270227 - PE - Engineering Projects

Coordinating unit: 270 - FIB - Barcelona School of Informatics
Teaching unit: 709 - DEE - Department of Electrical Engineering
           701 - DAC - Department of Computer Architecture
           739 - TSC - Department of Signal Theory and Communications
           723 - CS - Department of Computer Science
           732 - OE - Department of Management

Academic year: 2019
Degree: BACHELOR’S DEGREE IN DATA SCIENCE AND ENGINEERING (Syllabus 2017). (Teaching unit Compulsory)
ECTS credits: 12

Teaching languages: Catalan, Spanish, English

Prior skills

Have completed Entrepreneurship and Innovation (EI)

Degree competences to which the subject contributes

Basic:
CB2. That the students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and problem solving within their area of study.
CB3. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.
CB4. That the students can transmit information, ideas, problems and solutions to a specialized and non-specialized public.
CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Specific:
CE1. Skillfully use mathematical concepts and methods that underlie the problems of science and data engineering.
CE10. Visualization of information to facilitate the exploration and analysis of data, including the choice of adequate representation of these and the use of dimensionality reduction techniques.
CE11. Within the corporate context, understand the innovation process, be able to propose models and business plans based on data exploitation, analyze their feasibility and be able to communicate them convincingly.
CE12. Apply the project management practices in the integral management of the data exploitation engineering project that the student must carry out in the areas of scope, time, economic and risks.
CE13. (End-of-degree work) Plan and design and carry out projects of a professional nature in the field of data engineering, leading its implementation, continuous improvement and valuing its economic and social impact. Defend the project developed before a university court.
CE2. To be able to program solutions to engineering problems: Design efficient algorithmic solutions to a given computational problem, implement them in the form of a robust, structured and maintainable program, and check the validity of the solution.
CE3. Analyze complex phenomena through probability and statistics, and propose models of these types in specific situations. Formulate and solve mathematical optimization problems.
CE4. Use current computer systems, including high performance systems, for the process of large volumes of data from the knowledge of its structure, operation and particularities.
CE5. Design and apply techniques of signal processing, choosing between different technological tools, including those of Artificial vision, speech recognition and multimedia data processing.
CE6. Build or use systems of processing and comprehension of written language, integrating it into other systems driven by the data. Design systems for searching textual or hypertextual information and analysis of social networks.
CE7. Demonstrate knowledge and ability to apply the necessary tools for the storage, processing and access to data.

CE8. Ability to choose and employ techniques of statistical modeling and data analysis, evaluating the quality of the models, validating and interpreting them.

CE9. Ability to choose and employ a variety of automatic learning techniques and build systems that use them for decision making, even autonomously.

General:

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CG3. Work in multidisciplinary teams and projects related to the processing and exploitation of complex data, interacting fluently with engineers and professionals from other disciplines.

CG4. Identify opportunities for innovative data-driven applications in evolving technological environments.

Transversal:

CT1. Entrepreneurship and innovation. Know and understand the organization of a company and the sciences that govern its activity; Have the ability to understand labor standards and the relationships between planning, industrial and commercial strategies, quality and profit.

CT2. Sustainability and Social Commitment. To know and understand the complexity of economic and social phenomena typical of the welfare society; Be able to relate well-being to globalization and sustainability; Achieve skills to use in a balanced and compatible way the technique, the technology, the economy and the sustainability.

CT3. Efficient oral and written communication. Communicate in an oral and written way with other people about the results of learning, thinking and decision making; Participate in debates on topics of the specialty itself.

CT4. Teamwork. Be able to work as a member of an interdisciplinary team, either as a member or conducting management tasks, with the aim of contributing to develop projects with pragmatism and a sense of responsibility, taking commitments taking into account available resources.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

Teaching methodology

In this subject the work plan designed to implement and validate the functional prototype of the product or service designed in the Entrepreneurship and Innovation (EI) subject is carried out. Therefore, most of the hours are hands-on in the lab, with faculty present to support and monitor the progress of the project (90). There are also a significant number of hours of autonomous, individual or subgroup work (180). At the same time, the concepts associated with the business plan are actively reviewed and revised and completed in a way that is consistent with the technical implementation developed. The responsibility for defining and monitoring the work plan corresponds to the team, mainly to the team leader. A follow-up meeting is held every week and there is, at least, three presentations to the external company or institution (Preliminary Design Review, Critical Design Review, Final Design Review).

Learning objectives of the subject

1. Conceive, design, implement and plan the operation and complete life cycle of a product or service, based on the challenge defined by an external company or institution. Obtain the results of learning of the transversal and generic skills from a team work context on a high complexity design challenge.

