60817 - Hydraulic Machinery and Systems

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	532 - Master's in Industrial Engineering
ECTS	6.0
Course	1
Period	First semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

It is the objective that the student gets knowledge in piping systems. In this way it is evaluated capabilities in calculating and analyzing every element involved in a fluid conduction.

5.2.Learning activities

Learning activities are programed to get fulfill results at the end of the course .

These activities involve:

1. **Master class** , where all topics are developed and where some practical cases are exposed in order to get more understanding in the most important topics.

2. **Experimental classes** in the lab. Four lab sessions are designed to investigate some important behaviors in any piping system. Laboratory reports are an important activity which is evaluated.

3. It is considered to **visit** a hydraulic power plant, where students can observe magnitudes and confirm knowledge in those topics studied in class.

4. **Personal and collective work** is desired to fulfill objectives. It has been considered to dedicate at least 90 hours to this activitiy.

5. **Tutoring** is seen as an important activity, because teacher and student can both evaluate the degree in knowledge, or correct it in any other case.

5.3.Program

Detail subjects are differentiated in Master and Lab clases .

Master classes take into account the next list of topics:

0. Introduction. The fluid conduction in different industrial processes. Hydraulic machinery as active elements in piping systems.

1. Review of lost energy in piping systems. Power, head lost and efficiency. Moody and Darcy-Weisbach equations.

2. Fundamentals of turbomachinery. Geometrical and kinematics aspects to take into account in a hydraulic machine impeller.

3. 1-D theory. Parameters involved in modeling and design a turbomachinery.

4. Hydraulic machines similarities. Turbines. Reaction degree. Francis, Kaplan and Pelton turbines. Characteristics curves and scale effects.

5. Piping systems. Pumps, Fans and Ventilators.

6. Mass and volumetric flow control. Pumps, fans and ventilators.

7. Cavitation. Effects and problems.

Lab sessions are

1. Pumps selection. Breaking up a turbo machine.

2. Pump's assay. Cavitation problems.

3. Fans. Characteristic curves.

4. Pelton Turbine. Characteristic curves.

5.4.Planning and scheduling

In Master Classes are included sessions in which the student must apply all their knowledge participating to solve problems.

Lab sessions are taking into account in order to confirm knowledge and learning.

Topic	Clase presencial		Lab sesions. Experiments.	Personal work and study
	Master Class	Apply Problem.		
0. Introduction. Fluid conduction in industrial processes.	2			
1. Head lost. Moody's diagram.	3	1	1.5	10
2. Fundamentals of turbomachinery.	2		5.5	
3. Modeling and desingn turbomachinery.	4	6		20

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4. Hydraulic similarities.	6	3	1.5	10
5. Piping systems.	8	7	1.5	40
6. Mass and volumetric flow control. Cavitación.	5	3		10
TOTAL	30	20	10	90

5.5.Bibliography and recomended resources

- Mataix, Claudio. Hydraulic machinery. 1982.
- Agüera Soriano, José. Mecánica de fluidos incompresibles y turbomáquinas hidráulicas. 5ª ed. act. Madrid : Ciencia 3, D.L. 2002
- Streeter, Víctor L.. An introduction to Fluid mechanics. 1988|
- White, Frank M.. Fluid machanics. McGraw-Hill/Interamericana, D. L. 2008