340098 - SEDI-D5O10 - Electronic Systems for Design

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2017
Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Jordi Prat Tasias

Others: Jordi Prat Tasias
Rafael Ramos
Joaquín del Río

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 solvings 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.
9. 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 both digital and analog electronic systems. At the end of the course students will be able to implement their own electronic prototypes.

### Study load

<table>
<thead>
<tr>
<th><strong>Total learning time:</strong> 60h</th>
<th>Hours large group: 45h</th>
<th>75.00%</th>
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<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 15h</td>
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<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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### Content

<table>
<thead>
<tr>
<th>Module 1 - Basic Circuit Analysis (AC and DC)</th>
<th>Learning time: 56h 20m</th>
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<tbody>
<tr>
<td></td>
<td>Assessment sessions: 1h 20m</td>
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<tr>
<td></td>
<td>Self study (distance learning): 35h</td>
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<td></td>
<td>Theory classes: 16h</td>
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<td>Laboratory classes: 4h</td>
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#### Description:
Themes in Module 1:

1.1 Steady-state domain (DC): General and Basic Electrical Rules: Ohm's law, Kirchoff, Thevenin/Norton changes, the superposition theorem, voltage/current dividers, etc.


#### Related activities:
- Class sessions include examples in the form of exercises
- Lab activities (2 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: Introduction to DC Power Supplies

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<th>Description:</th>
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<tbody>
<tr>
<td>Themes of Module 2</td>
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<tr>
<td>2.1 Introducció to Linear DC Power Supplies: Instrument main specifications and basic discrete semiconductors</td>
</tr>
<tr>
<td>2.2 Main block sections of DC Power Supply: Voltage Transformation, Rectifiers, Filters and Regulators</td>
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<tr>
<td>2.3. Advanced Features of DC Power Supplies: The use of Bipolar Junction Transistors (BJT) and Operational Amplifiers (OPAMP) in the improvement of output features.</td>
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<table>
<thead>
<tr>
<th>Related activities:</th>
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<tr>
<td>- Class sessions include examples in the form of exercises</td>
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<tr>
<td>- Lab activities (3 sessions)</td>
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<tr>
<td>PRT3: Introduction to linear DC Power Supplies: Rectifier diode and Zener</td>
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<tr>
<td>PRT4: Switching Electronics: The Bipolar Transistor (BJT)</td>
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<tr>
<td>PRT5: Introduction to Analog Electronics: The Operational Amplifier</td>
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<tr>
<td>- Self study (30 hores)</td>
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<td>- Evaluation Sessions (70 min)</td>
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<tr>
<th>Specific objectives:</th>
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<tr>
<td>To know how to use the basic discrete and integrated semiconductors (rectifier and zener diodes, bipolar transistors and operational amplifiers) and learn their basic operation within a DC power supply.</td>
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</table>
- **Module 3: Introduction to Digital Electronics**

  **Learning time:** 39h
  - Assessment sessions: 1h
  - Self study (distance learning): 24h
  - Theory classes: 12h
  - Laboratory classes: 2h

  **Description:**
  Themes of Module 3
  3.1 Introduction to Boolean Algebra and Digital Codification: Boolean techniques and basic digital and numerical representations
  3.3 Sequential Systems: Basic sequential circuits: Latch, Flip-Flop and memory circuits (ROM, RAM, EEPROM, etc). Introduction to state machines and microcontroller systems.

  **Related activities:**
  - Class sessions include examples in the form of exercises
  - Lab activities (1 session)

  **PRT6:** Introducció to the Digital World
  **PRT7:** This session is reserved for the lab exam

  - Self study (24 hores)
  - Evaluation sessions (60 min)

  **Specific objectives:**
  To know the basic digital formats for number representation and to get used to the basic simplification techniques used in combinational circuits.

  To know the basic elements the state machines and microcontrollers are made of.

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**Qualification system**

Knowledge of students about electronics will be evaluated through written exams and lab activities. Theoretical concepts correspond to the 70%-weight of student evaluation. As for the lab, the weight is 30%.

The evaluation of theoretical concepts consists of two individual written exams: one midterm (NP1) and a second midterm exam (NP2)

The overall grade of the course (NF) is obtained as follows,

\[
NF = NP1 \times 0.35 + NP2 \times 0.35 + NL \times 0.3
\]
Regulations for carrying out activities

As for the written exams (NP1 and NP2), students can take a scientific calculator, and can use a pencil or black/blue ballpen (the red colour is reserved for teacher corrections and annotations).
Using any kind of electronic device with Internet connection (mobile phone, Tablet, or laptop) according to the current school regulations.

Bibliography

Basic:


