ENEE 691 - Optical Communication Systems

Spring 2002: TuTh 2:00-3:15pm

Course Number 22992

Chemical Engineering (CHE) 2110

Instructor: Professor Christopher C. Davis

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T.A.: TBD

Method of Grading:

20%	1st Examination
20%	2nd Examination
25%	Final Examination
20%	Homeworks and Projects
15%	Final Project

All examinations are closed book/closed notes.

If you miss an examination for **documented** medical or other **documented** convincing reason you will be permitted to take an additional **comprehensive** examination near the time of the final exam.
Students with special needs or documented disabilities should contact me to discuss accommodations.

Examination Dates:

1st Exam, 2:00-3:15, date to be decided
2nd Exam, 2:00-3:15, date to be decided
Final Exam, Friday, May 17, 10:30am - 12:30pm

Course Synopsis

I hope to cover most of the following topics:

1. Overview
2. Basic optical principles, optical fibers and waveguides, practical issues of fiber design and fabrication. There will be a detailed discussion of both the ray and wave theory of planar slab and cylindrical waveguides. Multimode and single-mode fibers, V-number.
3. Attenuation and dispersion in fibers. Modal, material, waveguide and polarization mode dispersion. Calculation of waveguide dispersion curves. Effects of dispersion on pulse broadening and maximum bit-rate. Solitons and dispersion management.
4. Optical sources, lasers and LEDs. A discussion of device physics, brightness, spectral properties. Optical amplifiers, saturation and noise. Residual intensity noise of optical sources. Gauussian beams.
5. Coupling to fibers, connectors. Gaussian beam models of coupling.

6. Photodetectors. device physics of PMTs, APDs, and p-i-n photodiodes. Quantum efficiency and responsivity.
7. Optical receivers, noise, errors. Calculation of NEP and D^*, bandwidth, bit-error-rate.
8. Digital optical communication links, coding.
9. Analog systems, coherent detection.
10. WDM, DWDM, multiplexers, filters. Bragg gratings, Fabry-perot filters.
11. Optical amplifiers. Device physics, performance and applications.
12. Optical Networks, SONET/SDH, nonlinear effects, Network topologies, wavelength conversion, switches.

Text

Optical Fiber Communications, Gerd Keiser, 3rd Edition, McGraw-Hill, 2000
http://www.mhhe.com/engcs/electrical/keiser/

Other Optical Communications Texts

Optical Fiber Communication Systems, L. Kazovsky, S. Benedetto, and A. Willner, Artech House, 1996.
Optical Communication Systems, John Gowar, Prentice-Hall, Second Edition, 1993
Fiber Optic Networks, Paul Green, Prentice-Hall, 1993

Other Useful Texts

Lasers and Electro-Optics, C.C. Davis, Cambridge University Press, 1996
Fiber Optics and Optoelectronics, 2nd. Ed. P.K. Cheo, Prentice-Hall, 1990
Fiber Optic Communications, 4th Ed. J.C. Palais, Prentice-Hall, 1998
Semiconductor Optoelectronic Devices, P. Bhattacharya, Prentice-Hall, 1997
Semiconductor Devices for Optical Communication, H. Kressel, Ed., 2nd Ed., Springer-Verlag, 1982
Optical Semiconductor Devices, M. Fukuda, Wiley, 1999 Optical Fibers, T. Okoshi, Academic, 1982
Optical Waveguide Theory, A.W. Snyder and J.D. Love, Chapman and Hall, 1983
Optical Communications, R.M. Gagliardi and S. Karp, Wiley, 1976
Optical Fiber Telecommunications II, S.E. Miller and I. Kaminow, Eds. Academic, 1988
Long Wavelength Semiconductor Lasers, G.P. Agrawal and N.K. Dutta, Van Nostrand, 1986
Optical Integrated Circuits, H. Nishikara, M. Haruna, and T. Sukara, McGraw-Hill, 1989
Fields and Waves in Optoelectronics, H.A. Haus, Prentice-Hall, 1984