Integrated Circuits and Systems for Communications 2013/2014

Code: 42835
ECTS Credits: 6

Degree	Type	Year	Semester
4313797 Enginyeria de Telecomunicacions / Telecommunication Engineering	OB	1	1

Contact

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Use of languages

Principal working language: anglès (eng)

Prerequisites

Recommendations: basic knowledge on electronics devices and 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

Enginyeria de Telecomunicacions / Telecommunication Engineering

- 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. Student should possess the learning skills that enable them to continue studying in a way that is largely student led or independent
9. 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
10. Synthesis devices with linear responses at different bandwidth frequencies
11. Use standard tools effectively for integrated circuit design

Content

1. Design of integrated circuits and systems for radiofrequency applications. Main RF communication system architectures. Design and analysis of the basic building blocks in integrated systems: amplifiers, mixers, oscillators and filters.

2.- Design of integrated circuits for portable systems. Basic concepts and circuits for telemetry. Energy management and powering in portable integrated systems.

3. Limits and trends of the radiofrequency integrated circuits and systems

Methodology

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

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

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

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Laboratory	15	0.6	1, 2, 4, 5, 6, 7, 8, 9, 10, 11
Problems	15	0.6	1, 2, 4, 5, 6, 7, 9, 11
Theory	15	0.6	1, 2, 4, 6, 7, 9, 10, 11
Type: Autonomous			
Preparation of reports and oral expositions	30	1.2	1, 2, 4, 6, 7, 9, 10, 11
Problems solving	25	1	1, 2, 4, 6, 7, 9, 10, 11
Study to assimilate concepts	30	1.2	1, 2, 4, 5, 6, 7, 8, 9

Evaluation

There will be 2 written exams along the semester. Additionally there will be 2 additional homeworks which will be evaluated as oral expositions or in a written format related with the design and analysis of a specific integrated circuit. Finnally the evaluation will be completed with and oral exposition of the practical work

towards the design of an integrated circuit made by the students in the laboratory.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Exam	30%	6	0.24	1, 2, 4, 6, 7, 9, 10
Report and oral exposition on practical work	40%	6	0.24	1, 2, 3, 5, 7, 8, 9, 11
Specific written and oral presentations	30%	8	0.32	2, 3, 5, 8, 9

Bibliography

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Radio frequency integrated circuit design. Rogers, John W. M. Boston : Artech House, 2010 2nd ed.

Analysis and design of analog integrated circuits . Paul R. Gray... [et al.New York [etc.] : John Wiley, cop. 2010

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

Millimeter-wave integrated circuits.Eoin Carey, Springer, cop. 2005

The design of CMOS radio-frequency integrated circuits. Lee, Thomas H., 1959- Cambridge [etc.] : Cambridge University Press, 2004. 2nd ed.

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