



## Teaching Guide

Identifying Data					2023/24
Subject (*)	Heat transfer		Code	730G05022	
Study programme	Grao en Enxeñaría Naval e Oceánica				
Descriptors					
Cycle	Period	Year	Type	Credits	
Graduate	1st four-month period	Third	Obligatory	4.5	
Language	Spanish				
Teaching method	Face-to-face				
Prerequisites					
Department	Ciencias da Navegación e Enxeñaría MariñaEnxeñaría Naval e Industrial				
Coordinador	Arias Fernández, Ignacio	E-mail	ignacio.arias@udc.es		
Lecturers	Arias Fernández, Ignacio Cartelle Barros, Juan José	E-mail	ignacio.arias@udc.es juan.cartelle1@udc.es		
Web					
General description	Heat transfer modes: conduction, convection and radiation. Practical applications.				

## Study programme competences / results

Code	Study programme competences / results
A14	Knowledge of the applied thermodynamics and of the transmission of the heat.
B2	That the students know how to apply its knowledge to its work or vocation in a professional way and possess the competences that tend to prove itself by the elaboration and defense of arguments and the resolution of problems in its area of study
B3	That the students have the ability to bring together and to interpret relevant data (normally in its area of study) to emit judgments that include a reflection on relevant subjects of social, scientific or ethical kind
B4	That the students can transmit information, ideas, problems and solutions to a public as much specialized as not specialized
B5	That the students developed those skills of learning necessary to start subsequent studies with a high degree of autonomy
B6	Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.
C1	Using the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of its profession and for the learning throughout its life.
C4	Recognizing critically the knowledge, the technology and the available information to solve the problems that they must face.

## Learning outcomes

Learning outcomes	Study programme competences / results		
Know the basic concepts of heat transfer.	A14	B2	C1
Know the basics of the processes of conduction and convection of heat as a transport mechanism.		B3	C4
Know the basic concepts of heat transfer of external and internal flow of fluids for its application on fluid mechanics processes.		B4	
Know the operation of heat exchange equipment for industrial use to develop projects of some simple equipment.		B5	
		B6	

## Contents

Topic	Sub-topic
The following topics develop the contents indicated in the Verification Memory (Memoria de Verificación), which are:	Conduction Convection Heat exchangers
1. Introduction	Introduction Heat transfer modes Conservation of energy



2. One-dimensional steady heat conduction	Introduction General heat conduction equation Cartesian coordinates Thermal contact resistance Cylindrical coordinates Spherical coordinates Fins
3. Numerical methods	Introduction Solution of the governing equations
4. Transient heat conduction	Lumped system analysis Semi-infinite solids Other cases
5. External forced convection	Introduction Flow across flat plates Flow across cylinders Flow across spheres Flow across tube banks Other cases
6. Internal forced convection	The entrance region Laminar flow Turbulent flow Non-circular tubes Distribution of temperature
7. Free convection	Introduction Vertical plates Inclined and horizontal plates Cylinders Spheres
8. Boiling and condensation	Boiling Condensation
9. Heat exchangers	Introduction DTML method Epsilon-NUT method
10. Radiation heat transfer	Fundamentals Radiation heat transfer

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Guest lecture / keynote speech	A14 B2 B3 B4 B5 B6 C1 C4	30	30	60
Mixed objective/subjective test	A14 B2 B3 B4 B5 B6 C1 C4	9.5	0	9.5
Problem solving	A14 B2 B3 B4 B5 B6 C1 C4	21	21	42
Personalized attention		1	0	1

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description



Guest lecture / keynote speech	Classes
Mixed objective/subjective test	Exam/s
Problem solving	Students must deliver exercises

### Personalized attention

Methodologies	Description
Guest lecture / keynote speech	Attention will be provided by personalized attention, e-mail and Teams.
Problem solving	Academic dispense is allowed. Students who request it must contact teacher to realize additional homework.
Mixed	
objective/subjective test	

### Assessment

Methodologies	Competencies / Results	Description	Qualification
Problem solving	A14 B2 B3 B4 B5 B6 C1 C4	Students must deliver exercises	30
Mixed objective/subjective test	A14 B2 B3 B4 B5 B6 C1 C4	Exam/s	70
Others			

### Assessment comments

It is possible to obtain other evaluation agreements between students and teachers, but in this case the conditions will be included in an evaluation contract signed by the parties. And the phrase "According to what is included in the Teaching Guide in the evaluation observations" will be explicitly cited.

The evaluation criteria contemplated in tables A-III/1 and La-III/2 of the STCW Code and its amendments related to this matter will be taken into account when designing and carrying out the evaluation. If it is coming

For students with recognition of part-time dedication and academic exemption from assistance, according to what is established in the "RULE THAT REGULATES THE REGIME OF DEDICATION TO THE STUDY OF UNIVERSITY DEGREE AND MASTER'S DEGREE STUDENTS AT UDC (Arts. 2.3; 3 .b; 4.3 and 7.5) (05/04/2017): The evaluation criteria for this student body are the same as for full-time students.

To pass it will be necessary to obtain at least a 4 in the final exam and a 5 in the overall grade for the subject.

In the case of not being able to go to the laboratory, and provided that the means are available to make it possible, the compulsory practices can be carried out without going to the center using software that has a license from the UDC or is freely distributed.

The commission of academic fraud will mean the application of the disciplinary sanctions established in Article 11 of the Disciplinary Regulations for UDC Students. [https://sede.udc.gal/services/electronic\\_board/EXP2023/007335](https://sede.udc.gal/services/electronic_board/EXP2023/007335)

### Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- Incropera, F. P.; DeWitt, D. P., (). Fundamentos de Transferencia de Calor y Materia. Pearson Educación</li> <li>- Cengel, Y.A. (). Heat Transfer. A Practical Approach. McGraw-Hill</li> <li>- Sáiz Jabardo, J.M., Arce Ceinos, A., Lamas Galdo, M.I. (). Transferencia de Calor. Universidade da Coruña</li> <li>- Mills, A.F. (). Transferencia de Calor, 1ª Ed. Irwin</li> <li>- Holman, H.P. (). Transferencia de Calor. McGraw-Hill</li> </ul>
<b>Complementary</b>	





(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.