SUBJECT TEACHING GUIDE

G771 - Thermodynamics and Heat Transmission

Degree in Chemical Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Chemical Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Thermodynamics, Heat Transmission and Fluid Mechanics Module: Compulsory Training in Common with the Industrial Branch				
Course unit title and code	G771 - Thermodynamics and Heat Transmission				
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	EUGENIO DANIEL GORRI CIRELLA
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Other lecturers	ALFREDO ORTIZ SAINZ DE AJA MARCOS FALLANZA TORICES GONZALO MORAL REAL

3.1 LEARNING OUTCOMES
- The student should have a clear understanding of the thermodynamic principles, its formulation and its applications
- The student should be able to find or estimate physical and thermodynamic properties, including the parameters characterizing the phase and chemical equilibria, which are necessary for a particular application.
- The student should be able to identify the criteria that must be met for a system in order to reach the state of thermodynamic equilibrium under certain restrictions.
- The student should be able to identify the mechanisms of heat transfer
- The student should be able to design in a systematic way the different equipments for heat transfer.

4. OBJECTIVES
To understand and to apply concepts, principles, relationships and the experimental basis of thermodynamics to evaluate the transformations of energy in chemical engineering processes. To introduce students of Chemical Engineering at the foundation and rigorous application of the first and second law of thermodynamics, both for closed systems and open systems of interest in the field of chemical engineering. To know and understand the mechanisms of heat transfer. To know, to understand, and to calculate the equipments required for heat transfer in the field of chemical engineering.

6. COURSE ORGANIZATION	
	CONTENTS
1	PART 1: THERMODYNAMICS 1.1 Introduction to thermodynamics 1.2 Principles and thermodynamic functions 1.3 Physical properties of pure fluids. Equations of state. 1.4 Heat effects 1.5 Estimation of thermodynamic properties. Steam: characteristics and uses. 1.6 Principles of phase and chemical equilibria
2	PART 2: HEAT TRANSFER 2.1 Heat transfer by conduction. Thermal insulation. 2.2 Principles of heat flow in fluids. Natural and forced convection. 2.3 Heat transfer to fluids with phase change: condensation and boiling 2.4 Radiation heat transfer 2.5 Heat-exchange equipment 2.6 Evaporation

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Exam 1: It includes the contents of Part 1. Date: Week 8 5.0 grade (in the scale 0-10) is required to pass the exam	Written exam	Yes	Yes	50,00
Exam 2: It includes the contents of Part 2. Date: Week 15 5.0 grade (in the scale 0-10) is required to pass the exam	Written exam	Yes	Yes	50,00
TOTAL				100,00

Observations

The evaluation of the course is based in two partial exams that will be performed in weeks 7 and 15 of the semester.
Each part will contribute 50% to the overall grading mark.
Those failed in January will have an overall exam in February. 5.0 grade (in the scale 0-10) is required to pass each exam.
In the case of a health alert that makes it impossible to conduct the evaluation in person, the same type and distribution of tests will be maintained with the support of telematic means.

Observations for part-time students

For part-time students is possible to adapt the course evaluation to the part-time regime, preserving the results for at least two consecutive academic years.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

J.M. Smith, H.C. Van Ness, M.M. Abbott, “Introducción a la Termodinámica en Ingeniería Química”, 7ª ed., McGraw-Hill, 2007.

J.R. Elliott, C.T. Lira, “Introductory Chemical Engineering Thermodynamics”, 2nd edition, Prentice Hall, New Jersey, 2012.

W.L. McCabe, J.C. Smith, P. Harriot, "Operaciones Unitarias en Ingeniería Química", 7ª ed., McGraw Hill, 2007.

O. Levenspiel, "Flujo de Fluidos e Intercambio de Calor", Editorial Reverté, 1993.