Syllabus
2023 - 2024

GENERAL INFORMATION

Data of the subject	
Subject name	Heat Transfer
Subject code	DIM-GITI-314
Mainprogram	Bachelor's Degree in Engineering for Industrial Technologies
Involved programs	Grado en Ingeniería en Tecnologías Industriales y Grado en Administración y Dirección de Empresas [Third year] Grado en Ingeniería en Tecnologías Industriales [Third year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	4,5 ECTS
Type	Obligatoria (Grado)
Department	Department of Mechanical Engineering
Coordinator	Luis Mochón Castro

Teacher Information	
Teacher	
Name	Luis Manuel Mochón Castro
Department	Department of Mechanical Engineering
Office	Alberto Aguilera 25 [D-308]
EMail	lmochon@icai.comillas.edu
Teacher	
Name	Alberto David Jáñez Cordero
Department	Department of Electrical Engineering
EMail	adjanez@icai.comillas.edu
Teacher	
Name	Federico Ramírez Santa-Pau
Department	Department of Mechanical Engineering
EMail	framirez@icai.comillas.edu
Teacher	
Name	José Luis Martínez del Pozo
EMail	jlmartinez@comillas.edu
Teacher	
Name	José Rubén Pérez Domínguez
Department	Department of Mechanical Engineering
EMail	jrpdominguez@icai.comillas.edu

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Teacher	
Name	César Ignacio Boró Martín
Department	Department of Mechanical Engineering
EMail	ciboro@icai.comillas.edu
Teacher	
Name	Jorge Sampedro Feito
Department	Department of Mechanical Engineering
EMail	jsampedro@comillas.edu
Teacher	
Name	José Luis Becerra García
Department	Department of Mechanical Engineering
EMail	jlbecerra@icai.comillas.edu
Teacher	
Name	Leopoldo Prieto Fernández
Department	Department of Mechanical Engineering
EMail	lpfernandez@icai.comillas.edu
Profesores de laboratorio	
Teacher	
Name	Iñigo Sanz Fernández
Department	Department of Mechanical Engineering
EMail	isanz@icai.comillas.edu
Teacher	
Name	Juan Norverto Moriñigo
Department	Department of Mechanical Engineering
EMail	jnorvert@icai.comillas.edu

DESCRIPTION OF THE SUBJECT

Contextualization of the subject

Prerequisites

Basic knowledge of thermodynamics and fluid mechanics.

Course contents

Contents

Theory:

1. Introduction to heat transfer. Conduction, Convection and Radiation. Energy balance for control volumes and surfaces.
2. Conduction. The heat diffusion equation: initial and boundary conditions. One-dimensional, steady-state conduction. Thermal resistance. Thermal contact resistance. Critical radius of insulation. Conduction with thermal energy generation. Fins. Transient conduction: the lumped capacitance model. Geometrical effects. The semi-infinite solid.
3. Convection. Hydrodynamic and thermal boundary layers. Laminar and turbulent flow. Nusselt number. Functional forms of convection coefficients. Non dimensional groups in heat transfer. Forced convection: internal and external flow. Free convection: internal and external flow. Mixed convection.
4. Heat exchangers. Classification. Overall heat transfer coefficient. Basic equations: the log mean temperature method and the Effectiveness-NTU method.
5. Radiation. Blackbody radiation: Planck's, Wien's and Stefan-Boltzmann's laws. Radiation exchange between black surfaces: view factor. Radiative properties of real surfaces. Kirchoff's Law. Radiation exchange between opaque diffuse surfaces. Solar radiation.

Laboratory:

Students will complete three of the six sessions proposed:

1. Conductive heat transfer
2. Convective heat transfer
3. Radiation heat transfer
4. Boiling heat transfer
5. Heat exchangers
6. Numerical methods in heat transfer

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Mid-term exams Final Exam	Understanding of concepts Applications of concepts for the resolution of practical problems Analysis and interpretation of the conclusions obtained from problem-solving	75
Labs	Understanding of concepts Application of concepts for the resolution of practical problems and for their implementation in labs Analysis and interpretation of the data obtained in labs Ability to work in groups Oral presentation and writen communication	25

Grading

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.
- A minimum grade in the final exam of 5 over 10.

The overall grade is obtained as follows:

- Final exam 50%.
- Other exams 25%.
- Lab exam 20%.
- Performance during the lab sessions 5%.

BIBLIOGRAPHY AND RESOURCES

Basic References

- Notes in Moodle
- Heat and mass transfer. Yunus A. Çengel; Afshin J. Ghajar. Mc Graw Hill.