METROPOLITAN STATE UNIVERSITY OF DENVER
Office of Academic and Student Affairs

REGULAR COURSE SYLLABUS

College of: Professional Studies

Department: Engineering and Engineering Technology

Prefix & Course Number: CPE 3500 **Crosslisted With*:** _____

Course Title: Semiconductor Device Fundamentals

Transcript Course Title (30 characters): Semiconductor Dev Fundamentals

Check All That Apply: Required for Major: X Required for Minor: Specified Elective: _____

Required for Concentration: _____ Elective: ___ Service Course:

To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliance with this definition.

> ***Federal Credit Hour Definition:*** *A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:*
> *(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practica, studio work, and other academic work leading toward to the award of credit hours. 34CFR 600.2 (11/1/2010)*

Credit Hours: 3 (3+0) **Schedule Type**: L **Grade Mode**: L

Face-to-Face or Equivalent Hours per course:

Lecture 45 Lab __ Internship _____ Practicum _____ Other (please specify type and hours):_____

Additional Student Work Hours per course: 90

Variable topics umbrella course: No X **Yes** _____ If yes, number of credits/repeats allowed _____

Specified repeatable course: No X **Yes** _____ If yes, number of credits/repeats allowed _____

Prerequisite(s): CPE 2145, CPE 2165, CHE 1100 and CHE 1150 (with a grade of "C" or better for all prerequisites)

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

Banner Enforced Coding:

Prerequisite(s): CPE 2145, CPE 2165, CHE 1100 and CHE 1150 (with a grade of "C" or better for all prerequisites)

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

Registration restrictions: Level _____ **Class** _____**Program/Major** _____ **Student attribute** _____

Catalog Course Description:
This course will provide the fundamental knowledge of semiconductor physics, materials, devices and fabrication technology. The students will learn semiconductor band theory, semiconductor materials and statistics, pn junction, bipolar transistor, heterojunction, Schottky junction and solar cells. The course will focus on the MOSFET designs for advanced VLSI technology from its physical structure, accurate modeling, manufacturability and applications by using computer simulation.

Specific Variable Topics Course Description (if applicable, umbrella course description included above):

Required Reading and Other Materials will be equivalent to:

1. Hu, Chenming Calvin. (2010). *Modern Semiconductor Devices for Integrated Circuits*. Prentice Hall.
2. Sze, Simon M. and Ng, Kwok K. (2006). *Physics of Semiconductor Devices*. Wiley. (Optional).
3. Muller, Richard S., Kamins, Theodore I., and Chan, Mansun. (2003). *Device Electronics for Integrated Circuits (3rd Ed.)*. Wiley. (Optional)

Specific, *Measurable* Student Behavioral Learning Objectives:
Upon completion of this course the student should be able to:

1. Understand the fundamentals of semiconductor physics, materials, devices and fabrication technology
2. Learn semiconductor band theory, semiconductor materials and statistics, pn junction, bipolar transistor, heterojunction, Schottky junction and solar cells
3. Design the device for advanced VLSI technology from its physical structure, accurate modeling, manufacturability and applications
4. Deal with technical concerns in current VLSI industry by using computer simulation and experimental data

Detailed Outline of Course Content or Outline of Field Experience/Internship (experience, responsibilities and supervision):

I. Electrons and Holes in Semiconductors

II. Motion and Recombination of Electrons and Holes

III. Device Fabrication Technology

IV. PN Junction

V. Application of Optoelectronic Devices

VI. Metal-Semiconductor Junctions

VII. Bipolar Transistor

VIII. Heterojunctions

Evaluation of Student Performance:

1. Examinations
2. Written Assignments
3. Design Demonstrations