Universitat Autònoma de Barcelona

2019/2020

Integrated Circuits and Systems for Communications

Code: 42835
ECTS Credits: 6

Degree	Type	Year	Semester
4313797 Telecommunications Engineering	OB	1	1

Contact

Name: Núria Barniol Beumala

Email: Nuria.Barniol@uab.cat

Use of Languages

Principal working language: english (eng)

Teachers

Jorge Sacristán Riquelme

Maria Aránzazu Uranga del Monte

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.

Competences

- 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.

Problems: analytical resolution and simulation of problems, exercises and specific-cases .

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, 6, 10, 9, 5, 11
Problems	15	0.6	1, 2, 4, 6, 10, 5, 11
Theory	15	0.6	1, 2, 4, 6, 10, 11
Type: Autonomous			
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, 6, 10, 9, 5

Assessment

Progressive evaluation is based on the following qualifications:

• 2 partial exams (40%)
• Lab report (written) (30%)
• 2 homeworks which will be evaluated as oral expositions or in a written format (30%)

There will be a final exam for improving exam qualifications (compulsory for students obtaining a partial exam mark below 4 and only possible for students presented to the 2 partial exams). 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)

Assessment 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, 10, 9, 5, 11
Specific written and oral presentations	30%	8	0.32	2, 3, 7, 10, 9, 8, 5

Bibliography

CMOS analog circuit design. Allen, Holberg , Oxford University Press, 2002.

Design of Analog CMOS Integrated Circuits. Razavi, McGraw-Hill, 2001

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

Analog Design for CMOS VLSI Systems. F. Maloberti. Kluwer Academic Publishers, 2001

Radio-frequency microelectronic circuits for telecommunication applications. Papananos, Yannis E.. Kluwer Academic Publishers, 1999

CMOS mixed-signal circuit design. Baker, R. Jacob. Piscataway : IEEE Press ; New York : Wiley-Interscience, cop. 2009 2nd ed.

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.

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