

## Course guides

# 295901 - EII - Industrial Equipments and Installations

Last modified: 19/06/2020

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

**Degree:** BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Optional subject).  
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Optional subject).

**Academic year:** 2020    **ECTS Credits:** 6.0    **Languages:** Catalan, Spanish

### LECTURER

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**Coordinating lecturer:** José Ignacio Iribarren Laco

**Others:** Primer quadrimestre:  
ELAINE APARECIDA ARMELIN DIGGROC - M11, M12  
GEORGINA FABREGAT JOVÉ - M11, M12  
JOSE IGNACIO IRIBARREN LACO - M11, M12

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

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

### TEACHING METHODOLOGY

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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

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Apply the knowledge of mathematics and electrochemistry to study the corrosion. Design equipment and plants in chemical industry with efficiency and economic criteria.

### STUDY LOAD

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Type	Hours	Percentage
Hours large group	50,0	33.33
Hours small group	10,0	6.67
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:**

Exercices session.

**Full-or-part-time:** 10h

Theory classes: 4h

Practical classes: 4h

Self study : 2h

### Corrosion kinetics.

**Description:**

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

**Specific objectives:**

To obtain the kinetics implications in corrosion processes and apply to different factors afectting 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)
- Laboratory sessions evaluation (10% of final qualification).
- Complementary activities like seminars, expositions and guided works (15% of final qualification).
- Final examination (50% of final qualification).

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

## EXAMINATION RULES.

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

## BIBLIOGRAPHY

**Basic:**

- Uhlig, Herbert H.. Corrosión y control de corrosión. Bilbao: Urmo, 1970. ISBN 8431401494.
- Bilurbina, L., Liesa, F., Iribarren, J.I.. Corrosión y protección [on line]. Barcelona: Edicions UPC, 2003 [Consultation: 30/04/2020]. Available on: <http://hdl.handle.net/2099.3/36748>. ISBN 8483017113.
- Sinnott, R. K. Chemical engineering design vol. 6. 5th ed. Oxford: Elsevier Butterworth-Heinemann, 2009. ISBN 9780750685511.



**Complementary:**

- 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.
- Talbot, D.; Talbot, J. Corrosion science and technology. Boca Raton: CRC Press, 1998. ISBN 0849382246.