Engineering Faculty Document No. 51-06
May 10, 2007

TO: The Faculty of the College of Engineering
FROM: The Faculty of the School of Electrical and Computer Engineering
RE: ECE 612 Changes in Course Title, Terms Offered, and Description

The faculty of the School of Electrical and Computer Engineering has approved the following changes in ECE 612. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: **ECE 612 Advanced VLSI Devices**
Sem. 2. Class 3, cr. 3 (Offered in alternate years.)
Prerequisite: ECE 606. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

Device physics of advanced transistors. Process, device, circuit, and systems considerations affecting development of new integrated circuit technologies. Review of metal oxide semiconductor (MOS) fundamentals along with key process and circuit concepts. Short channel effects in sub-micron channel length metal oxide semiconductor field-effect transistors (MOSFETs) including device scaling considerations. Device physics and technology issues for sub-100 nm (nanoscale) MOSFETs. Limits of silicon device technology and key issues in the continuing miniaturization of devices. Alternative device structures to replace bulk MOSFET. Computer simulationis employed throughout the course to examine device issues and prototype new device technologies.

To: **ECE 612 Nanoscale Transistors**
Sem.1, even years. Class 3, cr. 3
Prerequisite: ECE 606. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

This course examines the device physics of advanced transistors and the process, device, circuit, and systems considerations that enter into the development of new integrated circuit technologies. The course consists of three parts. Part 1 treats MOS and MOSFET fundamentals as well as second order effects such as gate leakage and quantum mechanical effects. Short channel effects, device scaling, and circuit and system considerations are the subject of Part 2. Part 3 examines new transistor materials and device structures. The use of computer simulation to examine device issues is an integral part of the course.

Reason: The course title and description have been changed to reflect the updated content of the course. The terms offered has been changed to meet the needs of the school.

M. J. T. Smith, Head
School of Electrical & Computer Engineering

ECE 612 Nanoscale Transistors

Required Text: Yuan Taur and Tak H. Ning, *Fundamentals of Modern VLSI Devices*, Cambridge Univ. Press, ©1998; ISBN 0-521-55056-4 (hardback) 0-521-55959-6 (paperback).

Recommended References: R.F. Pierret, *Advanced Semiconductor Fundamentals*, 2nd Edition, Prentice Hall, ISBN 0-13-061792-X.

Lectures	***Principal Topics***
3	MOSFET Review
4	MOS Gate Stacks
7	MOSFET I-V characteristics above and below threshold
6	2D electrostatics, short channel effects, and scaling
2	CMOS Processes
5	CMOS circuits and interconnects
3	SOI technology
3	Strained channel MOSFETs
3	III-V and heterostructure FETs
6	Novel transistors