



## GENERAL INFORMATION

Data of the subject	
Subject name	Heat Transfer
Subject code	DIM-GITI-314
Main program	<a href="#">Bachelor's Degree in Engineering for Industrial Technologies</a>
Involved programs	Grado en Ingeniería en Tecnologías Industriales y Grado en Administración y Dirección de Empresas [Third year] 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	Compulsory
Department	Department of Mechanical Engineering
Coordinator	Luis Mochón Castro

Teacher Information	
<b>Teacher</b>	
Name	Federico Ramírez Santa-Pau
Department	Department of Mechanical Engineering
E-Mail	framirez@icai.comillas.edu
<b>Teacher</b>	
Name	José Rubén Pérez Domínguez
Department	Department of Mechanical Engineering
E-Mail	jrpdominguez@icai.comillas.edu
<b>Teacher</b>	
Name	Luis Manuel Mochón Castro
Department	Department of Mechanical Engineering
Office	Alberto Aguilera 25 [D-308]
E-Mail	lmochon@icai.comillas.edu
<b>Teacher</b>	
Name	César Ignacio Boró Martín
Department	Department of Mechanical Engineering
E-Mail	ciboro@icai.comillas.edu
<b>Teacher</b>	



<b>Name</b>	José Luis Becerra García
<b>Department</b>	Department of Mechanical Engineering
<b>E-Mail</b>	jlbecerra@icai.comillas.edu
<b>Teacher</b>	
<b>Name</b>	Leopoldo Prieto Fernández
<b>Department</b>	Department of Mechanical Engineering
<b>E-Mail</b>	lpfernandez@icai.comillas.edu
<b>Profesores de laboratorio</b>	
<b>Teacher</b>	
<b>Name</b>	Iñigo Sanz Fernández
<b>Department</b>	Department of Mechanical Engineering
<b>E-Mail</b>	isanz@icai.comillas.edu
<b>Teacher</b>	
<b>Name</b>	Juan Norverto Morriño
<b>Department</b>	Department of Mechanical Engineering
<b>E-Mail</b>	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 written 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.

In compliance with current regulations on the **protection of personal data**, we would like to inform you that you may consult the aspects related to privacy and data [that you have accepted on your registration form](#) by entering this website and clicking on "download"

<https://servicios.upcomillas.es/sedelectronica/inicio.aspx?csv=02E4557CAA66F4A81663AD10CED66792>