UNIVERSIDADE DA CORUÑA

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

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

2. One-dimensional steady heat conduction	Introdution 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 analysys 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 Problem solving Mixed objective/subjective test	Attention will be provided by personalized attention, e-mail and Teams. Academic dispense is allowed. Students who request it must contact teacher to realize additional homework.

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

Sources of information	
Basic	- Incropera, F. P.; DeWitt, D. P., (). Fundamentos de Transferencia de Calor y Materia. Pearson Eduación - Cengel, Y.A. (). Heat Transfer. A Practical Approach. McGraw-Hill - Sáiz Jabardo, J.M., Arce Ceinos, A., Lamas Galdo, M.I. (). Transferencia de Calor. Universidade da Coruña - Mills, A.F. (). Transferencia de Calor, 1ª Ed. Irwin - Holman, H.P. (). Transferencia de Calor. McGraw-Hill
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Thermodynamics /730G03014
Subjects that are recommended to be taken simultaneously
Fluid Mechanisc /730G03018
Subjects that continue the syllabus
Graduation Project/730G03068
Other comments

To help achieve a
sustained immediate environment and meet the objective of action number 5:
"Healthy and sustainable environmental and social teaching and
research" of the "Green Campus Ferrol Action Plan":
           The
delivery of the documentary works that are made in this matter:
             ?
Will be requested in virtual format and / or computer support
             ?
It will be done through Moodle, in digital format without the need to print
them
             ?
If it is necessary to make them on paper:
                   -
Plastics will not be used
                   -
Double-sided prints will be made.
                    -
Recycled paper will be used.
                    -
Printing of drafts will be avoided.
               ?
A sustainable use of resources and the prevention of negative impacts on the
natural environment must be made
                ?
The importance of ethical principles related to the values ??of sustainability in personal and professional
behaviors must be taken into account
                ?
Gender perspective is incorporated into the teaching of this subject
(non-sexist language will be used, bibliography of authors of both sexes will
be used, intervention in class of students will be encouraged ...)
                ?
Work will be done to identify and modify prejudices and sexist attitudes, and
the environment will be influenced to modify them and promote values ??of respect and equality.
                ?
Discrimination situations must be detected and actions and measures will be
proposed to correct them.

(*)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.