



# Course guide

## 240657 - 240657 - Industrial Equipment and Facilities

Last modified: 16/05/2023

**Unit in charge:** Barcelona School of Industrial Engineering  
**Teaching unit:** 713 - EQ - Department of Chemical Engineering.

**Degree:** BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

**Academic year:** 2023    **ECTS Credits:** 6.0    **Languages:** Catalan, Spanish

### LECTURER

**Coordinating lecturer:** Jose Ignacio Iribarren Laco

**Others:** Jose Ignacio Iribarren Laco

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

**Specific:**

CE4. Capacity to understand and apply basic knowledge principles of general chemistry, organic and inorganic chemistry and their engineering applications.

### TEACHING METHODOLOGY

Learning based in expositive lessons by using the resources available in Atenea campus and cooperative learning in practice sessions oriented to exercises resolution.

### LEARNING OBJECTIVES OF THE SUBJECT

### STUDY LOAD

Type	Hours	Percentage
Hours medium group	60,0	40.00
Self study	90,0	60.00

**Total learning time:** 150 h

### CONTENTS

#### Introduction. Chemical industry characteristics.

**Description:**

General characteristics of chemical industry. Equipment and general installations. Associated problematic to the chemical plant.

**Specific objectives:**

Knowledge of the general characteristics of a chemical industry.

**Full-or-part-time:** 3h

Theory classes: 2h

Self study : 1h



### Thermodynamic basis of the corrosion.

**Description:**

Electrochemical cells. Nernst equation. Galvanic, concentration and differential aeration cells. Pourbaix diagrams and applications.

**Specific objectives:**

To obtain the thermodynamic basis of corrosion and apply the Pourbaix diagrams to predict the possibility of corrosion.

**Related activities:**

Exercises session.

**Full-or-part-time:** 8h

Theory classes: 4h

Practical classes: 2h

Self study : 2h

### Corrosion kinetics.

**Description:**

Polarization. Evans diagrams and Tafel equations. Passivity. Flade potential.

**Specific objectives:**

To obtain the kinetics implications in corrosion processes and apply to different factors affecting to corrosion rate.

**Related activities:**

Exercise session.

**Full-or-part-time:** 7h

Theory classes: 3h

Practical classes: 2h

Self study : 2h

### Types of corrosion. Protection against corrosion.

**Description:**

Environmental, water, soils and microbiological corrosion. Galvanic, homogeneous and located (pitting) corrosion. Stress corrosion cracking. Cathodic protection, metallic and plastic coatings. Applications to Chemical Industry.

**Specific objectives:**

To distinguish the different types of corrosion related with the morphology and properties of metals and alloys.

**Related activities:**

Exercise session. Team work and visit to Galvanizados Tenas.

**Full-or-part-time:** 6h

Theory classes: 2h

Practical classes: 2h

Self study : 2h



### Materials properties.

**Description:**

Metals and alloys. Mechanical and thermal properties. Carbon steels and stainless steels. Non ferrous metals. Special alloys. Plastics materials. Reinforced plastics.

**Specific objectives:**

To study the main properties of materials which can be used in chemical industry.

**Related activities:**

Exercise session.

**Full-or-part-time:** 6h

Theory classes: 2h

Practical classes: 2h

Self study : 2h

### Materials selection.

**Description:**

Materials selection criteria. Application to apparatus and equipment of chemical industry.

**Specific objectives:**

To establish the basis of materials selection criteria in chemical industry.

**Related activities:**

Exercise session.

**Full-or-part-time:** 6h

Theory classes: 2h

Practical classes: 2h

Self study : 2h

### Costing and project evaluation.

**Description:**

Investment analysis. Economic evaluation of projects. Total investment cost. Net present worth. Pay back time. Rate of return. Factorial methods of cost estimation applied to chemical equipment.

**Specific objectives:**

To study preliminarily the investment analysis and associated costing in chemical industry.

**Related activities:**

Exercise session.

**Full-or-part-time:** 6h

Theory classes: 2h

Practical classes: 2h

Self study : 2h



### Mechanical design.

**Description:**

Pressure vessels under internal and external pressure. Design parameters.. Cylinders and spherical shells. Head and closure design. Liquid storage tanks. Piping and instrumentation.

**Specific objectives:**

To study the basis of mechanical design of vessels under pressure and storage tanks.

**Related activities:**

Exercise session.

**Full-or-part-time:** 6h

Theory classes: 2h

Practical classes: 2h

Self study : 2h

## GRADING SYSTEM

Evaluation system includes:

- Exercises resolution in continuous evaluation (25% of final qualification)
- Complementary activities like to seminars, expositions and guided works (25% of final qualification).
- Two examinations (50% of final qualification).

Reevaluation will replace the qualification of final examen, remaining unchanged the continuous evaluation.

During the periode of spring of the course 2019-2020, and as a consequence of the health crisis due to the Covid19, the qualification methodology will be:

- Continuous evaluation based on deliveries of exercises of the first part of the subject, being the weight a 65% in the final qualification.
- Continuous evaluation based on deliveries of exercises of the second part of the subject, being the weight a 35% in the final qualification.

## EXAMINATION RULES.

Additional material is allowed in examination in accordance with the criteria of the professor.

## BIBLIOGRAPHY

**Basic:**

- Talbot, D. ; Talbot, J.. Corrosion Science and Technology. 3rd ed. Boca Raton: CRC Press, 2018. ISBN 9781498752411.
- Sinnott, R. K. Coulson & Richardson's chemical engineering. Vol. 6 [on line]. 6th ed. Oxford: Butterworth-Heinemann, 2020 [ Consultation : 24/03/2023 ]. Available on : <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=5787890>. ISBN 9780081026007.
- Bilurbina, L.; Liesa, F.; Iribarren, J.I.. Corrosión y Protección [on line]. Barcelona: Edicions UPC, 2003 [Consultation: 11/05/2020]. Available on: <http://hdl.handle.net/2099.3/36748>. ISBN 8483017113.
- Uhlig, Herbert H.. Corrosión y Control de la Corrosión. Bilbao: Urmo, 1970. ISBN 8431401494.
- Peters, Max S.; Timmerhaus, Klaus D. Plant design and economics for chemical engineers. 5th ed. New York: Mc Graw Hill International Editions, 2003. ISBN 9780071240444.