

SUBJECT TEACHING GUIDE

G778 - Macroscopic and Microscopic Balances in Chemical Engineering

Degree in Chemical Engineering

Academic year 2021-2022

| 1. IDENTIFYING DATA | | | | | |
|----------------------------------|---|------------------|--------------------|------------------|--------------------|
| Degree | Degree in Chemical Engineering | | | Type and Year | Compulsory. Year 2 |
| Faculty | School of Industrial Engineering and Telecommunications | | | | |
| Discipline | Subject Area: Balances, Biotechnology, Separation, Chemical Reaction Engineering, Reactor Design, Assessment and Transformation of Resources Module: Compusory Training Industrial Chemistry | | | | |
| Course unit title and code | G778 - Macroscopic and Microscopic Balances in Chemical Engineering | | | | |
| Number of ECTS credits allocated | 6 | Term | Semester based (1) | | |
| Web | https://campusvirtual.unican.es/Profesor/ProfesorGrado/GuiaDocenteFw.aspx | | | | |
| Language of instruction | Spanish | English Friendly | Yes | Mode of delivery | Face-to-face |

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|------------------|---|--|--|--|--|
| Department | DPTO. INGENIERIAS QUIMICA Y BIOMOLECULAR | | | | |
| Name of lecturer | MARIA MARGALLO BLANCO | | | | |
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| Other lecturers | ESTHER SANTOS SANTAMARIA GUILLERMO DIAZ SAINZ | | | | |

3.1 LEARNING OUTCOMES

- Formulation of macroscopic balances of momentum, energy, and mass in systems with different complexity
- Applications of the formulation of macroscopic balances to solve selected cases of study
- Identification of the molecular transport mechanisms involved in the transfer of momentum, heat and mass
- Formulation of microscopic balances for mass conservation, momentum, heat and mass
- Application of the formulation of microscopic balances in selected cases of study

4. OBJECTIVES

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| Understand the key role of the macroscopic and microscopic balances for momentum, energy, and mass |
| Formulation of macroscopic balances for momentum, energy and mass that describe the behaviour of systems with different complexity |
| Fundamentals of the phenomena associated with the transfer of momentum, heat, and mass described on the basis of their corresponding fundamental molecular transport laws |
| Relationship between molecular transfer phenomena and their practical applications in Chemical Engineering |
| To conceptualize the different comprehensive levels and the application of the macroscopic and microscopic balances of momentum, energy and mass |

6. COURSE ORGANIZATION

| CONTENTS | |
|----------|--|
| 1 | 1. INTRODUCTION |
| 2 | 2. MACROSCOPIC BALANCES |
| 3 | 3. TURBULENCE, AGITATION AND MIXING |
| 4 | Week 8 assessment macroscopic balances |
| 5 | 4. INTERPHASE TRANSFER |
| 6 | 5. MICROSCOPIC BALANCES |

7. ASSESSMENT METHODS AND CRITERIA

| Description | Type | Final Eval. | Reassessn | % |
|---|--------------|-------------|-----------|--------|
| Week 8 assessment macroscopic balances | Written exam | No | Yes | 45,00 |
| Assessment macroscopic balances | Written exam | No | Yes | 45,00 |
| Ongoing assessment and portfolio | Others | No | No | 10,00 |
| TOTAL | | | | 100,00 |
| Observations | | | | |
| To pass the course, a minimum mark of 5 as an average of the two individual assessments is required. A portfolio is a criterion to attend these individual assessments. Otherwise, a final exam will have to be passed. A retake assessment is also available. In the event the course cannot be completed in the face-to-face mode, equivalent assessments using the Moodle platform will be available | | | | |
| Observations for part-time students | | | | |
| An individual assessment can be valid two years | | | | |

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

R.B. Bird, W.E. Stewart, E.N. Lightfoot, Transport Phenomena, Second, John Wiley & Sons, Inc., 2002

J.F. Izquierdo Torres, J. Costa López, E. Martínez de la Ossa Fernández, J. Rodríguez Mirasol, M. Izquierdo Ramonet, Introducción a la Ingeniería Química: Problemas resueltos, Segunda, Editorial Reverté, 2013

C Oloman "Material and Energy Balances for Engineers and Environmentalists" Imperial College Press (2009)

J.R. Welty, C.E. Wicks, R.E. Wilson, G.L. Rorrer, Fundamentals of Momentum, Heat, and Mass Transfer, Fifth, John Wiley & Sons, Inc., 2008

N. Ghasem, R. Henda, Principles of Chemical Engineering Processes: Material and Energy Balances, Taylor & Francis Group, Boca Raton, 2015