Fall 2001: EE 693F Optical Networks

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Textbook: *Optical Networks* by Rajiv Ramaswami and Kumar Sivarajan, Morgan Kaufmann Publishers.
Summary: Within the past five years optical communication has grown dramatically in the commercial sector. There are least two reasons. The first reason is that there is exponentially growing demand for communication bandwidth. Internet traffic has been reported to be at least doubling every year, and some reports show doubling every 8 months. Thus, broadband systems are needed that can support this explosion of traffic. The second reason is that optical fiber is viewed as the medium of choice for broadband, long haul transport systems. Wavelength division multiplexing (WDM) is the technology that allows many multiples of optical signals to be carried on a single fiber. Today commercially available systems allow a fiber to transport a total aggregate bandwidth that is nearing a terabit per second.

The purpose of this course is as an introduction to optical networks. We will cover key components, line systems, and network architectures. The course will follow the textbook for the most part. However, there will be additional material such as IP over WDM.

Outline: (Note that this outline is subject to change.)
1) *Introduction to optical networks*
2) *Propagation of signals in fiber:* light propagation in optical fiber, loss and bandwidth, chromatic dispersion, nonlinear effects.
3) *Components:* Couplers, isolators and circulators, multiplexers and filters, optical amplifiers, transmitters, detectors, switches, wavelength converters.
4) Modulation and demodulation
5) *Transmission system engineering*: system model, power penalty, transmitter, receiver, optical amplifiers, crosstalk, dispersion, fiber nonlinearities, wavelength stabilization.
6) *First-generation optical networks*: SONET/SDH, ESCON, Fiber channel, Gigabit Ethernet, IP, traffic engineering and grooming, network design.
7) *Wavelength routed networks*: routing, protection schemes, physical impairment constraints, nonblocking network theory, network models, network design.
8) *Control and Management*: network management functions, configuration management, performance management, fault management, optical safety, service interface.
9) *IP over WDM*

Grading: There will be weekly or bi-weekly homework assignments (40%), a final exam (30%), and a final project (30%). The final project will be a written report on a research topic. The report will require a survey of the topic and directions for new research. The report will be approximately 12-15 pages (per person).

Prerequisites: EE 371 (undergraduate electromagnetic theory) or equivalent, and EE 367 (undergraduate data structures) or equivalent. Knowledge of graph algorithms will be very helpful.

For More Information: http://www-ee.eng.hawaii.edu/~sasaki/EE693F/Fall01/