

GEORGE MASON UNIVERSITY

ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT

**Spring 2008**

**ECE 684: MOS Device Electronics**

Time and location: Monday 7:20 pm – 10:00 pm, S&T-II, Room 260

Instructor: Qiliang Li, S&T-II, Room 249, Tel 703-993-1596, Fax 703-993-1601 [qli6@gmu.edu](mailto:qli6@gmu.edu)

Office Hours: Monday 3:00 – 5:00 pm; other times by appointment.

Required Textbook: “Device Electronics for Integrated Circuits” by Muller and Kamins (3<sup>rd</sup> Ed. Wiley 2003, ISBN 978-0-471-59398-0).

**COURSE DESCRIPTION**

The main purpose of this course is to provide the fundamental knowledge of Metal-Oxide-Semiconductor (MOS) devices, with emphasis on the principles of operation of the MOS Field Effect Transistor (FET). The MOSFET is the fundamental device of most electronic (digital and analog) circuitry. The course will also briefly cover silicon technology used to fabricate MOSFETs and the silicon chips in general. The course will also cover the basic theory of heterojunction, the heterojunction bipolar junction transistor (HBJT) and the high electron mobility transistor (HEMT). For these topics lecture notes will supplement the class textbook.

**REFERENCE LIST**

1. Operation and Modeling of The MOS Transistor, by Yannis Tsividis.
2. Physics of Semiconductor Devices, by Simon M. Sze and Kwok K. Ng. (Wiley, 3<sup>rd</sup> Ed.)

**COURSE OUTLINE**

1. Silicon Technology (two weeks)
2. Metal-Oxide-Silicon System (two weeks)
3. MOS Field Effect Transistor I: physics and model (two weeks)
4. MOS Field Effect Transistor II: high-field effects and scaling issue (two weeks)
5. Silicon on Insulator (SOI) MOSFETs (one week)
6. Advanced transistors (HEMT and HBJT) (three weeks)

**GRADING**

Homework/project	- 40%
Midterm Exam	- 30%
Final Exam	- 30%

The dates of the Midterm exam will be announced in class at least two weeks before the exam, and will depend on the course progress.