2. From the technical solution developed in the project, to deepen the knowledge and methodologies acquired in the different subjects of the degree and to add value from their integration.

3. Complete the objectives of the Entrepreneurship and Innovation subject by improving the business plan developed on the same product or service.
Study load

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>Hours small group:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total learning time: 300h</td>
<td>30h</td>
<td>90h</td>
<td>180h</td>
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<tr>
<td></td>
<td>10.00%</td>
<td>30.00%</td>
<td>60.00%</td>
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</tbody>
</table>

Content

**Specific technical contents.**

**Degree competences to which the content contributes:**

**Description:**
Depending on the topic of the project, it may be necessary to impart specific contents, additional to those obtained in previous subjects.

**Advanced and reinforcing content for the business plan.**

**Degree competences to which the content contributes:**

**Description:**
Although this part has been covered in the previous Entrepreneurship and Innovation subject, there will be seminars and tutorials to complete and improve the final version of the business plan as it may have modifications as you implement the technical solution. Includes: Training of work teams. Refining the Business Model. Refining the product or service design. Refining the marketing plan. Business development. Legislation and regulations. Intellectual property. Business plan. Provisional financial statements. Treasury plan. Analysis of economic, environmental and social sustainability.
### Planning of activities

<table>
<thead>
<tr>
<th>Seminars</th>
<th><strong>Hours:</strong> 48h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 28h</td>
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<tr>
<td></td>
<td>Practical classes: 0h</td>
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<tr>
<td></td>
<td>Laboratory classes: 0h</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
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<td>Self study: 20h</td>
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**Description:**

Strengthening and mentoring the aspects associated with the business plan, the legal aspects and the sustainability of the project, applied to the specific case of the project being developed.

**Specific objectives:**

1, 3

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<table>
<thead>
<tr>
<th>Presentation of initial project planning (Preliminary Design Review)</th>
<th><strong>Hours:</strong> 6h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 0h</td>
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<tr>
<td></td>
<td>Practical classes: 0h</td>
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<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
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<td>Self study: 4h</td>
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</tbody>
</table>

**Description:**

Preparation and presentation of the project plan in public for validation.

**Specific objectives:**

1

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<table>
<thead>
<tr>
<th>Presentation of the critical review of the progress of the project (Critical Design Review)</th>
<th><strong>Hours:</strong> 6h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 0h</td>
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<tr>
<td></td>
<td>Practical classes: 0h</td>
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<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
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<td>Self study: 4h</td>
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**Description:**

Mid-term presentation of the critical review of the project (Critical Design Review) in order to detect malfunctions or forecasts that are difficult to fulfill and correct them.

**Specific objectives:**

1

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<table>
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<tr>
<th>Final presentation of the project (Final design Review)</th>
<th><strong>Hours:</strong> 10h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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<tr>
<td></td>
<td>Practical classes: 0h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
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<tr>
<td></td>
<td>Self study: 6h</td>
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</table>

**Hours:**

- **Theory classes:** 28h
- **Practical classes:** 0h
- **Laboratory classes:** 0h
- **Guided activities:** 0h
- **Self study:** 20h
Description:
Final presentation of the project and the associated business plan (Final Design Review). Depending on the confidentiality agreement with the external institution that has proposed it, it can be done in conjunction with other projects or behind closed doors only with representatives of the institution.

Specific objectives:
1, 2, 3

Technical realization of the project

Hours: 183h
- Theory classes: 0h
- Practical classes: 0h
- Laboratory classes: 84h
- Guided activities: 0h
- Self study: 99h

Description:
Execution of the work plan

Specific objectives:
1, 2

Qualification system

A global mark is assigned to the project developed by the team using a rubric that takes into account the different aspects of the process, the final result and the presentations that have been made by the team. This mark is modulated for each component of the group with three coefficients, with a modulation rate of 20% each. One is determined from the evidences collected by the teaching staff in the in-person sessions, the other is determined by the team leader with the points-bag procedure and the other by the co-assessment carried out by all members of the team using a rubric. In the latter case, the team leader is evaluated for his or her role as a team leader.

Although the fair fulfilment of the assigned tasks should lead to a favourable assessment, in the event that the subject is failed, students are entitled, in accordance with the academic regulations of the degree, to a re-evaluation test which would consist of an individual presentation in front of a committee of the overall project and of the individual contribution. The panel would consist of the subject coordinator, one of their teachers and an external member who is a teacher of a project subject of another degree.

Bibliography

Basic: