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

Academic year: 2020  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: JORGE JIMENEZ URROZ
Others:
- Aguiló Gost, Francisco
- Aroca Farrerons, Josep M.
- Gracia Rivas, Ignacio
- Gràcia Sabaté, Xavier
- Jiménez Urroz, Jorge
- Martín Molleví, Sebastià
- Padró Laimón, Carles
- Sáez Moreno, Germán

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

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<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Self study</td>
<td>85,0</td>
<td>56.67</td>
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<tr>
<td>Hours small group</td>
<td>13,0</td>
<td>8.67</td>
</tr>
<tr>
<td>Hours large group</td>
<td>52,0</td>
<td>34.67</td>
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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
<table>
<thead>
<tr>
<th>Unit 3. Functions</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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<tr>
<td><strong>Full-or-part-time:</strong> 16h 06m</td>
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<tr>
<td>Theory classes: 7h</td>
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<tr>
<td>Self study : 9h 06m</td>
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<th>Unit 4. Function limits</th>
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<td><strong>Description:</strong></td>
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<td><strong>Full-or-part-time:</strong> 16h 06m</td>
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<tr>
<td>Theory classes: 7h</td>
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<td>Self study : 9h 06m</td>
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<th>Unit 5. Continuity</th>
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<td><strong>Description:</strong></td>
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<tr>
<td><strong>Full-or-part-time:</strong> 9h 21m</td>
</tr>
<tr>
<td>Theory classes: 4h</td>
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<tr>
<td>Self study : 5h 21m</td>
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<tr>
<th>Unit 6. Differentiability</th>
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<td><strong>Description:</strong></td>
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<tr>
<td><strong>Full-or-part-time:</strong> 16h 06m</td>
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<tr>
<td>Theory classes: 7h</td>
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<td>Self study : 9h 06m</td>
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<th>Unit 7. Taylor polynomials</th>
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<tr>
<td><strong>Description:</strong></td>
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<tr>
<td><strong>Full-or-part-time:</strong> 11h 30m</td>
</tr>
<tr>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td>Self study : 6h 30m</td>
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## 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:**
Locally integrable functions . Improper integrals of the first kind . improper integrals the second kind . Convergence criteria. Absolute convergence . Euler gamma function.

**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:**