SUBJECT TEACHING GUIDE

1041 - Energy Systems

Master's Degree in Industrial Engineering
Master's Degree in Industrial Engineering

Academic year 2026-2027

1. IDENTIFYING DATA					
Degree	Master's Degree in Industrial Engineering Master's Degree in Industrial Engineering			Type and Year	Compulsory. Year 1 Compulsory. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Energy Systems Industrial Technology Industrial Technologies				
Course unit title and code	1041 - Energy Systems				
Number of ECTS credits allocated	5	Term		Semester based (1)	
Web	https://personales.unican.es/ortizff/				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA
Name of lecturer	FELIX ORTIZ FERNANDEZ
E-mail	felix.ortiz@unican.es
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 3. DESPACHO PROFESOR (S3030)
Other lecturers	AGUSTIN SANTISTEBAN DIAZ

3.1 LEARNING OUTCOMES
- Ability to understand the operation of: hydraulic machines, steam turbines, engines, and industrial heating and cooling facilities
- Ability to analyze the functioning of: hydraulic machines, steam turbines, engines, and facilities for heat and industrial cooling.
- Capacity for the design of: hydraulic machines, steam turbines, engines, and facilities for heat and industrial cooling.

4. OBJECTIVES
The aim is that students acquire the necessary knowledge to get the skills developed in the subject

6. SUBJECT PROGRAM	
CONTENTS	
1	SUBJECT PRESENTATION
2	HYDRAULIC MACHINES
2.1	INTRODUCTION.
2.2	CENTRIFUGAL PUMPS . POSITIVE DISPLACEMENT PUMPS. Centrifugal Pumps Characteristics Head Classification Characteristic Curves Installation Couplings Power, Efficiency, and Losses Water Hammer and Cavitation Similarity Laws Specific Speed Number of Blades Operating Point ... Positive Displacement Pumps General Overview Types
2.3	HYDRAULIC TURBINES
2.4	FANS
3	THERMAL MACHINES
3.1	STEAM TURBINES
3.2	GAS TURBINES
4	ENGINES
5	Industrial Heating and Cooling

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Exam of Hydraulic Machines	Written exam	No	Yes	35,00
Exam of Thermal Machines (steam and gas turbines)	Written exam	No	Yes	30,00
Exam of Engines	Written exam	No	Yes	25,00
It is necessary to prepare a report on the practicals	Written exam	No	No	10,00
There are TWO evaluation modalities: FIRST OPTION: Through partial exams, which will be recoverable in the extraordinary call. The minimum grade to compensate for the partial exams will be 4 out of 10 in the Machines sections. SECOND OPTION: Through a f	Written exam	Yes	Yes	0,00
TOTAL				100,00

Observations
Students pass the course if they obtain an average mark of 5 out of 10
Observations for part-time students
Part-time students can do an exam which evaluates all the topics covered by the course.

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Mataix, Claudio. Mecánica De Fluidos y Máquinas Hidráulicas. Oxford University Press, Oxford, 2001.
Agüera Soriano. José. Mecánica De Fluidos Incompresibles y Turbomáquinas Hidráulicas. Ciencia 3, Madrid, 2002.
Mataix, Claudio. Turbomáquinas Hidráulicas: Turbinas Hidráulicas, Bombas, Ventiladores. Universidad Pontificia Comillas, Madrid, 2009.
Mataix, Claudio. Termodinámica Técnica y Máquinas Térmicas. ICAI, Madrid, 1978
Segura Clavell, José, and Juan Rodríguez Sevilla. Problemas De Termodinámica Técnica. Reverté, Barcelona, 1990.
Mataix, Claudio. Turbomáquinas Térmicas: Turbinas De Vapor. Turbinas De Gas. Turbocompresores. Dossat, Madrid [etc.], 1973.
Payri González, Francisco, and José M. Desantes Fernández. Motores De Combustión Interna Alternativos. Universitat Politècnica de València, Valencia, 2011.