Universidad Zaragoza
1542

Year : 2018/19

60817 - Hydraulic Machinery and Systems

Syllabus Information

Academic Year:	2018/19
Subject:	60817 - Hydraulic Machinery and Systems
Faculty / School:	110 -
Degree:	532 - Master's in Industrial Engineering
ECTS:	6.0
Year:	1
Semester:	First semester
Subject Type:	Optional
Module:	---

General information

Aims of the course

Context and importance of this course in the degree

Recommendations to take this course

Learning goals

Competences

Learning goals

Importance of learning goals

Assessment (1st and 2nd call)

Assessment tasks (description of tasks, marking system and assessment criteria)

Methodology, learning tasks, syllabus and resources

Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. Its aim is for students to acquire knowledge in piping systems and focuses on the calculation and analysis of every element involved in a fluid conduction system.

Learning tasks

The course includes the following learning tasks:

- **Lectures**. Presentation of the course contents combined with practical cases to facilitate the understanding of the most important topics.
- **Laboratory sessions.** Four sessions to investigate some important behaviors in any piping system. Laboratory reports are an important activity which is evaluated.
- **Visit**. A visit to a hydraulic power plant is considered, where students can observe magnitudes and check the knowledge learned in class.
- **Autonomous work and study** (90 hours). Work to fulfil the learning objectives.
- **Tutorials**. Teacher's office hours for students to solve doubts, follow-up their progress with the teacher, etc.

Syllabus

The course will address the following topics:

Lectures

1. Introduction. The fluid conduction in different industrial processes. Hydraulic machinery as active elements in piping systems.
2. Review of lost energy in piping systems. Power, head lost and efficiency. Moody and Darcy-Weisbach equations.
3. Fundamentals of turbomachinery. Geometrical and kinematics aspects to take into account in a hydraulic machine impeller.
4. 1-D theory. Parameters involved in modeling and the design of turbomachinery.
5. Hydraulic machines similarities. Turbines. Reaction degree. Francis, Kaplan and Pelton turbines. Characteristic curves and scale effects.
6. Piping systems. Pumps, Fans and Ventilators.
7. Mass and volumetric flow control. Pumps, fans and ventilators.
8. Cavitation. Effects and problems.

Laboratory sessions

1. Pumps selection. Breaking up a turbo machine.
2. Pump's assay. Cavitation problems.
3. Fans. Characteristic curves.
4. Pelton Turbine. Characteristic curves.

Course planning and calendar

Provisional course planning

Topic	Teaching sessions		Lab sessions	Autonomous work
	Lectures	Problems		
0. Introduction. Fluid conduction in industrial processes.	2			
1. Head lost. Moody's diagram.	3	1	1.5	10
2.	2		5.5	

Fundamentals of turbomachinery.				
3. Modeling and design turbomachinery.	4	6		20
4. Hydraulic similarities.	6	3	1.5	10
5. Piping systems.	8	7	1.5	40
6. Mass and volumetric flow control. Cavitation.	5	3		10
TOTAL (hours)	30	20	10	90

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

Bibliography and recommended resources