340035 - SIEK-N9O10 - Electronic Systems

**Coordinating unit:** 340 - EPSEVG - Vilanova i la Geltrú School of Engineering  
**Teaching unit:** 710 - EEL - Department of Electronic Engineering  
**Academic year:** 2018  
**Degree:**  
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)  
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)  
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)  
**ECTS credits:** 6  
**Teaching languages:** Catalan, Spanish

### Teaching staff

**Coordinator:** Jaume Miret  
**Others:**  
Miguel Castilla  
Luís García de Vicuña  
Mariano López  
Jaume Miret

### Opening hours

**Timetable:** Office hours vary each semester according to professor availability.  
Check on the EPSEVG web site for more information.

### Prior skills

Autonomous learning and taking initiative in problem solving are necessary skills in this course.

### Requirements

Students registering in this subject are expected to have the subjects "Equacions Diferencials", "Calcul Avançat" and "Sistemes Elèctrics" from previous semesters passed.

### Degree competences to which the subject contributes

#### Specific:

1. CE11. Knowledge of electronical fundamentals.
2. CE32. Ability to analyze electrical circuits in all possible regimes.

### Teaching methodology

Basic and theoretical concepts of electronics are provided by means of class lectures and by means of examples in the form of exercises. As for the lab, students will consolidate the main technical concepts by prototyping electronic circuits.

### Learning objectives of the subject

The aim of this subject is to provide the fundamental knowledge and to show the basics of industrial electronics. It will describe the most important technologies of electronic devices and systems available and it will explain the basic methodologies to analyze electronic systems.
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>10.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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</table>
# Content

## Module 1 - Introduction. Resistive circuit analysis

**Learning time:** 73h  
Theory classes: 22h  
Laboratory classes: 8h  
Guided activities: 2h  
Self study: 41h

**Description:**  
The electronic system, introduction  
Basic concepts, Kirchoff laws  
Thevenin and Norton equivalents  
Systematic analysis, mesh currents  
Systematic analysis, node voltages

**Related activities:**  
- Class sessions include examples in the form of exercises  
- Lab activities (4 sessions)  
- Self study (35 hores)  
- Evaluation sessions (80 min)

**Specific objectives:**  
Knowing and learning how to apply the basic electrical rules so that the behaviour of electronic circuits can be analyzed and studied

## Module 2 - Passive systems analysis with RLC

**Learning time:** 58h  
Theory classes: 14h  
Laboratory classes: 6h  
Guided activities: 2h  
Self study: 36h

**Description:**  
Solving using differential equations  
System in Laplace domain  
Solving using Laplace domain  
Transfer function  
Bode diagrams

**Related activities:**  
- Class sessions include examples in the form of exercises  
- Lab activities (3 sessions)  
- Self study (30 hores)  
- Evaluation Sessions (70 min)

**Specific objectives:**  
Know and use the basic mathematical tools to solve circuits with memory elements
Module 3 - Circuits with semiconductor elements

**Learning time:** 19h
- Theory classes: 6h
- Guided activities: 1h
- Self study: 12h

**Description:**
- P-N union, circuits with diodes, rectifiers
- Zener diode, regulation and limiting voltage circuits
- LED diode, photo-diode and opto-coupler
- The transistor, amplifiers, commutation circuits and voltage regulators
- The operational amplifier, comparers, active filters
- Introduction to the digital world, microcontrollers

**Related activities:**
- Class sessions include examples in the form of exercises
- Self study (24 hours)
- Evaluation sessions (60 min)

**Specific objectives:**
Know and analyze circuits with the basic electronic components electronic: diodes, transistors and operational amplifiers

### Planning of activities

<table>
<thead>
<tr>
<th><strong>LAB - Lab Activities</strong></th>
<th><strong>Hours:</strong> 18h</th>
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<tbody>
<tr>
<td></td>
<td>Self study: 6h</td>
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<tr>
<td></td>
<td>Guided activities: 12h</td>
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<table>
<thead>
<tr>
<th><strong>NP1 - First Midterm Exam</strong></th>
<th><strong>Hours:</strong> 56h</th>
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<tbody>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td></td>
<td>Theory classes: 18h</td>
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<tr>
<td></td>
<td>Self study: 36h</td>
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<table>
<thead>
<tr>
<th><strong>NP2 - 2nd Midterm Exam</strong></th>
<th><strong>Hours:</strong> 47h 50m</th>
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<tbody>
<tr>
<td></td>
<td>Guided activities: 1h 30m</td>
</tr>
<tr>
<td></td>
<td>Theory classes: 14h 20m</td>
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<td></td>
<td>Self study: 32h</td>
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Knowledge of students about electronics will be evaluated through written exams and lab activities. Theoretical concepts correspond to the 80%-weight of student evaluation. As for the lab, the weight is 20%.

The evaluation of theoretical concepts consists of two individual written exams: one midterm (Nex1 weighed 40%) and a second midterm exam (Nex2 weighed 40%). In examination Nex2 it will be possible to re-evaluate Nex1.

If the final mark of this course is higher or equal to 3, the theoretical exams will be repeated (re-evaluation). In this case, the value of the final mark will be limited to 5.

Bibliography

Basic:


