EE 396V – Nanostructured Optoelectronics

Description:
This course focuses on the physics and performance aspects of modern optoelectronic devices that utilize quantum confinement of electrons in semiconductor nanostructures. The emphasis will be on understanding and the operation of these devices based on their energy band diagrams. The topics that will be discussed in this course include: review of the optical properties of semiconductors, semiconductor heterostructures, quantum wells, quantum dots, and superlattices, calculation of quantum states, quantum size effect in nanostructures, quantum-confined Stark effect, quantum well and quantum dot lasers, intersubband transitions, quantum well infrared photodetectors, quantum cascade lasers, and solar cells that utilize semiconductor nanostructures to improve performance.

Class hours: Tuesday, Thursday 5-6:30pm; RLM 5.120

Instructor:
Prof. Mikhail Belkin
Email: mbelkin@ece.utexas.edu
Tel. (512) 471-4424 (MER)
http://www.ece.utexas.edu/~mbelkin
Office Hours: Tuesday, Thursday 4-5pm; ENS 612 or by appointment in MER 2.606A
Teaching Assistant: TBD
Office Hours: TBD

Prerequisites:
Required: Electromagnetic engineering (EE 325 or equivalent)
Solid-state electronic devices (EE 339 or equivalent)
Quantum mechanics and/or solid-state physics course

Text:
Required:
- *Semiconductor Optoelectronic Devices, 2nd Ed.*, by Pallab Bhattacharya
- Lecture notes and/or relevant papers (to be distributed as necessary)

Planned Topics:
- Review of basic physics and optical properties of semiconductors (mostly III-V)
- Semiconductor heterostructures
- Density of states of low-dimensional systems
- Quantum wells and superlattices
- Calculation of quantum states
- Quantum size effect in nanostructures
- Optical properties of quantum wells
- Quantum-confined Stark effect
- Optical modulators
- Quantum well lasers
- Intersubband transitions
- Quantum well infrared photodetectors
- Quantum cascade lasers
- Nanostructured solar cells

Examinations and Grading:
- Homeworks (1/3 of the grade), midterm (1/3), in-class presentation + paper (1/3)
- Late homework will be accepted at instructor’s discretion
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 is a violation of University rules and will be penalized. For University policies see: http://www.utexas.edu/news/2004/04/29/nr_honor/