Integrated Circuits and Systems for Communications

Code: 42835
ECTS Credits: 6

<table>
<thead>
<tr>
<th>Degree</th>
<th>Type</th>
<th>Year</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>4313797 Telecommunications Engineering</td>
<td>OB</td>
<td>1</td>
<td>1</td>
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</tbody>
</table>

Contact

Name: Núria Barniol Beumala
Email: Núria.Barniol@uab.cat

Teachers

Jorge Sacristán Riquelme
Maria Aránzazu Uranga del Monte

Use of languages

Principal working language: english (eng)

Prerequisites

Recommendations: basic knowledge on electronic devices; theory and analysis of electrical circuits; microelectronics technology

Objectives and Contextualisation

Provide the concepts, techniques and tools for the design and implementation of integrated systems specially those applied to the area of radiofrequency communication. The studies will cover future trends of these integrated systems in terms of design and technological predictions.

Skills

- Capacity for critical reasoning and thought as means for originality in the generation, development and/or application of ideas in a research or professional context.
- Capacity for designing and manufacturing integrated circuits.
- Capacity for working in interdisciplinary teams
- Capacity to design communications components such as routers, commuters, concentrators, emitters and receivers in different bandwidths.
- Capacity to integrate new technologies and systems developed within telecommunications engineering in general and in broader, multidisciplinary contexts such as bioengineering, photovoltaic conversion, nanotechnology, telemedicine
- Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context
- Student should possess the learning skills that enable them to continue studying in a way that is largely student led or independent
- Students should know how to apply the knowledge they have acquired and their capacity for problem solving in new or little known fields within wider (or multidisciplinary) contexts related to the area of study
Learning outcomes

1. Analyse the function of integrated circuits for RF from the dimensions of their components
2. Capacity for critical reasoning and thought as means for originality in the generation, development and/or application of ideas in a research or professional context.
3. Capacity for working in interdisciplinary teams
4. Define the electrical characteristics of integrated RF systems according to their application
5. Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context
6. Propose alternative circuits to improve the performance of the integrated circuits designed
7. Propose specific architectures for integrated RF systems.
8. Recognize the possibilities of integration according to the characteristics of the communication system to perform
9. Student should possess the learning skills that enable them to continue studying in a way that is largely student led or independent
10. Students should know how to apply the knowledge they have acquired and their capacity for problem solving in new or little known fields within wider (or multidisciplinary) contexts related to the area of study
11. Use standard tools effectively for integrated circuit design

Content

1. Design and analysis of the basic building blocks in CMOS integrated systems for analog applications
2.-Design of integrated circuits for radiofrequency communication systems. Basic concepts and circuits.
3. Limits and trends of the radiofrequency integrated circuits and systems

Methodology

Theory: Oral exposition of the fundamentals concepts. Concepts will be partially introduced as specific-cases.

Exercises: Resolution and discussion in relation with the proposed problems and exercises.

Laboratory: Hands-on specific design tools for integrated circuit design and simulation.

Activities

<table>
<thead>
<tr>
<th>Title</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning outcomes</th>
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</thead>
<tbody>
<tr>
<td>Type: Directed</td>
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<tr>
<td>Laboratory</td>
<td>15</td>
<td>0.6</td>
<td>1, 2, 4, 5, 6, 9, 10, 11</td>
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<tr>
<td>Problems</td>
<td>15</td>
<td>0.6</td>
<td>1, 2, 4, 5, 6, 10, 11</td>
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<tr>
<td>Theory</td>
<td>15</td>
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<tr>
<td>Type: Autonomous</td>
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<td></td>
<td></td>
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<tr>
<td>Preparation of reports and oral expositions</td>
<td>30</td>
<td>1.2</td>
<td>1, 2, 4, 6, 10, 11</td>
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<tr>
<td>Problems solving</td>
<td>25</td>
<td>1</td>
<td>1, 2, 4, 6, 10, 11</td>
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<tr>
<td>Study to assimilate concepts</td>
<td>30</td>
<td>1.2</td>
<td>1, 2, 4, 5, 6, 9, 10</td>
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</table>
Evaluation

Progressive evaluation is based on the following qualifications:

• 2 partial exams (40%)
• Lab report (written) (35%)
• 2 homeworks which will be evaluated as oral expositions or in a written format (25%)

There will be a final exam for improving exam qualifications (compulsory for students obtaining a partial exam mark below 4). The resulting final exam mark will be weighted 40%.

The qualification "Not evaluated" will be only granted if the student does not participate in any evaluation activities (lab sessions, oral exposition, exams)

Any change on the above evaluation method will be communicated in advance.

Evaluation activities

<table>
<thead>
<tr>
<th>Title</th>
<th>Weighting</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning outcomes</th>
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<tr>
<td>Exam</td>
<td>40%</td>
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<td>0.24</td>
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<tr>
<td>Report on practical work</td>
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<td>6</td>
<td>0.24</td>
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<td>Specific written and oral presentations</td>
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<td>8</td>
<td>0.32</td>
<td>2, 3, 5, 7, 8, 9, 10</td>
</tr>
</tbody>
</table>

Bibliography


LNA-ESD co-design for fully integrated CMOS wireless receivers. Leroux, Paul. Springer, 2005


Microelectronics Circuits, Sedra and Smith, Oxford University Press, 2010