GEORGIA INSTITUTE OF TECHNOLOGY

SCHOOL of ELECTRICAL & COMPUTER ENGINEERING

ECE 6542: Optoelectronics: Devices, Integration, Packaging, Systems

Fall 2025

Syllabus

Aim of the course:
ECE 6542 is a 3-credit course aimed at helping you to actively discover the optoelectronic devices (LED, Lasers, Modulators…) from the practical realization and theoretical performance perspective, to explore monolithic and hybrid integration of devices, packaging and system implementation.

COURSE OUTLINE

Introduction

Part 1 - Fundamentals of Optoelectronic Devices
- Semiconductor crystals structures
- Electronic and optical properties
- Materials growth & Characterizations
- Fabrication processes
- Light emitting diodes & lasers (homojunction, heterojunction, BH, quantum well, and advanced structure lasers)
- Type of lasers: Fabry Perot, DFB, DBR & VCSELs
- Diodes and Laser testing (IV, LI, WL, BER)
- Optical Modulation: Direct modulation, Electro-optical modulator, Electro absorption modulator

Part 2 - Packaging and Optoelectronic Integration
- Integration techniques: hybrid, monolithic
- Flexible devices and heterogeneous integrations
- Advanced packaging

Part 3 - Optoelectronic Systems
- Advanced packaging
- Optoelectronic communication systems
- Photovoltaic systems

Class Details:
Lectures: Mondays and Wednesdays: 15:30 – 16:45

Instructor: Dr Simon Gautier
sgautier6@gatech.edu **(Please include "ECE 6542" in the subject line.)**

Office hours
Institut Lafayette, Office 103
Tyically on Tuesdays 9:30-11:30.
Other times by appointment in person or remote.

Prerequisites:
None
The course assumes a familiarity with the basic principles of classical optics and with the solid-state physics.

Course resources:

The keynote files, homework and solutions, plus extra resources will be posted on Canvas.

Textbook(s):
Semiconductor Optoelectronic Devices, Pallab Bahttacharia, Prentice Hall, second edition

Recommended Textbooks:
Physics of Optoelectronic Devices, Shun Lien Chuang, Wiley Series
The Physics of semiconductors, K.F. Brennan Cambridge, University Press
Understanding Optical Communications H.J.R. Duton, IBM Redbooks
Optoelectronic Packaging, A.R Mickelson, Nagesh R. Basavanhally, John Wiley & Sons Inc

Honor Code:
GT Academic Honor Code is strictly enforced at GT Lorraine. Adherence to the Georgia Tech Honor Code is expected and all suspected instances of academic misconduct will be reported to the Dean of Students. It is your responsibility to ask for clarification if collaboration guidelines, test-taking policies, etc. are not clear. You will find detailed information at http://osi.gatech.edu/content/honor-code.

Grade Policy:
Your course grade will be determined out of a maximum of 100 percentage points on the following basis:
Exams: 65%
Homework: 10%
Project: 25%

The final grade will be curved based on your attendance, performance and participation. Over two unexcused absences, no curving will be applied. In case of a health issue that prevent students taking an exam, a note from a doctor will be required before rescheduling the exam otherwise the students will have an F to the exam

Attendance policy:
This class is a core course of your curriculum, you better have to be present. Attendance will be taken at the beginning of each class. For more information about class attendance at Georgia Tech, you may go to http://www.catalog.gatech.edu/rules/4/.

Student-Faculty Expectations Agreement:
At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See

http://www.catalog.gatech.edu/rules/22/ for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain com- mitted to the ideals of Georgia Tech while in this class.

Major Emergencies:
If you have some sort of major life emergency - serious illness or injury, death in the family, etc. - that seriously impedes your progress in the class, please let me know as soon as possible so we can work something out. Don't disappear with no warning half way through, making me think that you dropped the class, and then reappear out of nowhere the week before finals asking what you can do to make things up.

Disabilities:
Georgia Tech offers accommodation to students with disabilities, this policy is extended to GT Lorraine. If you need any accommodation, then inform Mrs Corinne Guyot with a certificate from the Office of Disability Services (ODS).
If you have been approved by ODS for an accommodation, I will work closely with you to understand your needs and make a good faith effort to investigate whether or not requested accommodations are possible for this course. If the accommodation request results in a fundamental alteration of the stated learning outcome of this course, ODS, academic advisors, and the school offering the course will work with you to find a suitable alternative that as far as possible preserves your progress toward graduation.

Miscellaneous:
In classroom, the cellphone is turned off or in Do Not Dis-turb or Airplane mode, no food or drink during class time. You can use your laptop to take notes but not for gaming.

Assignments:
Assignments and solutions will be posted periodically on Canvas. All homework assignments will be submitted through Canvas.

Important dates:
See below the tentative calendar of the semester, the dates of the written will be confirmed 2 weeks in advance. The date of the final exam will be released in September and will be non-negotiable.

- Midterm written exam Week of 20th October
- Project in November
- Finals week, 4th to 11th December