COMMUNICATION ENGINEERING AND ELECTRONIC TECHNOLOGIES

(Lecce - Università degli Studi)

Insegnamento RF MICROELECTRONICS C.I.

GenCod A005770

Docente titolare STEFANO D'AMICO

Insegnamento RF MICROELECTRONICS C.I.

Insegnamento in inglese RF MICROELECTRONICS C.I.

Settore disciplinare ING-INF/01

Corso di studi di riferimento COMMUNICATION ENGINEERING AND

Tipo corso di studi Laurea Magistrale

Crediti 6.0

Ripartizione oraria Ore Attività frontale: 54.0

Per immatricolati nel 2022/2023

Erogato nel 2022/2023

Anno di corso 1

Lingua

Percorso PERCORSO COMUNE

Sede Lecce

Periodo

Tipo esame Orale

Valutazione

Orario dell'insegnamento https://easyroom.unisalento.it/Orario

BREVE DESCRIZIONE DEL CORSO	This is a course in RF Microelectronic: it is aimed at providing principles and tools to analyze and design RF analog circuits in CMOS integrated technology.
PREREQUISITI	It is recommended to overcome the exam of Analog Electronics preliminary.
OBIETTIVI FORMATIVI	After the course the student should be able to: 1) Describe the basic RF analog circuits (LNA, Mixer, etc...) and wireless transceiver architectures. 2) Evaluate the performance parameters and discuss complexity issues associated with different basic RF analog circuits and wireless transceiver architecture. 3) Demonstrate circuit analysis capability of not standard circuits. 4) Understand the technology limits in circuit design. 5) Use the simulator to analyse performance of RF analog circuits. 6) Correctly expose a RF circuit study or a wireless transceiver architecture description.
METODI DIDATTICI	The Course forecasts 30 hours of theoretical lectures about technology description and fundamental RF circuit analysis and wireless architectures. The theoretical concepts are verified in laboratory by using state of the art circuit simulator. 24 hours of laboratory are forecast.

MODALITA' D'ESAME	The final (oral) exam consists of two cascaded parts: 1. the first part is based on the discussion about a report on the assigned RF circuit. The circuit must be simulated at the calculator. The student is asked to learn using the simulator, to illustrate the circuit design, to evaluate the performance parameters, and to define the operation of each part of the circuit. It is aimed to verify to what extent the student has gained knowledge and understanding of the use of the circuit simulator and the circuit analysis. 2. the second part is on circuit analysis of one of the RF basic circuits studied during the course or a wireless RF architecture; it is aimed to determine to what extent the student the circuit analysis capability, ability to identify and use data to formulate responses to well-defined problems, correct exposure of the circuit analysis, problem solving abilities and the capacity integrate different concepts.
ALTRE INFORMAZIONI UTILI	to set an appointment contact the instructor by email (stefano.damico@unisalento.it).

PROGRAMMA ESTESO	▪ 1. Introduction to the RF and Wireless Technology -Wireless communication systems today -CMOS RF design issues ▪ 2. Basic Concepts in the RF Design -Non-linearitiy issues -Noise issue -Timing/frequency issues ▪ 3. Matching -Matching for power -Matching for impedance -Matching for noise -Design of matching circuits -Transmission line issues ▪ 4. Transceivers Architectures -RF transceiver at glance -Superheterodyne receivers -Direct receivers -Low-IF receivers -Need of I&Q down conversion -Direct conversion transmitters - Two steps transmitters ▪ 5. Low-Noise Amplifiers -LNAs in receiver front-ends -Impedance matching -S-parameters and stability -Circuit examples -Downconversion Mixers ▪ 6. Mixers -Basics of mixers -Active mixers -Passive switching mixers -Circuits examples ▪ 7. Oscillators -General considerations -Basic LC oscillator Topologies -Phase noise -Noise folding -Circuit examples ▪ 8. Frequency Synthesizers -Preliminary considerations -Phase Locked Loop frequency synthesizers -Noise and frequency spurs -Direct digital synthesizers ▪ 9. Cases of study: GSM and UMTS Receiver design -Standard descriptions -RX chain specs derivation -RX dimensioning
TESTI DI RIFERIMENTO	Behzad Razavi “RF Microelectronics”