EEC235 – Photonics

Winter Quarter 2020
CRN: 54621 (4 units)

Course Description: This course focuses on the propagation of electromagnetic waves and beams in photonic components and the design of such devices using numerical techniques.

Prerequisites: EEC 230

Instructor: Prof. Weijian Yang (wejyang@ucdavis)

Lecture Time: Tuesday, Thursday 4:10-5:30 pm
Location: 1070 Bainer

Office Hours: Tuesday, 2:30-4:00 pm; or by appointment
Location: 3127 Kemper

Textbook:

- Katsunari Okamoto, Fundamentals of Optical Waveguides, 2nd edition, Academic Press, 2006.
- Shun Lien Chuang, Physics of Photonic Devices, 2nd edition, John Wiley & Sons, Inc., 2009.

Optional Reference:

- Jia-Ming Liu, Photonic Devices, Cambridge University Press, 2005.
- Lukas Chrostowski, Silicon Photonics Design, Cambridge University Press, 2015.
- Subhasish Dutta Gupta, Nirmalya Ghosh, Ayan Banerjee, Wave optics, Basic concepts and contemporary trends, CRC Press, 2016.
- Hermann A. Haus, Waves and fields in optoelectronics, Prentice-Hall, Inc., 1984.

Software used in the course:

- MATLAB: to write programs to perform numerical simulations.
- Lumerical software: to perform finite element method (FEM) and finite difference time-domain method (FDTD) simulation. Each student will receive a key to access the software on his or her own personal computer. The software access will be available throughout the winter quarter, and will expire by the end of March, 2020.
    - Only EEC235 students will be given access to the Lumerical software as part of the university education program of Lumerical Inc. Giving others access to this license is a violation of UC Davis Code of Academic Conduct.

Homework: Homework is typically assigned on a weekly basis on Canvas. Please turn in your homework digitally to Canvas. Late homework will not be graded. Homework copied from others will be considered cheating. Any student involved with copying will receive a no-appeal grade F for the course.

Quiz: There will be a few in-class written quizzes. Notice would be given one week before each quiz.

Term Project: Two students form a group to review and investigate an advanced topic in photonics. This should include a theoretical study, numerical simulations, and an exploration of its applications. Each group will submit a term paper detailing their study. The term paper should follow the format of publications from Nature Publishing Group or Optical Society of America.

Academic Integrity: Cheating and plagiarism will not be tolerated. Professional integrity is an important aspect of all engineering and science disciplines.

Acknowledge the Code of Academic Conduct: All students are required to acknowledge the Code of Academic Conduct for each registered course, no later than the quarter add deadline. my.ucdavis.edu will notify students online and through email for the action.
Please read the code of Academic Conduct at http://sja.ucdavis.edu/files/cac.pdf
Please also visit https://participate.ucdavis.edu/

Grading: Letter grade based on the following

- Homework: 55%
- Quizzes: 10%
- Final project: 35%

Course outline:
Waves propagation in isotropic media and polarization
Waves propagation in multi-layered media and periodic media
Waves propagation in anisotropic media
Optical waveguides
Finite element method
Beam propagation method
Coupled-mode theory
Radiation and beam propagation in free space
Advanced topics in photonics