

SUBJECT TEACHING GUIDE

G609 - Operations and Processes

Degree in Energy Resources Engineering

Academic year 2019-2020

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|---|------------------|--------------------|------------------|------------------|
| Degree | Degree in Energy Resources Engineering | | | Type and Year | Optional. Year 3 |
| Faculty | | | | | |
| Discipline | Optional Subjects for Energy Resources Module: Optional Training | | | | |
| Course unit title and code | G609 - Operations and Processes | | | | |
| Number of ECTS credits allocated | 6 | Term | Semester based (1) | | |
| Web | | | | | |
| Language of instruction | Spanish | English Friendly | Yes | Mode of delivery | Face-to-face |

| | | | | | |
|------------------|--|--|--|--|--|
| Department | DPTO. INGENIERIAS QUIMICA Y BIOMOLECULAR | | | | |
| Name of lecturer | RUBEN ALDACO GARCIA | | | | |
| E-mail | ruben.aldaco@unican.es | | | | |
| Office | E.P. de Ingeniería de Minas y Energía. Planta: + 1. DESPACHO 1 (148) | | | | |
| Other lecturers | | | | | |

3.1 LEARNING OUTCOMES

- Identify mass and energy conservation laws. Identify transport processes include heat conduction (energy transfer), fluid flow (momentum transfer), molecular diffusion (mass transfer). Examples of process and unit operations.

4. OBJECTIVES

The objectives of the subject are:

- (1) learning unit operations applied to the energy engineering;
- (2) learning physical and chemical-physical operations and processes;
- (3) tools to introduce the design of the equipment used in these operations, particularly in the field of energy.

| 6. COURSE ORGANIZATION | |
|------------------------|---|
| CONTENTS | |
| 1 | Thematic Block I: Introduction to unit operations and processes in energy engineering. 1.1 Unit operations: Theoretical contents. 1.2 The chemical industry: Classification. Socioeconomic aspects 1.3. Raw materials. Energy consumption. Visit 1st Industry |
| 2 | Thematic Block II: Unit operations. 2.1.- Operations based on the mass transfer. 2.2.- Operations based on heat transfer. 2.3.- Operations based on transfer of momentum. 2.4.- Solid operations. Visit 2nd Industry |
| 3 | Thematic Block III: Chemical reaction engineering. 3.1. Chemical reaction engineering: classification of chemical reactions. 3.2. Kinetics of chemical reactions. 3.3. Homogeneous and heterogeneous reactions. |
| 4 | Thematic Block IV: Chemical reactors. 4.1. Introduction 4.2. Homogeneous reactors 4.3. Heterogeneous reactors |

| 7. ASSESSMENT METHODS AND CRITERIA | | | | |
|--|--------------|-------------|-----------|--------|
| Description | Type | Final Eval. | Reassessn | % |
| Objective Test I: Thematic Blocks I and II. | Written exam | No | Yes | 20,00 |
| Objective Test II: Thematic Blocks III and IV. | Written exam | No | Yes | 20,00 |
| Portfolio I: Practical Blocks I and II | Work | No | Yes | 30,00 |
| Portfolio II: Practical Blocks III and IV | Work | No | Yes | 30,00 |
| Final Exam | Written exam | Yes | Yes | 0,00 |
| TOTAL | | | | 100,00 |
| Observations | | | | |
| Observations for part-time students | | | | |

| 8. BIBLIOGRAPHY AND TEACHING MATERIALS |
|---|
| BASIC |
| McCABE, W.L.; SMITH, J.C. "Operaciones Básicas de la Ing. Química". Ed.. Reverté. Barcelona.(1990) McGraw Hill, 2007D. Allen, K.S. Rosselot. Pollution Prevention for Chemical Processes. WileyInterscience, NY, 1997. Levenspiel, O. "Flujo de Fluidos. Intercambio de Calor". Editorial Reverté. Barcelona, 1996. |