EEE 6428   Nanoscale Devices for VLSI Technology
(Spring 2019, MWF 5th period, BLK 315)

1. Catalog Description – (3 credits) Understand nanoscale devices in future very large scale integration (VLSI) technologies; 10nm-scale transistors, ballistic nanotransistors, bandstructure, molecular transistors, nanowires, and nanotransistor circuit models.

2. Pre-requisites - EEE 4420/EEE 5426 "Intro to Nano Devices"

3. Course Objectives - To understand state-of-the-art and future nanotransistors in VLSI technologies.

4. Instructor – Dr. Jing Guo
    a. Office location: 551 NEB
    b. Telephone: 392-0940
    c. E-mail address: guoj@ufl.edu
    d. Class Web site: UFL elearning canvas website
    e. TBD

5. Textbooks and Software Required -
    a. Title: Nanoscale Transistors: Device Physics, Modeling, and Simulation
    b. Author: M. Lundstrom and J. Guo
    c. Publication date and edition: Springer, 2005
    d. ISBN number:

    a. Title: Quantum Transport: Atom to Transistor
    b. Author: S. Datta
    c. Publication date and edition: Cambridge University Press, 2005
    d. ISBN number:

6. Course Outline (provide topics covered by week or by class period) –

Molecular Transistor	(1 week)
Nanowire transistor	(2 weeks)
Ballistic silicon transistor	(1 week)
Quasiballistic transistor	(1 week)
MOS field effect transistor	(1 week)
Device model of double gate MOSFETs	(1 week)
Basic concepts of Schrödinger Equation	(2 weeks)
Self-Consistent Electrostatics	(1 week)
Bandstructure of semiconductors with application to new channel materials	(1 week)
Bandstraucture of a "FIN" in a FINFET	(1 week)
Nanoscale MOS Capacitors	(1 week)

Homework and in-class assignments include modeling nanoscale double gate transistors, bandstructure calculations for two-dimensional channels, modeling nanoscale MOS capacitors, assessment of ballistic and quasi-ballistic silicon transistors.

7. Grading

   (1) 5% Homework: Late homework results in loss of points.
   (2) 5% in-class demos and quizzes
   (3) 40% Exam: The exam is based on class notes including oral comments, problems solved in classroom and homework and quiz problems. The students are responsible for the above materials.
   (4) 15% Research paper presentation: Each student will choose a research paper, preferably related to their term project, in the field of memory device technology and present it in class. The presentations will be graded based on 1) the presenter's ability to clearly describe the problem, explain the solution, and evaluate the (experimental or simulation) results, 2) the quality of answers provided to the questions, and 3) the content of the slides.

   (5) 35% Project: It consists of 5% project midterm proposal, 30% final presentation, and 5% peer review participation. The students will sign up time slots for the midterm proposal and final presentation in the course e-learning website.

8. Class attendance: As this course will have in class demos and quizzes, consistent attendance is very important. There is no make-up for in-class demos and quizzes. Attendance is required on the days I announce demos and discussions.

9. Computer: The students are required to bring a laptop computer to class on the days for demos.

10. Make-Up Exam Policy - If you have a University-approved excuse and arrange for it in advance, or in case of documented emergency, a make-up exam will be allowed and arrangements can be made for making up missed work. University attendance policies can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

    Otherwise, make-up exams will be considered only in extraordinary cases, and must be taken before the scheduled exam. The student must submit a written petition to the instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

11. Honesty Policy – UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

12. Accommodation for Students with Disabilities – Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide documentation to the student who must then provide this documentation to the course instructor when requesting accommodation.

13. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
    · UF Counseling & Wellness Center, psychological and psychiatric services, 3190 Radio Rd, 392-1575, online: http://www.counseling.ufl.edu/cwc/Default.aspx,
    · Career Resource Center, Reitz Union, career and job search services, 392-1601.
    · University Police Department, 392-1111 or 911 for emergencies

14. Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

15. Course Evaluation – Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at: https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at: https://evaluations.ufl.edu/results.