
ECE 4930/6930
Silicon Photonic Integrated Circuits

Class Location/Time: Mon/Wed, Riggs 223 12:25-1:50pm

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

Teaching Assistant/Grader (if applicable): Cody Nelson
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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>

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

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	40%
Project Assignments	40%
Quizzes / Exams	20%

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

Additional Policies

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