PHYC 569, Advanced Optics in Modern Optics (53327)

Laser Physics II

Tu, Th 5:30-6:45, Room 184, Fall 2016

Homepage: http://www.optics.unm.edu/sbahae/physics564/index.htm

Note: This course was offered in the past under PHYC 564 (Laser Physics II)

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Reference Texts:
- Laser Electronics by J.T. Verdeyen
- Optical Electronics in Modern Communications by Amnon Yariv
- Physics of Optoelectronic Devices by S. L. Chuang
- Foundations of Photonics, by Saleh and Teich
- Theory of Optical Properties in Semiconductors by P. K. Basu

Pre-requisites: Advanced Optics, Laser Physics I, (Check UNM Catalog for more details). Basic knowledge of Quantum Mechanics is also required.

Grading: One midterm exam (40%), homework (20%), final presentation (40%)

TOPICS

Some of the topics covered in this course may vary depending on the overall students’ interests and requests.

- Review of laser principles (1-2 lectures)
- Semiconductor Lasers (11 lectures)
  - Review of band-theory, k.p theory and effective mass approximation, Derivation of optical transitions and gain in semiconductors, Optical propagation in dielectric waveguides, Heterojunction lasers, Quantum-confined structures, multiple quantum well (MQW) lasers, Vertical cavity surface emitting lasers (VCSEL), Optically Pumped Semiconductor Lasers (VECSELS), Quantum-cascade lasers

- Optical Detectors and Detection Techniques (3 lectures)
- Statistical Optics, Noise in Detection (2 lectures)
- Topics in Ultrafast Phenomena (Femtosecond Metrology, Extreme Nonlinear Optics & Atto-Science) (5-6 lectures)
- Terahertz radiation (Generation and Detection) and Applications (2-3 lectures)

Other topics may include:
- Plasmonics, Nano-Optics
- Unstable resonators and applications
- Maxwell-Bloch equations, coherent transient effects