (ENG) TERCERA LENGUA: 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.
- 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.
- CBGTI1. (ENG) Que els estudiants hagin demostrat posseir 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 em llibres de text avançats. inclou també alguns aspectes que impliquen coneixements procedents de la vanguardia 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
- 3.7 Machining processes without cutting tool

**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 and 3 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. Casting processes
- 4.3. Forging
- 4.4. Sheet metal parts processing
- 4.5. Additive manufacturing

**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

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Final Mark 'NF':

It will be awarded taking the highest one between the following final mark calculations:

$$NF1 = 0.48 NEF + 0.32 NPP + 0.2 NAC$$

$$NF2 = 0.8 NEF + 0.2 NAC$$

Where:

NF: Final Mark (calculated 1, calculated 2, and awarded)

NEF: Mark of the Final Exam

NPP: Mark of the Midterm Test

NAC: Mark obtained through the Continuous Assessment items

Concerning the Continuous Assessment items:

The marking NAC is planned to evaluate the contents in the practical sessions in the Laboratory. During each scheduled session there will be a deliverable exercise and a test that will be taken into account in equal percentages.

Reassessment:

The Reassessment Exam corresponds to the content of theory and exercises of the subject. In the case of sitting it, the mark obtained in the Reevaluation Exam NER replaces the marks NPP of the Partial Exam and NEF of the Final Exam.

$$NF = 0.8 NER + 0.2 NAC$$

## EXAMINATION RULES.

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Both in the midterm test and in the final exam there is a theory and an exercise part. In the theory parts it cannot be used any teaching/support material. In the exercise parts, if necessary, it is possible to use a non-programmable calculator and the metrology tables.

In the exercise parts, to obtain the maximum marks it is necessary to deploy all formulas used, to specify what is each variable and its units, and to write down (commenting) all calculations. Hypotheses can be done but must be specified and duly explained.

The reevaluation exam will only cover the theory and the exercises, not the laboratory sessions.

## BIBLIOGRAPHY

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### Basic:

- Vivancos Calvet, J ; I. Buj Corral ; Ll. Costa Herrero. Tecnologías de fabricación : colección de preguntas de teoría. Barcelona: Serveis gràfics de Copisteria Imatge, 2012.

- Buj, I.; Domínguez, A.; Zayas, E.E.; Costa, L.; Goma, J. R.; Fenollosa, F. Sistemas de Fabricación. Segunda edición.. 2a ed. Barcelona: ETSEIB, 2021. ISBN 9788409160037.

- Vivancos Calvet, J ; A. Domínguez Fernández ; I. Buj Corral ; J.R. Gomà Ayats ; H.A. González Rojas ; Ll. Costa Herrero ; R.M. Rodríguez Sendra. Tecnologías de Fabricación : Material docente complementario : guiones de prácticas y problemas complementarios. Barcelona: Imatge. Serveis Gràfics de Copisteria, 2009.

### Complementary:

- Groover, Mikell P.. Fundamentos de Manufactura Moderna : Materiales, Procesos y Sistemas [on line]. 3a ed. México: Prentice Hall Iberoamericana S.A., 2007 [Consultation: 26/06/2020]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=4585363>. ISBN 9789701062401.

- Kalpakjian, S.; S.R. Schmid. Manufactura, Ingeniería y Tecnología [on line]. 7a ed. México: Pearson, 2014 [Consultation: 26/06/2020]. Available on: [http://www.ingebook.com/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=5323](http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5323). ISBN 9786073227353.

## RESOURCES

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### Other resources:

Presentations of the laboratory classes.