Course guides

270205 - AC2 - Advanced Algebra and Calculus

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

Degree: BACHELOR'S DEGREE IN DATA SCIENCE AND ENGINEERING (Syllabus 2017). (Compulsory subject).

Academic year: 2021  ECTS Credits: 7.5  Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: JORDI QUER BOSOR
Others: Segon quadrimestre:
JORDI GUARDIA RUBIES - 11
JORDI QUER BOSOR - 11

PRIOR SKILLS

Courses on Algebra and Calculus of the first term

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE1. Skillfully use mathematical concepts and methods that underlie the problems of science and data engineering.

Generical:
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.
CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

Transversal:
CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.
CT6. Autonomous Learning. Detect deficiencies in one’s own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

Basic:
CB1. That students have demonstrated to possess and understand knowledge in an area of ??study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply Knowledge from the vanguard of their field of study.

TEACHING METHODOLOGY

Theory classes will be in the form of master classes in which the contents of the subject will be explained and examples and illustrative problems will also be given.
In the problem classes, problems will be solved on the topics studied in theory.

LEARNING OBJECTIVES OF THE SUBJECT

1. Extension of knowledge of Algebra and Calculus.
2. Recognize and apply the concepts of Algebra and Calculus related to multidisciplinary problems.
3. Achieve a mastery of software that allows you to solve problems of greater complexity from the knowledge acquired.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>112.5</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45.0</td>
<td>24.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30.0</td>
<td>16.00</td>
</tr>
</tbody>
</table>

Total learning time: 187.5 h

CONTENTS

**Multiple integrals**

**Description:**

**Fourier series and Fourier transform**

**Description:**

**Quadratic forms and extrema**

**Description:**
# ACTIVITIES

## Development of topic 1 of the course

**Description:**
Theory classes and Problems of the topic 1

**Specific objectives:**
1, 2, 3

**Related competencies:**
- 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.
- CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.
- CE1. Skillfully use mathematical concepts and methods that underlie the problems of science and data engineering.
- CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.
- CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.
- CB1. That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply Knowledge from the vanguard of their field of study.

**Full-or-part-time:** 50h
Theory classes: 12h
Practical classes: 8h
Self study: 30h

## Development of topic 2 of the course

**Description:**
Theory and Problems classes on topic 2

**Specific objectives:**
1, 2, 3

**Related competencies:**
- 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.
- CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.
- CE1. Skillfully use mathematical concepts and methods that underlie the problems of science and data engineering.
- CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.
- CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.
- CB1. That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply Knowledge from the vanguard of their field of study.

**Full-or-part-time:** 87h 30m
Theory classes: 21h
Practical classes: 14h
Self study: 52h 30m
Development of topic 3 of the course

Description:
Theory and problem classes on topic 3

Specific objectives:
1, 2, 3

Related competencies:
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.
CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.
CE1. Skillfully use mathematical concepts and methods that underlie the problems of science and data engineering.
CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.
CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.
CB1. That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply Knowledge from the vanguard of their field of study.

Full-or-part-time: 50h
Theory classes: 12h
Practical classes: 8h
Self study: 30h

GRADING SYSTEM

There will be two exams: a mid-course exam P (which does not release a subject) and a final exam F; in addition solved problems will have to be delivered and/or answer quizzes L.

The grade of the subject in the ordinary call will be calculated as follows:

\[ \text{MAX} (0.6 \times F + 0.3 \times P; 0.9 \times F) + 0.1 \times L \]

The mark in the extraordinary call will be the mark of the exam.

BIBLIOGRAPHY

Basic:

Complementary: