240404 - The Origins of Modern Engineering

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2019
Degree: BACHELOR’S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR’S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: Catalan

Degree competences to which the subject contributes

Specific:
1. Understanding and dominion of basic concepts on mechanics, thermodynamics, fields and waves and electromagnetism laws and their application to solve engineering problems.

Transversal:
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
3. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

Teaching methodology
Presentation sessions of different topics, supplemented by the use of ICT and audiovisual resources.
Cooperative learning based on case studies; oral presentations and delivering papers by students.
Case studies preparation, based on library resources and web resources.

Learning objectives of the subject
After the course the student should be able to:

- 1. Explain the main contributions of Greek an Chinese cultures related to the origin of Western science and technology.
- 2. Identify the technological advances made in different historical contexts.
- 3. Recognize the most significant changes that have contributed to the emergence of modern science and engineering.
- 4. Understand classic texts in the history of science and technology.
- 5. Describe the main features of scientific and technical institutions in the eighteenth and nineteenth centuries.
- 6. Use library resources and the Internet to find materials in relation with the history of the origins of engineering.
# Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>30h</td>
<td>40.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>45h</td>
<td>60.00%</td>
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</tbody>
</table>
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## Content

<table>
<thead>
<tr>
<th>1. SCIENCE AND TECHNOLOGY IN THE OLD WEST (GREECE) AND EASTERN (CHINA)</th>
<th>Learning time: 15h</th>
</tr>
</thead>
</table>
| **Description:** The origins of Western science. The rational cosmology from ancient Greece. The geometric explanations of the apparent movements of celestial bodies between Plato and Ptolemy. The former physics. Introduction to traditional Chinese civilization. Main fields of technical innovations of Chinese: printing (paper, wood engraving, typography), proto-chemistry (gunpowder and military technology), physics (magnetic compass), use of animal power, technology of iron and steel; nautical inventions, astronomical instruments; mechanical watches; hydraulic technology and domestic inventions. | Theory classes: 6h  
Self study: 9h |

**Specific objectives:** That students achieve the objectives 1 and 6

<table>
<thead>
<tr>
<th>2. SCIENCE AND TECHNIQUE UP TO RENAISSANCE</th>
<th>Learning time: 15h</th>
</tr>
</thead>
</table>
Self study: 9h |

**Specific objectives:** That students achieve the objectives 2, 4 and 6
### 3. THE TIME OF THE SCIENTIFIC

**Learning time:** 15h  
Theory classes: 6h  
Self study: 9h

**Description:**  

The new Academies as centres of investigation in the XVII century. Fermat, Roberval, Mengoli and Wallis as precursors of infinitesimal calculus. The fluxions of Newton and the differentials of Leibniz.

Les noves acadèmies com centres d’investigació al segle XVII. Fermat, Roberval, Mengoli i Wallis precursors del càlcul infinitesimal. Les fluxions de Newton i els diferenciais de Leibniz.

**Specific objectives:**  
That students achieve the objectives 3, 4 and 6.

### 4. MATHEMATICS AND ENGINEERING IN THE ENLIGHTENMENT: LEONHARD EULER

**Learning time:** 15h  
Theory classes: 6h  
Self study: 9h

**Description:**  
The time of enlightenment. The creation of the Encyclopédie by Diderot and D’Alembert. Aims, contents and significance of this work.

The work of Leonhard Euler as engineer and mathematic. Concept of function, number “e”, exponential and logarithmic functions, Beta and Gamma functions.

**Specific objectives:**  
That students achieve the objectives 4, 5 and 6.

### 5. SCIENTIFIC AND TECHNICAL INSTITUTIONS AND THE TECHNICAL TRAINING IN 18TH-19TH CENTURIES. THE SCHOOLS OF THE JUNTA DE COMERÇ (OR BOARD OF COMMERCE)

**Learning time:** 15h  
Theory classes: 6h  
Self study: 9h

**Description:**  
Scientific and technical institutions established in the eighteenth century. The case of Catalonia: Military engineers and the Military Academy of Mathematics; the introduction of new science and the Royal Academy of Sciences and Arts of Barcelona; the first technical schools (the precursors of the Industrial School of Barcelona.) and the Junta de Comerç (Board of Commerce) of Catalonia.

**Specific objectives:**  
That students achieve the objectives 5 and 6.
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Qualification system

The final mark will be the result of four tests or evaluations. Their respective weightings are:
Issues 1 and 2 (30%)
Issues 3, 4 and 5 (40%)
Oral presentation and written work group (30%)

Regulations for carrying out activities

Compulsory oral presentation in class.

Bibliography

Basic:


Complementary:


Others resources: