UE Integrated technologies & process of fabrication

Level
Baccalaureate +5

ECTS
3 credits

Component
UFR PhITEM (physique, ingénierie, terre, environnement, mécanique)

Semester
Automne

- **Teaching language(s):** English
- **Open to exchange students:** Yes
- **Code d'export Apogée:** PAX9ICAE

Presentation

Description

The goal of this course is to give a general view on the fabrication processes that exist in microelectronics.

This teaching module will be divided into 2 parts

- Standard and alternative microelectronics technologies – 20 hours – 2 ECTS

Focus is made on integrated silicon applications. Various standard technologies will be presented in CMOS bulk, BiCMOS, FD SOI, interposers. Special attention will be paid on RF and millimeter waves constraints. Weighing between the pros and cons will enable to enface a specific technology for a specific application, digital and/or analog, RF and/or millimeter waves. An overview of potentially future trends will be drawn also with alternative technologies: MEMS vs varactors for tunability, graphene for very high mobility channels.

- Clean room based fabrication – 8 hours – 1 ECTS

An 8-hour tutorial in the cleanroom of the CIME-Nanotech will illustrate this class.It will be dedicated to the clean-room presentation and the fabrication of diodes or MOM capacitors.

In the framework of these courses, the following topics will be presented: Fabrication process in clean-room. From sand to silicon wafer. Cleaning techniques. Material deposition: epitaxy, sputtering, chemical vapor deposition. Material transformation:

wet and dry oxidation. Doping: diffusion, ionic implantation. Lithography. Chemical etching, physical etching, chemical mechanical polishing. Standard technologies front-end and back-end, CMOS for digitals and low-frequencies, FD SOI for low consumption, BiCMOS for high frequencies and millimeter waves analogs, silicon interposers for taking advantage of various technologies. Specific constraints for RF and millimeter waves consideration: dummies, coupling, back-end thickness. Alternative technologies: MEMS vs varactors. Alternative technologies: graphene and high mobility channels

Course parts

UE Integrated technologies & process of fabrication - TP	Practical work (TP)	8h
UE Integrated technologies & process of fabrication - CMTD	Lectures (CM) & Teaching Unit (UE)	20h

Period : Semester 9

Bibliography

- R. Levy, “Microelectronic Materials and Processes.

- C. Grovenor, “Microelectronic materials”.

- G. Rebeiz, “RF MEMS, theory, Design , and Technologies, Wiley.

- Mohamed Gad-el-Hak, “MEMS Introduction and Fundamentals”, The MEMS Handbook 2nd Ed.

- J. Ramsden, “Nanotechnology, an introduction”, Elsevier.

Useful info

Place

Grenoble

Campus

Grenoble - Scientific Polygon