ECE 4080/6080
Silicon Photonic Integrated Circuits

Class Time: Tues/Thurs, 12:30-1:45pm
Class Location: Primary = Riggs 219 (recorded on zoom)

Instructor: Dr. Judson Ryckman Email: jryckma@clemson.edu Office: Riggs 207C
Phone: (864) 656-5907 Office Hours: By appointment

Teaching Assistant/Grader (if applicable): TBD
Email: TBD Office and Office Hours: TBD

Course Description

Silicon photonics has emerged as a powerful form of opto-electronics, leveraging CMOS foundries to realize advanced optical technologies relevant to applications such as data communications, sensing, and biomedicine. This course will introduce the fundamentals of silicon photonic components and circuits, and students will learn methods for modern device simulation, CAD/layout, device fabrication, test, and data analysis.

Within this course, students will be assigned a design project where they will develop a new device design (targeted to meet or surpass given target specifications) that is then fabricated and tested through a partnership with The University of British Columbia.

Course Objectives

The purpose of this course is for students to: (1) gain exposure to a rapidly growing area of opto-electronics, (2) gain proficiency in the simulation, design, and optimization of optical circuits, (3) learn how devices are fabricated and affected by process variations, and (4) execute a design project which meets or exceeds target specifications.

Required Materials

Course material will be posted on canvas:

- www.clemson.edu/canvas

Fabrication/Test partnership with The University of British Columbia:

- edX: https://www.edx.org/course/silicon-photonics-design-fabrication-ubcx-phot1x-5

(You will be automatically enrolled using your Clemson email address. Instructions will follow.)

Textbook: Chrostowski, Lukas Hochberg, Michael. (2015). *Silicon Photonics Design.* Cambridge University Press. (available online)

Computer: A computer will be required to complete assignments. E.g. MATLAB and Ansys Lumerical software will be used and demonstrated in class.

Topical Outline

Topics
Course overview, Background
Intro to modes and wave propagation
Simulation methods
Passives and routing
CAD / physical layout
Gratings
Optical I/O
Anti-reflection design
Modulators
Detectors
Lasers
Fabrication
Circuit level simulation
Testing and Packaging
Wafer scale data analysis, sensitivities, and tolerances

Grading

(Undergraduate Students)
A – 90% - 100%; B – 80 to < 90%; C – 70 to < 80%; D – 60 to < 70 & F – < 60%

(Graduate Students)
A – 90% - 100%; B – 80-89%; C – 70-79%; & F – < 70%

Homework Assignments	35%
Course HWs (20%)	
edX online HW completion/grade (15%)	
Project Assignments & Final Report	35%
Quizzes / Exams	30%

(all the above are subject to change at discretion of the instructor)

Additional Policies

Attendance: Mandatory in-person or on-line for all students, quizzes may be given. Short make up assignments will be coordinated only on a case-by-case basis.