Course guides
230001 - CAL - Calculus

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

Degree:
- BACHELOR’S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).
- BACHELOR’S DEGREE IN ELECTRONIC SYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).
- BACHELOR’S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Compulsory subject).
- BACHELOR’S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010).
  (Compulsory subject).
- BACHELOR’S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Compulsory subject).
- BACHELOR’S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015).
  (Compulsory subject).

Academic year: 2021  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Muñoz Lopez, Francisco Javier

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:
12 CPE N1. They will be able to identify, formulate and solve engineering problems in the ICC field and will know how to develop a method for analysing and solving problems that is systematic, critical and creative.

TEACHING METHODOLOGY

Problem solving classes
On campus lessons
Individual work (no face to face lessons)
Short answer controls and homework
Final exam (long answer exam)

LEARNING OBJECTIVES OF THE SUBJECT

Achieving sufficient level of one variable Calculus to deal with, or to base the treatment of phenomena that can be described in these terms. Also support of parties other subjects that require mastery of real functions of one variable. Introduction to functions defined by series, the Laplace Transform and its use to solve elemental differential equations and system of differential equations.

Learning outcomes:
Clearly expresses the process of planning and problem solving, and problems that require the use of calculus of one variable.
Comprehend and dominates the most useful methods for solving problems in the field of one variable.
He/she is able to confront the equations and numerical description of problems with descriptive statement.
He/she uses more than one source, and uses it as complementary to observe the events described in the main text.
Identifies problems and models from open situations. Study alternatives for their resolution.
**STUDY LOAD**

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours large group</td>
<td>52,0</td>
<td>34.67</td>
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<tr>
<td>Hours small group</td>
<td>13,0</td>
<td>8.67</td>
</tr>
<tr>
<td>Self study</td>
<td>85,0</td>
<td>56.67</td>
</tr>
</tbody>
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**Total learning time:** 150 h

**CONTENTS**

**Unit 1. Real numbers**

**Description:**

**Full-or-part-time:** 11h 30m
Theory classes: 5h  
Self study: 6h 30m

**Complex numbers**

**Description:**

**Full-or-part-time:** 6h 54m
Theory classes: 3h  
Self study: 3h 54m

**Unit 3. Functions**

**Description:**

**Full-or-part-time:** 16h 06m
Theory classes: 7h  
Self study: 9h 06m

**Unit 4. Function limits**

**Description:**
Limit of a function at a point. Infinite limits. Limits at infinity. Properties of the limit, algebra of infinit limits. Lateral limits. Uncertainties: infinite / infinite (rational functions) infinity - infinity (difference of roots or logarithms), 1 ^ infinity (number e)

**Full-or-part-time:** 16h 06m
Theory classes: 7h  
Self study: 9h 06m
Unit 5. Continuity

Description:

Full-or-part-time: 9h 21m
Theory classes: 4h
Self study: 5h 21m

Unit 6. Differentiability

Description:

Full-or-part-time: 16h 06m
Theory classes: 7h
Self study: 9h 06m

Unit 7. Taylor polynomials

Description:

Full-or-part-time: 11h 30m
Theory classes: 5h
Self study: 6h 30m

Unit 8. Local study of functions

Description:

Full-or-part-time: 9h 12m
Theory classes: 4h
Self study: 5h 12m

Unit 9. Primitives

Description:
Definition. Calculation of immediate primitives, by parts and using change of variable. Calculation of rational primitives, trigonometric and irrational.

Full-or-part-time: 16h 06m
Theory classes: 7h
Self study: 9h 06m
### Unit 10. Riemann’s Integral

**Description:**  
Definition of Riemann integral . Properties. Fundamental Theorem of Calculus . Applications of the definite integral

**Full-or-part-time:** 9h 12m  
Theory classes: 4h  
Self study : 5h 12m

### Unit 11. Indefinite integrals.

**Description:**  

**Full-or-part-time:** 9h 12m  
Theory classes: 4h  
Self study : 5h 12m

### Unit 12. Series of numbers and power series

**Description:**  

**Full-or-part-time:** 13h 48m  
Theory classes: 6h  
Self study : 7h 48m

### ACTIVITIES

#### FINAL EXAMEN

**Description:**  
Final exam

**Full-or-part-time:** 3h  
Theory classes: 3h

#### CONTROL

**Description:**  
Short answer controls

**Full-or-part-time:** 3h  
Theory classes: 3h
GRADING SYSTEM

Kind of exams to do and weight on the final evaluation:

Final exam: 60%
Continuous evaluation: 40%

On this subject will be evaluated the degree competences:

- Self-directed learning (Elementary level)
- Ability to identify, formulate and solve engineering problems (Elementary level)

EXAMINATION RULES.

The standard ones for this kind of controls

BIBLIOGRAPHY

Basic:
- Gracia, I.; Padró, C. Apunts de teoria per a l'assignatura de càlcul. (Atenea) [on line]. [Consultation: 13/05/2020]. Available on: https://atenea.upc.edu/login/index.php.

Complementary: