ELC4006: Analog VLSI-RF/mm-wave Design

Course Introduction Slides

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Course Contents

- Basic Concepts in RF/mm-wave Design
  - Noise, Linearity & Cascade Analysis
- Transceiver Architectures
- High Frequency Device modeling
- Passive Devices
- Low Noise Amplifier design
- Variable gain amplifiers/Attenuators
- Mixers
- Power Amplifiers

Course Text books/References

- RF Microelectronics (2nd Edition), Prentice Hall Communications Engineering and Emerging Technologies Series, Prentice Hall Press, USA, by Behzad Razavi, 2011.

- High-Frequency Integrated Circuits, The Cambridge RF and Microwave Engineering Series, by: Sorin Voinigescu, 2013.

Course Objective
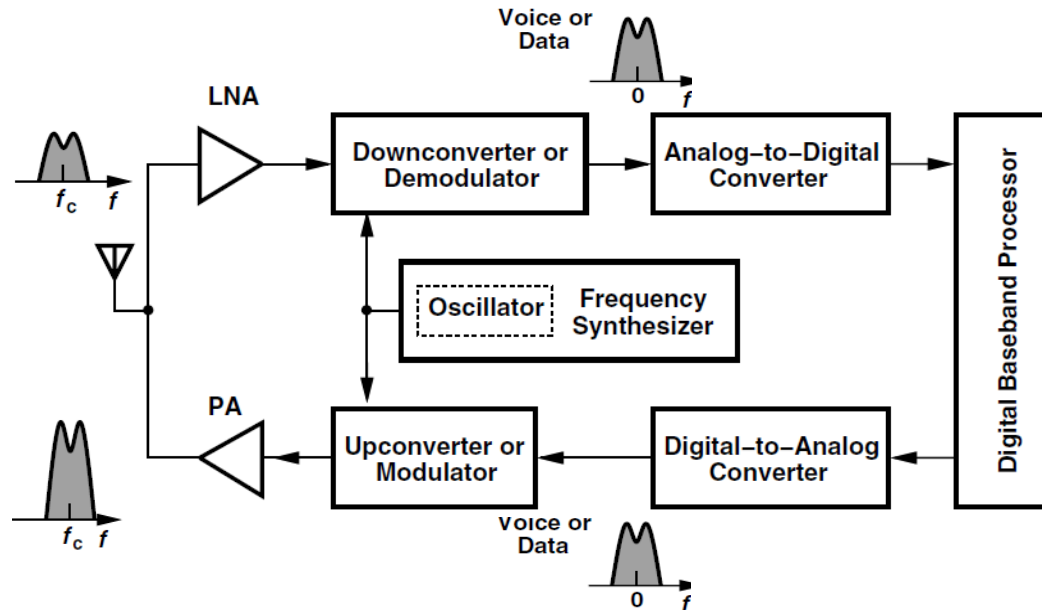
- To be capable of designing RF integrated circuits and systems in CMOS & SiGe HBT technologies starting from standard specification down to circuit level design
- Transceiver architectures and system metrics are discussed to derive circuit specifications
- Circuit design of basic building blocks of transceiver RF fronts is introduced
- Different circuit techniques are discussed to implement and integrate these building blocks in a fully integrated Silicon IC

Course ILOs

- Identify different RF Wireless transceiver systems.

- Identify Basic building blocks used in a wireless transceiver system and understand their challenges.

- Understand RF metrics (NF, IIP3, IIP2, P1dB)

- Perform a complete system design for one international wireless standard and generate all block specifications

- Design input and output matching networks for an RF amplifier to achieve a certain gain and Noise figure while maintaining stability.

- Design a Low Noise amplifier and perform all required checks to achieve a specific performance.

- Design an RF Mixer and perform all required checks to achieve a specific performance.

- Design a Power Amplifier and perform all required checks to achieve a specific performance.

- Conduct a design project in a group to perform a challenging course project.

- Document the outcomes of the project in a proper scientific report.

- Present the outcomes of the project in front of an audience