UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2017/18
Subject (*)	Energy technology		Code	730497006
Study programme	Mestrado Universitario en Enxeñaría Industrial (plan 2012)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	1st four-month period	First	Obligatoria	4.5
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Ciencias da Navegación e Enxeñaría MariñaEnxeñaría Naval e Industrial			
Coordinador	Arce Ceinos, Alberto	E-mail	alberto.arce@udc.es	
Lecturers	Arce Ceinos, Alberto	E-mail	alberto.arce@udc.es	
Web				
General description	Nowadays, energy is our most valuable natural commodity. The modern world generates power in increasingly large quantities from coal, oil and natural gas, due to an increasing demand. The finite nature of such fossil fuels, combined with an increasing worry about the concomitant greenhouse effect, has led to research into renewable sources of energy such as wind, sun, tides and waves. These alternatives will take much time and money to explore fully and require a very large capital investment. In the immediate future, therefore, the most direct and cheapest way to tackle the problem is to use existing energy sources more efficiently. This subject concentrates on this theme. It looks at energy conversion, giving and analytical treatment of methods of energy saving and recovery. This subject is aimed to settle and complete the student?s knowledge of energy technology.			

Study programme competences	
Code	Study programme competences
A6	Coñecementos e capacidades que permitan comprender, analizar, explotar e xestionar as distintas fontes de enerxía.
B2	Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en ámbitos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
B3	Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
B5	Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que terá que ser en boa medida autodirixido ou autónomo.
B7	Falar ben en público.

Learning outcomes			
Learning outcomes	Study programme competences		
Heat transfer	AJ6	BJ2 BJ3 BJ5 BJ7	
Energy conversion	AJ6	BJ2 BJ3 BJ5 BJ7	
Energy recovery	AJ6	BJ2 BJ3 BJ5 BJ7	

Pinch technology	AJ6	BJ2 BJ3 BJ5 BJ7	
Combined heat and power	AJ6	BJ2 BJ3 BJ5 BJ7	

Contents	
Topic	**Sub-topic**
0 Os temas seguientes desenrolan os contidos establecidos nas fichas da Memoria de Verificación que son:	(i) Introducción; fuentes, utilización, aspectos económicos y terminología. (ii) Combustibles en los procesos de conversión. (iii) Producción de energía térmica. (iv) Sistemas de combustibles fósiles. (v) Reactores Nucleares. (vi) Impacto ambiental. (vii) Energías y centrales renovables. (viii) Producción de energía mecánica. (ix) Fundamentos de la producción de energía eléctrica. (x) Fundamentos de almacenamiento de energía. (xi) Análisis energético de sistemas de conversión de energía.
1 Introduction	1.1 The energy problem 1.2 Combustion theory 1.3 Heat transfer 1.4 Electricity
2 The economics of energy-saving schemes	2.1 Costs 2.2 Investing in new energy-saving projects
3 Energy conversion	3.1 Fuels and combustion 3.2 Efficient combustion 3.3 Waste as fuel 3.4 Steam and gas cycles 3.5 Refrigeration, heat pumps and air conditioning 3.6 Electric conversion
4 Energy recovery	4.1 Insulation 4.2 Recuperative heat exchangers 4.3 Run-around coil systems 4.4 Regenerative heat exchangers 4.5 Heat pumps 4.6 Heat pipes 4.7 Selection of energy recovery methods
5 Process integration: Pinch technology	5.1 Basic concepts of Pinch technology 5.2 Stream networks 5.3 The significance of the Pinch 5.4 Design of energy recovery systems 5.5 Selection of Pinch temperature difference 5.6 Tabular method 5.7 Stream splitting 5.8 Process retrofit 5.9 Installation of heat pumps 5.10 Installation of heat engines 5.11 The grand composite curve

6 Energy in buildings	6.1 Steady state loads and comfort 6.2 Transient heating and air conditioning loads 6.3 Thermal performance monitoring 6.4 Lightning 6.5 Energy targets
7 CHP Plants	7.1 Introduction to CHP 7.2 The benefits of CHP 7.3 Problems asociated with CHP 7.4 Balance of energy demand 7.5 Types of prime movers 7.6 The economics of CHP generation 7.7 CHP in the industrial sector 7.8 CHP in the commercial sector 7.9 CHP in the domestic sector 7.10 Conclusions

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A6 B2 B3 B5 B7	12	15.5	27.5
Problem solving	A6 B2 B3 B5 B7	28	56	84
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	Oral presentation that can be audiovisually aided and the introduction of questions with the aim of transmiting the knowledge and facilitating the learning
Problem solving	Oral presentation that can be audiovisually aided and the introduction of questions with the aim of transmiting the knowledge and facilitating the learning

Personalized attention	
Methodologies	Description
Guest lecture / keynote speech Problem solving	Tutorials

Assessment			
Methodologies	Competencies	Description	Qualification
Guest lecture / keynote speech	A6 B2 B3 B5 B7	Exam	20
Problem solving	A6 B2 B3 B5 B7	Proba escrita	80

Assessment comments
Exam: therory (45 min) + exercises (180min) (use of textbook and solved exercises)

Sources of information

Basic	- T. D. Eastop y D. R. Croft (1990). Energy Efficiency for Engineers and Technologists. Londres: Longman Scientific & Technical - M. J. Moran y H. N. Shappiro (2004). Fundamentos de Termodinámica Técnica 2ª ed. Barcelona: Reverté - F. P. Incropera y D. P. DeWitt (1999). Fundamentos de Transferencia de Calor. Mexico: Prentice-Hall
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Thermal engineering/730497005
Subjects that continue the syllabus
Master Thesis/730497015
Other comments

(*)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.