Course guide
240404 - 240404 - The Origins of Modern Engineering

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2022 ECTS Credits: 3.0 Languages: Catalan

LECTURER

Coordinating lecturer: Maria Rosa Massa Esteve

Others: Segon quadrimestre: MARIA ROSA MASSA ESTEVE - 10

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>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>45.0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>30.0</td>
<td>40.00</td>
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</tbody>
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**Total learning time:** 75 h

## CONTENTS

### 1. SCIENCE AND TECHNOLOGY IN THE OLD WEST (GREECE) AND EASTERN (CHINA)

**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.

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

**Full-or-part-time:** 15h
Theory classes: 6h
Self study: 9h

### 2. SCIENCE AND TECHNIQUE UP TO RENAISSANCE

**Description:**


**Specific objectives:**
That students achieve the objectives 2, 4 and 6

**Full-or-part-time:** 15h
Theory classes: 6h
Self study: 9h
3. THE TIME OF THE SCIENTIFIC

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 precursor del càlcul infinitesimal. Les fluxions de Newton i els diferencials de Leibniz.

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

Full-or-part-time: 15h
Theory classes: 6h
Self study: 9h

4. MATHEMATICS AND ENGINEERING IN THE ENLIGHTENMENT: LEONHARD EULER

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 Leonard 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.

Full-or-part-time: 15h
Theory classes: 6h
Self study: 9h

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

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.

Full-or-part-time: 15h
Theory classes: 6h
Self study: 9h

GRADING SYSTEM
**EXAMINATION RULES.**

Compulsory oral presentation in class.

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**