EE 348 – Lasers and Optical Engineering

Description:

This course introduces the key aspects of lasers and other optical devices that are used in a variety of applications, ranging from cutting/welding to >10 Tbit/s fiber optic data links to artificial guide stars for astronomy. We will develop the requisite physics to (1) discover why lasers are actually losers, (2) qualitatively and quantitatively describe laser operation, and (3) identify the key tradeoffs in practical laser design.

Instructor:

Professor Seth R. Bank, 2.606C MER, 520A ENS, E-Mail: sbank@ece.utexas.edu
Office Hours: 6:30-7:30PM Tu/Th in ENS office & ***anytime my office door is open at MER***
Teaching Assistant: Xin Wang, Office Hours: *TBA*, E-Mail: xwang2@ece.utexas.edu
Course Website: https://courses.utexas.edu/webapps/portal/frameset.jsp (Lecture notes)

Prerequisites:

Engineering electromagnetics (EE 325 or equivalent)
Solid-state electronic devices (EE 339 or equivalent)

Text:

Required:

- *Laser Electronics*, 3rd Ed., by J. T. Verdeyen
- Relevant readings will be distributed as necessary

References:

- *Lasers*, by A. E. Siegman
- *Laser Fundamentals*, by W. Silfvast
- *Semiconductor Optoelectronic Devices*, 2nd Ed., by P.K. Bhattacharya

Planned Topics:

- Beam propagation (Gaussian beams, ray tracing, ABCD matrices)
- Cavities and resonators (Fabry-Perot etalons and stability criteria)
- Semiclassical quantum theory of gain media (Einstein A and B coefficients, rate equations, broadening mechanisms, saturation)
- Lasing criteria (intensity and phase)
- Practical laser systems (3 and 4 level lasers, Nd:YAG, Ar^+, Ti:Sapphire)
- Tunable lasers
- Short pulse lasers (mode-locked and Q-switched)
- Guided optical waves & optical fibers (waveguides, fiber lasers, and dispersion)
- Semiconductor optoelectronics (lasers, detectors, and modulators)

Examinations and Grading:

- Homeworks (30%), Two Midterms (40%), In-class presentation (30%)
  - Presentation: 15 minute in class talk developing an aspect of lasers more fully than in class

Collaboration on problem sets is strongly encouraged. However, copying another's work is cheating. Academic integrity is paramount and cheating will not be tolerated (see below).

- Late homework will be accepted at instructor's discretion
- Attendance is strongly encouraged, but not strictly enforced

College Drop/Add Policy:

An engineering student must have Dean's approval to add/drop after the fourth class day of the semester.

Students with Disabilities:

The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 TTY or the College of Engineering Director of Students with Disabilities at 471-4382.

Course Website and Student Privacy:

Web-based, password-protected class sites are associated with all academic courses taught at The University. Syllabi, handouts, assignments and other resources are types of information that may be available within these sites. Site activities could include exchanging e-mail, engaging in class discussions and chats, and exchanging files. In addition, electronic class rosters will be a component of the sites. Students who do not want their names included in these electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1.

Academic Integrity:

Plagiarism or any form of academic dishonesty (cheating includes, but is not limited to, copying another student's work, bringing notes into a test and copying material directly from a book, article or web site without including appropriate references, falsifying data, doing someone's work) is a violation of University rules and may return a grade of zero for each assignment in which it is detected or may incur even steeper penalties. For University policies see:
http://www.utexas.edu/opa/news/04newsreleases/nr_200404/nr_honor040429.html