



IDENTIFYING DATA

Hydraulic turbomachines

Subject	Hydraulic turbomachines			
Code	V12G360V01504			
Study programme	Degree in Industrial Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language				
Department	Mechanical Engineering, Heat Engines & Machines, and Fluids			
Coordinator	Martín Ortega, Elena Beatriz Meis Fernández, Marcos			
Lecturers	Carrera Pérez, Gabriel Martín Ortega, Elena Beatriz Meis Fernández, Marcos			
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Web				
General description	The *asignatura *Turbomáquinas Hydraulic describes the operation of the group of machines that govern by the principle of Euler (machines *rotodinámicas). The knowledge of these machines provides the necessary basic principles to analyse the behaviour of the same in any installation in which they find , as well as the basic principles for his design and *dimensionado.			

Competencies

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility 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 Problems resolution.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.

Learning outcomes

Expected results from this subject	Training and Learning Results		
□ Purchase skills on the process of *dimensionado of installations of pumping and machines of fluids	B3	C8 C25	D2 D9 D10
To understand basic aspects of hydraulic machines	B3	C8 C25	D2 D9 D10

Contents

Topic	
1.- Introduction	1.- Machines of Fluids. Classification 2.- *Turbomáquinas Hydraulic 3.- Applications to the Industry 4.-Characteristic general

2.- Transfer of Energy	1.- Equation of conservation of the energy 2.- Application to *Turbomáquinas 3.- Adimensional parameters and coefficients of speed 4.-Performances
3.- Similarity and characteristic Curves	1.- Similarity in *turbomáquinas 2.- Practical utilisation of the laws of similarity 3.- Comparison between *turbomáquinas 4.- Characteristic curves in hydraulic bombs 5. Characteristic curves in hydraulic turbines 6. Adimensional coefficients. Specific speed and specific power
4.- Transfer of Work	1.- Fundamental equation of the *Turbomáquinas. Equation of Euler. Distinct expressions of the equation of Euler 2.- One-dimensional ideal theory of *TMH 3.- Two-dimensional ideal theory of *TMH 4.- Real flow. Losses 5.- *Cavitación In *TMH
5.- Machines of fluids of despicable compressibility	1.-Classification 2.- Fans. Characteristic curves 3.- *Aerogeneradores. Classification - Theory of the disk actuator. Limit of *Betz - basic Concepts of aerodynamic profiles - Theory of the element of shovel - Curves of power
6.- Machines of positive trip and hydraulic transmissions	1.- Types and classification 2.- Alternative and rotatory bombs. 3.- Hydraulic engines of positive trip 4.- Transmissions and hydraulic attachments
Practices	1. Introduction to the pneumatic systems: - Description detailed of the pneumatic systems and his components. -Basic circuits. -Resolution of problems proposed 2. Resolution problems of *TMH 3. *Turbomáquinas -Test characterisation turbine Francis 4. Resolution of problems of *MDP

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	32	60	92
Laboratory practices	6	7	13
Problem solving	12	18	30
Essay questions exam	3	0	3
Problem 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	Exhibition of the theory *Traslación of technical problems to mathematical models.
Laboratory practices	Practices of pneumatic (see description in contents)
Problem solving	Practices of *TH (see description in contents) Technicians of design and calculation Presentation and interpretation of solutions. Practical cases

Personalized attention

Methodologies	Description
Problem solving	The professors will attend personally the doubts and queries of the students, so much in the classes as in the *tutorías.
Lecturing	The professors will attend personally the doubts and queries of the students, so much in the classes as in the *tutorías.

Laboratory practices The professors will attend personally the doubts and queries of the students, so much in the classes as in the *tutorías.

Assessment					
	Description	Qualification	Training and Learning Results		
Essay questions exam	Proof written that it will be able to consist of: - theoretical Questions - practical Questions - Resolution of exercises/problems - Subject to develop	80	B3	C8 C25	D2 D9 D10
Problem solving	Resolution of exercises proposed, including: -*Memoría/exercises proposed of practices	20	B3	C8 C25	D2 D9 D10

Other comments on the Evaluation

Continuous evaluation: it will have a final weight of 30% of the final note of the *asignatura. 20% will consist in the resolution of exercises proposed. 10% to the active assistance to class. The note of continuous evaluation will not save of a course for another neither for the announcement of Julio. Final Examination of the *asignatura (first announcement): it will have a final weight of 70% of the final note of the *asignatura. It will consist, as it indicates in the previous section of Proof written that it will be able to consist of: - theoretical Questions - practical Questions - Resolution of exercises/problems - Subject to develop so much of the classes of theory as of the classes of practices. Second announcement of Julio: it will consist in a final examination that represents 100% of the note of the *asignatura. Expects that the present student a suitable ethical behaviour. In case to detect a no ethical behaviour (copy, plagiarism, utilisation of unauthorised electronic devices, for example) will consider that the student does not gather the necessary requirements to surpass the matter. In this case the global qualification in the present academic course will be of suspense (0.0).

It will not allow the utilisation of any electronic device during the *probas of evaluation except permission expresses. The fact to enter an unauthorised electronic device in the classroom of examination will be considered reason of no *superación of the matter in the present academic course and the global qualification will be of suspense (0.0).

Sources of information

Basic Bibliography

Viedma A., Zamora B., **Teoría y Problemas de máquinas hidráulicas**, 3ª 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

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

To enrol in this matter is necessary to have surpassed or be enrolled of all the matters of the inferior courses to the course in which it finds this matter.

In case of discrepancies, will prevail the version in Spanish of this guide.