Course guide
220263 - 220263 - Fluid Systems Design

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 729 - MF - Department of Fluid Mechanics.
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN RESEARCH IN MECHANICAL ENGINEERING (Syllabus 2021). (Compulsory subject).
Academic year: 2022  ECTS Credits: 5.0  Languages: English

LECTURER
Coordinating lecturer: Robert Castilla
Others: Gustavo Raush

PRIOR SKILLS
Previous knowledge of Fluid Mechanics, Physics, Mathematics and Thermodynamics is required. It is very important to also have knowledge of Computational Fluid Dynamics.

REQUIREMENTS
Have degrees of industrial engineering, or similar.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE03-MEI. Ability to design and test machines.
CE05-MEI. Knowledge and skills for the design and analysis of heat engines and machines, hydraulic machines and installations of heating and cooling industry.
CE16-MEI. Ability to manage research, development and technological innovation.
CG04-MEI. Perform research, development and innovation in products, processes and methods.

Transversal:
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY
Theory and problems classes  
computer sessions  
Lab sessions
LEARNING OBJECTIVES OF THE SUBJECT

1. Knowledge of Fluid Mechanics applied to Turbomachinery
2. Basic knowledge of Turbomachinery design
3. Basic knowledge of Computational Fluid Dynamics applied to Turbomachinery

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>12.00</td>
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<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
</tbody>
</table>

Total learning time: 125 h

CONTENTS

Module 1: Introduction to turbomachinery design

Description:
1.1 Introduction
1.2 Radial fans and compressors
1.3 Axial fans and compressors
1.4 Vibration and noise

Related activities:
Exam
Assignment 1

Full-or-part-time: 35h
Theory classes: 15h
Self study: 20h

Module 2: Introduction to Turbomachinery CFD

Description:
2.1 Introduction to CFD
2.2 Computational methods for turbomachinery
2.3 Validation and verification

Related activities:
Assignment 2

Full-or-part-time: 45h
Theory classes: 7h 30m
Laboratory classes: 7h 30m
Self study: 30h
### Module 3: Experimental Methods for Turbomachinery

**Description:**
- 3.1 Introduction
- 3.2 Experimental methods for turbomachinery

**Related activities:**
- Assignment 3

**Full-or-part-time:** 45h
- Theory classes: 7h 30m
- Laboratory classes: 7h 30m
- Self study: 30h

### ACTIVITIES

#### Exam

**Description:**
Exam done either in class or online on the contents of the first module

**Full-or-part-time:** 17h 30m
- Theory classes: 7h 30m
- Self study: 10h

#### Assignment 1

**Description:**
Calculation or design project related to a turbomachines, made in groups of 3 students.

**Full-or-part-time:** 17h 30m
- Theory classes: 7h 30m
- Self study: 10h

#### Assignment 2

**Description:**
Computational Fluid Dynamics related to a Turbomachine, made in group of 3 students

**Full-or-part-time:** 45h
- Theory classes: 7h 30m
- Laboratory classes: 7h 30m
- Self study: 30h

#### Assignment 3

**Description:**
Experimental project related to a Turbomachines, made in group of 3 students.

**Full-or-part-time:** 45h
- Theory classes: 7h 30m
- Laboratory classes: 7h 30m
- Self study: 30h
GRADING SYSTEM

The final grade will be calculated from the exam of the first module (40% of weight) and the three deliverables (20% each)
Grade = 0.4*Exame + 0.2*Deliverable 1 + 0.2*Deliverable 2 + 0.2*Deliverable 3

BIBLIOGRAPHY

Basic:

RESOURCES

Other resources:
https://www.cfd-online.com/Wiki/Best_practice_guidelines_for_turbomachinery_CFD