

ECEN 689
SPECIAL TOPICS IN MILLIMETER-WAVE INTEGRATED CIRCUITS

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• **Spring 2008:** MWF 10:20am – 11:10am ZACH 223C

• **Instructor:** Kamran Entesari

Office Hours: Monday 9:00 am – 10:00am, Wednesday 9:00am – 10:00am

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• **Prerequisite:**

- Graduate standing; Understanding the basics of RFIC and MMIC design

• **References:** Papers in the field

• **Description:** Traditionally, monolithic microwave integrated circuits (MMICs) have been designed using III-V semiconductors, such as GaAs and InP, which have superior performance compared to CMOS and SiGe technologies and are more expensive. Due to huge commercial interest to wireless communications at mm-wave frequencies, novel system and circuit ideas using cheap and highly integrated CMOS and SiGe circuits for wireless transceivers have been developed in recent few years. Also, the high demand for reconfigurable wireless architectures at mm-wave makes the RF MEMS technology a viable solution for versatile integrated circuits at this frequency range. This is a graduate level course on the principles and applications of millimeter-wave integrated circuits for wireless transceivers. The principles of operation, modeling, design and fabrication of the most common millimeter-wave CMOS, SiGe and RF MEMS circuits will be discussed.

• **Grading Policy:**

1) Homework : 60%

2) Final Project: 40%

• **Topics:**

- 1 An overview of mm-wave integrated systems
- 2 Lumped and distributed passive elements at mm-wave
- 3 Tunable elements and switches at mm-wave
- 4 CMOS/SiGe mm-wave device modeling
- 5 RF MEMS and CMOS/SiGe phase shifters
- 6 RF MEMS tunable filters
- 7 CMOS/SiGe mm-wave front ends
- 8 CMOS/SiGe distributed amplifiers
- 9 CMOS/SiGe oscillators and frequency multipliers at mm-wave
- 10 Examples of mm-wave commercial integrated systems