SUBJECT TEACHING GUIDE

G778 - Macroscopic and Microscopic Balances in Chemical Engineering

Degree in Chemical Engineering
First Degree in Chemical Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Chemical Engineering First Degree in Chemical Engineering			Type and Year	Compulsory. Year 2 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/GuiaDocenteFrw.aspx				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIAS QUIMICA Y BIOMOLECULAR
Name of lecturer	ANTONIO DOMINGUEZ RAMOS
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Other lecturers	ESTHER SANTOS SANTAMARIA GUILLERMO DIAZ SAINZ

3.1 LEARNING OUTCOMES
- Formulate macroscopic balances of momentum, energy, and matter in systems of varying complexity
- Apply the formulation of macroscopic balances to solve selected case studies
- Identify the molecular transport mechanisms involved in the transport of momentum, heat energy, and matter in selected examples
- Formulate microscopic balances for the conservation of mass, momentum, heat energy, and matter in systems of varying complexity

4. OBJECTIVES
Understand the fundamental importance of macroscopic and microscopic balances of momentum, energy, and matter in the field of Chemical Engineering
Formulate the macroscopic balances of momentum, energy, and matter that describe the behavior of systems of varying complexity
Understand the fundamentals of the phenomena associated with the transfer of momentum, heat energy, and matter as described by their corresponding basic laws of molecular transport
Relate molecular transport phenomena to their practical applications in Chemical Engineering
Formulate the microscopic balances of momentum, energy, and matter that describe the behavior of systems of varying complexity

6. SUBJECT PROGRAM	
CONTENTS	
1	1. Introduction
2	2. Macroscopic balances
3	Week 8 assessment macroscopic balances
4	3. Molecular transport laws
5	4. Interfacial transport
6	5. Microscopic balances
7	Regular examination period assessment (macroscopic and microscopic balances)

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Written assessment macroscopic balances	Written exam	No	Yes	50,00
Written assessment microscopic balances	Written exam	Yes	Yes	50,00
TOTAL				100,00
Observations				
To pass the course, a minimum mark of 5 as an average of the two individual assessments is required. Week 8 written assesment (macroscopic) can be retaken in the ordinary exam period. Microscopic can be retaken within a whole exam during the extraordinary exam period.				
Observations for part-time students				
Partial time student can keep the partial marks for one academic course				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Bird, R.B., Stewart, W.E., Lightfoot, E.N. 2007. Transport Phenomena, Second edition, John Wiley & Sons, Inc., ISBN 978-0-470-11539-8
Izquierdo, J.F., Costa , J., Martinez de la Ossa, E., Rodríguez, J., Izquierdo, M. 2023. Introducción a la Ingeniería Química: Problemas resueltos, Tercera edición, Editorial Reverté, ISBN 978-84-19282-92-7
Oloman, C. 2009 "Material and Energy Balances for Engineers and Environmentalists", Imperial College Press, ISBN 978-1-84816-369-0
Welty, J.R., Wicks, C.E., Wilson, R.R. 1984. Fundamentals of Momentum, Heat, and Mass Transfer, Fifth, John Wiley & Sons, Inc., ISBN 0-471-87497-3
Ghasem, N., Henda, R., 2015. Principles of Chemical Engineering Processes: Material and Energy Balances, Taylor & Francis Group, Boca Raton, ISBN 978-1-4822-2228-9