TO: The Faculty of the College of Engineering

FROM: School of Electrical and Computer Engineering of the College of Engineering

RE: ECE 65600 Changes in Course Description and Terms Offered

The faculty of the School of Electrical and Computer Engineering has approved the following changes in ECE 65600. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: **ECE 65600 – Electronic Transport in Semiconductors**
Sem. 1 and 2. (Offered every third semester) Class 3, cr. 3.
Prerequisite: ECE 60600. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

A treatment of the microscope and phenomenological physics of carrier transport in bulk semiconductors and in semiconductor devices. The Botlzmann transport equation is introduced as are techniques for solving it analytically and numerically. The physics of carrier scattering in common semiconductors is explored. Theoretical treatments of low and high field transport are compared with measured results. Balance equations are derived as moments of the Botlzmann Transport Equation and are applied to the analysis of sub-micron semiconductor devices. Students are expected to be able to apply elementary concepts of quantum mechanics and solid state physics.

To: **ECE 65600 – Electronic Transport in Semiconductors**
Sem. 1, odd years. Class 3, cr. 3.
Prerequisite: ECE 60600. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

This course consists of three parts. Part 1 focuses on ballistic (and quasi-ballistic) transport – both semi-classical and quantum. Part 2 focuses on traditional low-field transport theory based on the Botlzmann Transport Equation. It treats drift-diffusion charge transport as well as thermoelectric effects (heat flow and temperature gradients) and galvanomagnetic effects (magnetic and electric fields). Part 3 examines, high-field transport – first in bulk semiconductors to explain phenomena such as velocity saturation and then in small devices where electric fields change rapidly and effects such as velocity overshoot arise.

Reason: The course description has been changed to reflect the udpated content of the course. The terms offered has been changed to meet the needs of the school.

ECE 65600 – Electronic Transport in Semiconductors

Required Text: *Fundamentals of Carrier Transport*, 2nd Edition, Mark Lundstrom, Cambridge University Press, 2000; ISBN 0-521-63134-3

Course Outline:

Lectures	Principle Topics
6	Review of essentials of semiconductor physics
8	Semiclassical ballistic transport
3	Quantum ballistic transport
9	Low-field, diffusive transport
3	Balance Equations
1	Monte Carlo Simulation
8	Carrier Scattering
2	High-field transport in bulk semiconductors
2	Off-equilibrium transport in devices

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