820330 - TDFE - Energy Fluid Transmission and Distribution

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6

Teaching staff
Coordinator: Francesc Estrany Coda

Others: Margarita Sánchez Jiménez
Francesc Estrany Coda

Opening hours
Timetable: Generally, during the hour before the start time of the class and during the hour after class.

Prior skills

Requirements
MECÀNICA DE FLUIDS - Prerequisite
TERMODINÀMICA I TRANSFERÈNCIA DE CALOR - Pre-corequisite

Degree competences to which the subject contributes

Specific:
CEENE-220. Knowledge of the principles of operation of liquid, gas and vapour transport and distribution systems for the transport.

Transversal:
5. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

Teaching methodology
The course uses the methodology exhibition by 40%, individual work by 20%, work in groups by 40%.

Learning objectives of the subject
Acquire the knowledge necessary for the calculation, modeling and simulation of transport facilities and channeling fluid power, knowledge and calculation of the thermodynamic properties of water vapor, and ability to design industrial distribution of water vapor. Knowledge of the physical properties of natural gas, and the operation of extraction facilities and distribution of this fuel. Computing capacity of f LNG vaporization installations.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 52h 30m</th>
<th>35.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>7h 30m</td>
<td>5.00%</td>
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<tr>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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</table>
# Content

## CHAPTER 1: SYSTEMS OF UNITS USED IN ENGINEERING

**Learning time:** 3h  
Theory classes: 1h  
Self study : 2h

**Description:**  
Dimensional analysis. Absolute systems, technical, engineering and mixed or international system. Getting processes formulas by dimensional analysis.

## CHAPTER 2: PIPELINES FOR ENERGY TRANSPORT

**Learning time:** 16h  
Theory classes: 6h  
Self study : 10h

**Description:**  
Energy balance applied to channeled fluids: Bernoulli’s principle, I raise general and specific pose for gases and vapors in isoentálpico regimes, isothermal and adiabatic. Fluid flow regimes. Calculation of friction head loss in a pipeline. Calculating the minimum diameter and the diameter of a driving optimum transport of a fluid. Concept and calculation of a bypass. Exercises and problems.

## Chapter 3: STEAM. TYPICAL TECHNOLOGICAL AGENT OF ENERGY TRANSPORT

**Learning time:** 20h 30m  
Theory classes: 6h 30m  
Laboratory classes: 4h  
Self study : 10h

**Description:**  
Saturated steam, wet steam and superheated steam: degrees of freedom and thermodynamic quantities. Specific calculation of the magnitudes of both the saturated steam as the wet steam and superheated steam. Determining a moisture vapor (condensation and strangulation methods). Enthalpy balances in steam plant. Mollier diagram. Schematic and parts of a steam boiler. Comprehensive facility energy use, with steam as the main carrier of energy. Application to a waste incineration plant. Exercises and problems.

## CHAPTER 4 - MODELLING AND SIMULATION OF FLUID PIPES AND VAPOR TRANSPORT INSTALLATIONS

**Learning time:** 16h  
Theory classes: 2h  
Laboratory classes: 6h  
Self study : 8h

**Description:**  
<table>
<thead>
<tr>
<th>Chapter Title</th>
<th>Learning Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHAPTER 6 - LIQUEFIED NATURAL GAS (LNG)</strong></td>
<td>16h</td>
<td>Composition of LNG compared to the GN. History of LNG. Security of LNG. Liquefaction of natural gas. Regasification of LNG-transport of LNG. Solving exercises and problems.</td>
</tr>
<tr>
<td><strong>CHAPTER 7 - PROCESSING AND DISTRIBUTION OF ENERGY</strong></td>
<td>3h</td>
<td>End of the route of transport of energy by fluid power piping. Operation of power stations. Starting the electricity supply system.</td>
</tr>
<tr>
<td><strong>CHAPTER 8 - MODELING AND SIMULATION OF INDUSTRIAL VAPORIZERS LNG</strong></td>
<td>14h 30m</td>
<td>Modelling and simulation of LNG vaporizers. In particular, the case of the vaporizers that using the sensible heat of sea water to the evaporation process.</td>
</tr>
</tbody>
</table>
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### Project in the Field of Energy

**Learning time:** 45h  
Guided activities: 15h  
Self study: 30h

**Description:**  
The project will focus on a topic contained within the field of the four specific SUBJECTS degree "Degree in Energy Engineering" taught in the fifth semester: "Generation Thermal fluid", "Electricity Generation", "Transport and Distribution Energy - I and" "Management of the Energy Industries. This is an activity common to all four subjects.

### Qualification System

- First Control Partial: 25% ç  
- Second Partial Control: 25%  
- Exercises in charge and Reports of Practice: 20%  
- Project (including the assessment of competition): 30%  
- No Examination of Reevaluation will take place

### Regulations for carrying out activities

Students will be tested individually in a classroom in partial checks. Submit exercises correspond to proposals for calculating industrial installations and process units, derived from topics of Modelling and Simulation practices, and experimental practice of the steamer, and carried out by groups outside the classroom. The Transversal Project will conform to the standards common to all courses involved.

### Bibliography

**Basic:**


**Complementary:**