Engineering Faculty Document No. 47-06
May 8, 2007

TO: The Faculty of the College of Engineering
FROM: The Faculty of the School of Electrical and Computer Engineering
RE: ECE 654 Change in Course Description

The faculty of the School of Electrical and Computer Engineering has approved the following changes in ECE 654. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: **ECE 654 Solid State Devices II**
Sem. 2, Class 3, cr. 3.
Prerequisite: ECE 606. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

Introduction to advanced concepts in semiconductor devices as an extension and continuation of ECE 606. Topics include charge storage and transfer in deep depletion MOS devices (CCDs and DRAMs); negative differential mobility and transit time effects in microwave oscillators (Gunn and IMPATT diodes); spontaneous and stimulated emission, quantum efficiency, and charge confinement in photonic devices (LEDs and double heterojunction lasers); and quantum efficiency and spectral response in conventional and avalanche photodiodes.

To: **ECE 654 Solid State Devices II**
Sem. 2, Class 3, cr. 3.
Prerequisite: ECE 606. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

Introduction to advanced concepts in semiconductor devices as an extension and continuation of ECE 606. The course is divided into three segments. The first segment introduces students to charge storage and charge transfer in deep-depletion MOS devices (CCDs and DRAMs). The second segment covers optical processes in semiconductor devices, including absorption (photodiodes), spontaneous emission (LEDs), and stimulated emission (semiconductor lasers). Depending on student interest, the third segment covers either (i) transferred-electron and transit-time effects in microwave oscillators (Gunn and IMPATT diodes), or (ii) power MOSFETs and high-level injection in PIN diodes, IGBTs, and thyristors.

Reason: The course description has been changed to reflect the updated content of the course.

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

ECE 654 – Solid State Devices II

Recommended References:

Advanced MOS Devices (Modular Series on Solid State Devices)
Dieter K. Schroder, Addison-Wesley, Reading, MA,1987.

Physical Principles of Semiconductor Devices
James A. Cooper, unpublished text for ECE-654.
(copies of relevant sections will be handed out in class)

Semiconductor Power Devices
Sorab K. Ghandi, John Wiley, New York, NY, 1977.

Power Semiconductor Devices
B. J. Baliga, PWS Publishing Co., Boston, MA, 1996.

Physics of Semiconductor Devices, 3nd Ed.
Simon M. Sze and Kwok Ng, John Wiley, New York, NY, 2007.

Course Outline:

Weeks	***Principal Topics***
4	Charge storage and charge transfer in deep-depletion MOS devices (CCDs and DRAMs)
6	Optical processes in semiconductor devices, including absorption (photodiodes), spontaneous emission (LEDs), and stimulated emission (semiconductor lasers)
5	(i) Transferred-electron and transit-time effects in microwave oscillators (Gunn and IMPATT diodes) (ii) Power MOSFETs and high-level injection in PIN diodes, IGBTs, and thyristors.