MICRO-711

# RF MEMS for communications applications

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| Cursus | Sem. | Type |
|---|---|---|
| Microsystems and Microelectronics | | Obl. |

| | |
|---|---|
| Language of teaching | English |
| Credits | 1 |
| Session | |
| Exam | Written |
| Workload | 30h |
| **Hours** | **14** |
| Courses | 14 |
| **Number of positions** | **20** |

## Frequency

Every 2 years

## Remark

May 28, 29 & 31, 2018

## Summary

This course provides an overview of RF MEMS/NEMS switches, passives, resonators, phase shifters and filters including hybrid devices (resonant-gate MOS transistor), carbon and phase-change materials, heterogeneous integration and a tutorial in S-parameters measurements and calibration techniques.

## Content

• RF MEMS switches: capacitive, contact, technology, electromechanical and RF design and modelling, figures of merit, reliability and advanced packaging.
• RF MEMS passives for reconfigurable and/or tunable transceiver/receiver architectures. Technology, CMOS compatibility and heterogeneous integration. Through silicon vias technology for 3D RF inductors.
• MEMS resonators and FBARs for essential circuit functions: filtering, mixing and frequency reference. Design, technology and Figures of merit. Resonator arrays and techniques for improvement of motional resistance. Resonant-gate MOS transistor: (i) hybrid MEMS-MOS switch, (ii) hybrid MEMS-MOS resonator with intrinsic gain and (iii) 1T memory cell.
• RF MEMS Phase shitfters and band-pass and band-stop filters: types, technology and design
• Carbon Nanotubes and Graphene based RF NEMS
• Phase change materials as Vanadium dioxide for communication applications
• Tutorial in S-parameters measurements and calibration techniques (SOLT and TRL)

## Keywords

RF MEMS, MEMS passives, MEMS resonators, FBAR, NEMS, Resonant-gate transistor

## Learning Prerequisites

### Recommended courses

Basic lectures in physics and electronics

## Resources

### Websites

• http://nanolab.epfl.ch