

**Integrated Circuits and Systems for  
Communications**

Code: 42835  
ECTS Credits: 6

Degree	Type	Year	Semester
4313797 Telecommunications Engineering	OB	1	1

## Contact

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## Teachers

Jorge Sacristán Riquelme

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## Use of languages

Principal working language: english (eng)

## Prerequisites

Recommendations: basic knowledge on electronic devices; theory and analysis of electrical circuits; fundamentals of 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, commutators, 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

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

## 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

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

## Bibliography

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**RF Microelectronics.** B.Razavi. Second edition. Prentice Hall, 2012

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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

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**High-frequency oscillator design for integrated transceivers.** Tang, Johan van der. Boston [etc.] : Kluwer Academic Publishers, cop. 2003

**CMOS circuit design, layout and simulation**. Baker, Li and Boyce. Ed. IEEE Press

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