Universida_{de}Vigo

Subject Guide 2022 / 2023

IDENTIFYIN				
	urbomachines			
Subject	Hydraulic turbomachines			
Code	V12G363V01504			
Study	Grado en Ingeniería en			
programme	Tecnologías			
	Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
Bescriptors	6	Mandatory	3rd	1st
Teaching		Handatory		
language				
Department				
Coordinator	Meis Fernández, Marcos			
Lecturers	Meis Fernández, Marcos			
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Web				
General description	This syllabus presents information the Hydraulic Turdegree in Industrial Technologies Engineering, 2020 European Space of Upper Education. This is a first course in Hydraulic Turbomachines, for Technologies Engineering applications. The course is intended to acquire essential knowled Hydraulic Turbomachines, studying the main parts of fundamental Euler stheorem, and the performant in hydroelectric power plants and pumps stations, reacquire fundamental knowledge of fans, airfoils and	0-2021, in accordan cusing on the topical ge about the funda of a turbomachines nce of both turbines espectively. Finally,	ce to the markers that are relevent mental principle and their classis and pumps with some brief con	ed guidelines by the ant to Industrial es and performance of ification, the application th different arrangements

Skills

Code

- B3 CG3 Knowledge of basic and technological subjects that enable students to learn new methods and theories, and to adapt to new situations.
- C8 CE8 Knowledge of the basic principles of fluid mechanics and their application to solving problems in the field of engineering. Calculation of pipes, channels and fluid systems.
- C25 CE25 Applied knowledge of the basics of fluidmechanics systems and machines.
- D2 CT2 Problem solving.
- D9 CT9 Application of knowledge.
- D10 CT10 Self learning and work.

Learning outcomes				
Expected results from this subject	Trai	Training and Learning Results		
Understand fundamentals of hydraulic machines	B3	C8	D2	
		C25	D9	
			D10	
Acquire skills for sizing pumps facilities and fluid machines	В3	C8	D2	
		C25	D9	
			D10	

Contents		
Topic		
1 Introduction	1 Turbomachinery. Classification	
	2 Hydraulic turbomachines	
	3 Applications to the Industry	
	4 General specifications	

2 Transfer of Energy	1 Equation of conservation of the energy
	2 Hydraulic turbomachines applications
	3 Dimensionless parameters
	4 Power and efficiencies
3 Similarity and Characteristic Curves	1 Similarity in hydraulic turbomachines
	2 Practical application of similarity laws
	3 Comparison of hydraulic turbomachines
	4 Characteristic curves in hydraulic pumps
	5 Characteristic curves in hydraulic turbines
	6 Dimensionless coefficients. Specific speed and specific power
4 Transfer of Work	1 Fundamental equation of hydraulic turbomachinery: Euler's equations.
	Expressions
	2 One-dimensional (ideal) theory of hydraulic turbomachinery
	3 Two-dimensional (ideal) theory of hydraulic turbomachinery
	4 Real flow. Losses
	5 Cavitation in HTM
5 Fluids machines of low pressure rise	1Classification
	2 Fans. Characteristic curves
	3 Wind turbines. Classification
	- Disk actuator theory.Betz's limit
	- Fundamentals Theory of Airfols. NACA Airfoils
	- Blade element theory
	- Characteristic curves
6 Positive displacement machines and hydraulic	
transmissions	2 Alternative and rotatory pumps.
	3 Hydraulic engines of positive displacement
	4 Transmissions and hydraulic couplings
Laboratory sessions	1. Introduction to the pneumatic systems:
	- detailed description of the pneumatic systems and his components.
	-Basic circuits.
	-Problems resolutions
	2. Resolution of problems of of hydraulic turbomachines
	3. Hydraulic turbines
	- Hill chart Francis Turbine
	4. Resolution of problems of Positive displacemetn machines

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	32	60	92
Laboratory practical	6	7	13
Problem solving	12	18	30
Essay questions exam	3	0	3
Problem and/or exercise solving	0	12	12

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

Methodologies	
	Description
Lecturing	Readings
	solution of problems
Laboratory practical	Practices of pneumatic (see description in contents)
	Practices of HTM (see description in contents)
Problem solving	Calculation methods and techniques
	Interpretation of results
	Practical cases

Personalized assistance			
Methodologies	Description		
Problem solving	Personalized attention will be given to the students during class (throughout the possible questions that could arise) and during the specific timetable of the teacher for tutorships. Updated information of the tutorships timetables will be given to the students		

Lecturing	Personalized attention will be given to the students during class (throughout the possible questions that could arise) and during the specific timetable of the teacher for tutorships. Updated information of the tutorships timetables will be given to the students
Laboratory practica	I Personalized attention will be given to the students during class (throughout the possible questions that could arise) and during the specific timetable of the teacher for tutorships. Updated information of the tutorships timetables will be given to the students

	Description	Qualification	Training	and Lear	ning Result
Essay questions exam	Proof written that it will be able to consist of - theoretical questions - practical questions - Resolution of exercises/problems - Short covering of a topic	: 80	В3	C8	D2 D9 D10
Problem and/or exercise solving (*)	Resolution of exercises proposed, including: -Short reports/exercises proposed -	20	В3	C8	D2 D9 D10

Other comments on the Evaluation

Continuous evaluation: represents 20% of the grade, which consists of solving some proposed exercises. Except official renounce of the student, the course is followed under continuous assessment mode.

Continuous assessment grading is not saved year after year

Final exam (first call): 80% of the total mark, which consists of theoretical question, practical questions, resolution of exercises/problems or short covering of a topic

July final exam (second call): represents 100% of the grade (continous evaluation is not considered)

Ethical Commitment: In case of noticing a non ethical behaviour (copy, plagiarism, utilisation of unauthorised electronic devices, and others) it will be considered that the student does not gather the necessaryrequirements to pass the course. In this case, the global qualification iof the present academic course will be failed (0.0)

Sources of information

Basic Bibliography

Viedma A., Zamora B., **Teoría y Problemas de máquinas hidráulicas**, 3º Ed., Horacio Escarabajal Editores., 2008

Mataix, C., Turbomáquinas Hidráulicas, Editorial ICAI, 1975

Mataix, C., Mecánica de Fluidos y Máquinas Hidráulicas, Editorial del Castillo S.A., 1986

Srinivasan, K.M., rotodynamic Pumps, New Age International Publishers, 2008

Complementary Bibliography

Hernández Krahe, J. M, Mecánica de Fluidos y Máquinas Hidráulicas., UNED, 1998

Krivchenko, G, **Hydraulic Machines: Turbines and Pumps**, 2ª ed., Lewis, 1994

Creus, A., Neumática e Hidráulica., Marcombo Ed., 2011

Karassik, I. J., Pump Handbook, 2ª ed., Nueva York, McGraw-Hill., 1986

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics 1/V12G360V01102 Physics: Physics 2/V12G360V01202

Mathematics: Calculus 2 and differential equations/V12G360V01204

Fluid mechanics/V12G360V01403

Other comments

Recommends to the student:

Attend to class

Spend the hours outside the classroom studying the subject