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%.
Ability in "Team Work", which is the rate that corresponds to this subject will be evaluated within the student's work to make the project that is commissioned during the semester.

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 LNG vaporization installations.

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

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
<th>Learning time</th>
<th>Class Time</th>
<th>Self Study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHAPTER 1: SYSTEMS OF UNITS USED IN ENGINEERING</strong></td>
<td>Dimensional analysis. Absolute systems, technical, engineering and mixed or international system. Getting processes formulas by dimensional analysis.</td>
<td><strong>3h</strong></td>
<td>Theory classes: 1h</td>
<td>Self study : 2h</td>
</tr>
<tr>
<td><strong>CHAPTER 2: PIPELINES FOR ENERGY TRANSPORT LÍQUIDES</strong></td>
<td>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</td>
<td><strong>16h</strong></td>
<td>Theory classes: 6h</td>
<td>Self study : 10h</td>
</tr>
<tr>
<td><strong>Chapter 3: STEAM. TYPICAL TECHNOLOGICAL AGENT OF ENERGY TRANSPORT</strong></td>
<td>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.</td>
<td><strong>20h 30m</strong></td>
<td>Theory classes: 6h 30m</td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td><strong>CHAPTER 4 - MODELLING AND SIMULATION OF FLUID PIPES AND VAPOR TRANSPORT INSTALLATIONS</strong></td>
<td>Modelling and simulation of fluid liquid pipelines energy (oil). Modeling and simulation of elements of a steam installation. Steam accumulators.</td>
<td><strong>16h</strong></td>
<td>Theory classes: 2h</td>
<td>Laboratory classes: 6h</td>
</tr>
</tbody>
</table>
### CHAPTER 5 - NATURAL GAS AS STRATEGIC FLUID FOR ENERGY TRANSPORT

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

**Description:**  

### CHAPTER 6 - LIQUEFIED NATURAL GAS (LNG)

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

**Description:**  
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.

### CHAPTER 7 - PROCESSING AND DISTRIBUTION OF ENERGY

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

**Description:**  
End of the route of transport of energy by fluid power piping. Operation of power stations. Starting the electricity supply system.

### CHAPTER 8 - MODELING AND SIMULATION OF INDUSTRIAL VAPORIZERS LNG

**Learning time:** 14h 30m  
Theory classes: 1h 30m  
Laboratory classes: 5h  
Self study: 8h

**Description:**  
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.
<table>
<thead>
<tr>
<th>Project in the Field of Energy</th>
<th>Learning time: 45h</th>
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<tbody>
<tr>
<td></td>
<td>Guided activities: 15h</td>
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<tr>
<td></td>
<td>Self study: 30h</td>
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</tbody>
</table>

**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:**