TO: The Faculty of the College of Engineering
FROM: The Faculty of the School of Electrical and Computer Engineering
RE: ECE 556 Changes in Course Description, Text, and Content

The faculty of the School of Electrical and Computer Engineering has approved the following changes in ECE 556. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: **ECE 556 – Fundamentals Of Microelectronics Processing (VLSI)**
Sem. 1. Class 3, cr. 3. (Offered in alternate years.)
Prerequisite: ECE 305; or Masters Student Standing or higher. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

The study of basic principles and practical aspects of the most advanced state of electronics processing. Emphasis is placed on crystal growth, epitaxy, lithography, and dry etching. Process-property relations are also presented. (Cross-listed with CHE 556.)

To: **ECE 556 – Fundamentals Of Microelectronics Processing (VLSI)**
Sem. 1, Class 3, cr. 3
Prerequisite(s): ECE 305; or Masters Student Standing or higher. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

Detailed investigation of the basic principles of 'unit' processes used in the fabrication of solid-state devices and integrated circuits. Emphasis is placed on the fundamental aspects of film desposition, wet etching, anostropic dry etching, crystal growth, ion implantation, and chemical vapor deposition of metals and insulators. (Cross-listed with CHE 556.)

Reason: The course description and content have been changed to reflect the updated content of the course.
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Mark Smith, Head
School of Electrical & Computer Engineering

ECE 556 – Fundamentals Of Microelectronics Processing (VLSI)

Required Text: J.D. Plummer, M.D. Deal, and P.B. Griffin, *Silicon VLSI Technology*, *Fundamentals, Practice and Modeling*, Prentice-Hall, 2000; ISBN 0-13-085037-3.

Recommended References:
S. A. Campbell, *The Science and Engineering of Microelectronic Fabrication*, 2nd edition, Oxford Press, 2001, ISBN 0-19-513605-5.

<u>**Course Outline:**</u>

Weeks	*Principal Topics*
1	Introduction to Microelectronic Fabrication
1	Semiconductor Substrates
1	Diffusion in Silicon
1	Thermal Oxidation of Single-Crystal Silicon
1	Ion Implantation
1	Rapid Thermal Processing
2	Silicon Epitaxial Film Growth
2	Chemical Vapor Deposition
1	Refractory Metals and their Silicides in VLSI
2	Wet and Dry Etching
1	Sputtering and Evaporation
1	Examinations

Course Outcomes: A student who successfully fulfills the course requirements will have demonstrated:

1) a basic knowledge of fabrication unit processes for impurity diffusion in crystals and rapid thermal processing [1,3; a,j,k].
2) an understanding of thermal oxidation and computer simulation using SUPREM-4 [1,3; a,j,k].
3) an understanding of ion implantation and calculations, including the design of an impurity profile of more than one impurity using SUPREM-4 [1,3,4; a,c,e,j].
4) an understanding of wet and dry etching of materials [1,3,4; a,c,e,j,k].

5) an understanding of chemical vapor deposition of materials and simulation using ThermoEMP software [1,3,4; a,c,e,j,k].
6) a basic understanding of metal deposition techniques [1,3,4; a,c,e,j,k].
7) conceptual understanding of photolithography fundamentals [1,3,4; a,b,c,e,j,k].

Outcome Assessment Method: Literature search, presentation, homework, and exams.