

Course guide

240EI034 - 240EI034 - Chemical Technology

Last modified: 16/04/2024

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

Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Darbra Roman, Rosa Mari

Others: Bou Serra, Jordi
Perseguer, Carme
Tarragó, Diana
Casal Valls, Oriol
Huisman, Ingmar Harald
Marti Gregorio, Vicenç

REQUIREMENTS

No prerequisites

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMEI04. Ability for the analysis and design of chemical processes.

TEACHING METHODOLOGY

EXPOSITIVE AND PARTICIPATIVE LECTURES

Description: Explain the contents of this subject.

Support material: Slides, exercises, videos and papers. All the material is available on-line (atenea).

Description of the assignments due and their relation to the assessment: Continuous test. Mid-term exam. Final exam.

Specific objectives: To comply with those set in this subject.

LEARNING OBJECTIVES OF THE SUBJECT

The specific objectives of this subject are:

1. Make the student aware of the diversity of products and industries related with the industrial chemistry.
2. Identify the raw materials and intermediate products used in the chemical production at large scale.
3. Understand the different physicochemical processes that allow the transformation of these raw materials to a final product.
4. Describe relevant processes for the chemical industry.
5. Identify environmental, social and safety aspects related to these processes.
6. Value the importance of maintenance and other related services for the proper functioning of the chemical plants.



STUDY LOAD

Type	Hours	Percentage
Hours large group	40,5	36.00
Self study	72,0	64.00

Total learning time: 112.5 h

CONTENTS

Chapter 1. Introduction

Description:

Chemical industry importance at Spanish level and at a global scale. Concept of Unit Operation. Definition of chemical process and the important factors for its success: continuous and discontinuous processes, flow diagram, PID. Storage and transport. Main natural sources of raw materials for the chemical industry: lithosphere, hydrosphere, atmosphere and biosphere.

Specific objectives:

Objectives: 1, 2 i 5.

Related activities:

Lectures (3h)

1 paper to read at home and online exercises

Related competencies :

CEMEI04. Ability for the analysis and design of chemical processes.

Full-or-part-time: 6h

Theory classes: 3h

Self study : 3h

Chapter 2. Maintenance and auxiliary services

Description:

Maintenance importance for the chemical industry. Maintenance types and function. Introduction to other practical aspects of the industry (subcontracting, communication, management, etc.). Auxiliary services: steam, vacuum, compressed air, nitrogen, etc.

Specific objectives:

Objective: 6.

Related activities:

Lectures (4h)

Related competencies :

CEMEI04. Ability for the analysis and design of chemical processes.

Full-or-part-time: 12h

Theory classes: 4h

Self study : 8h

Chapter 3. Distillation

Description:

Vapor-liquid equilibrium. Binary mixtures. Flash distillation. Calculus and design of columns. Multicomponent mixtures.

Specific objectives:

Objective: 3.

Related activities:

Lectures (7h)

Practical exercises

Related competencies :

CEMEI04. Ability for the analysis and design of chemical processes.

Full-or-part-time: 19h

Theory classes: 7h

Self study : 12h

Chapter 4. Petroleum and Petrochemical Industry

Description:

Petroleum industry at global scale. Refining industry: Refining processes I (distillation and cracking) and Refining processes II (reforming and purification). Final products. Petrochemical industry introduction. Detailed explanation of the derivatives from: methane, ethylene, propylene and benzene among others. Uses and applications.

Specific objectives:

Objectives: 2, 3 and 4.

Related activities:

Lectures (5h)

Practical exercises

2 papers to read at home

Related competencies :

CEMEI04. Ability for the analysis and design of chemical processes.

Full-or-part-time: 14h

Theory classes: 5h

Self study : 9h

Chapter 5. Kinetics and reactors

Description:

Chemical kinetics: elementary reactions, complex reactions, reaction order, reaction rate. Reaction types: reversible, parallel and series reactions. Ideal reactors. Catalytic reactors.

Specific objectives:

Objective: 2, 3 i 4

Related activities:

Lectures (7h)

Practical exercises

Related competencies :

CEMEI04. Ability for the analysis and design of chemical processes.

Full-or-part-time: 23h

Theory classes: 7h

Self study : 16h

Chapter 6. Chlor-Alkali industry

Description:

Introduction. Sodium chloride. Electrolysis process: diaphragm, mercury and membrane cells. Melt salt electrolysis. Production of other sodium chloride derivatives.

Specific objectives:

Objectives: 2, 3 and 4

Related activities:

Lectures (2h)

1 paper to read at home

Related competencies :

CEMEI04. Ability for the analysis and design of chemical processes.

Full-or-part-time: 6h

Theory classes: 2h

Self study : 4h

Chapter 7. Membrane technology

Description:

Definition of membrane. Nature and structure of the membranes. Configuration of the modules. Driving force. Transport mechanisms. Process parameters. Classification of membrane separation processes. Factors that limit the permeate flow: polarization of the concentration, fouling. Applications: reverse osmosis, ultra-filtration, pervaporation, electro-dialysis.

Specific objectives:

Objective: 3, 5

Related activities:

Lectures (6h)

Practical exercises

Related competencies :

CEMEI04. Ability for the analysis and design of chemical processes.

Full-or-part-time: 16h

Theory classes: 6h

Self study : 10h

Chapter 8. Other industries

Description:

Short description of production process of diverse chemical industries such as: Fertilizers industry, Detergents industry, Polimers industry, Paper industry, Cement industry, etc.

Specific objectives:

Objectives: 2, 3 and 4

Related activities:

Lectures (2,5h)

Practical exercises

Visits to a chemical plants (4h)

Related competencies :

CEMEI04. Ability for the analysis and design of chemical processes.

Full-or-part-time: 16h 30m

Theory classes: 6h 30m

Self study : 10h

GRADING SYSTEM

Continuous evaluation tests (PAC): 15% of the final qualification

Mid-term exam (EP): 35% of the final qualification

Final exam (EF): 50% of the final qualification

Final qualification (NF): $NF = 0.15 \cdot PAC + 0.35 \cdot EP + 0.50 \cdot EF$

Reevaluation exam (ER): 85% of the total reevaluation qualification

Reevaluation qualification (NR): $NR = 0,15 \cdot PAC + 0,85 \cdot ER$

EXAMINATION RULES.

The mid-term exam eliminates content, which is not recovered with the final exam.

The reevaluation exam will substitute the qualification obtained in the partial and final exams. The continuous tests are not reevaluated.

You will not be able to take notes with you at the exam, only the subject form for the problems part.

Programmable calculator will only be used in the tests when you are explicitly informed.

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Basic:

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- Calleja Pardo, Guillermo. Introducción a la ingeniería química. Madrid: Editorial Síntesis, 1999. ISBN 8477386641.
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Complementary:

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