COURSE OUTLINE

Course: EE558, Optical Fiber Communication Systems

Objective: To obtain a familiarity with most major areas of optical communications as well as delve deeply into a few state-of-the-art research topics in the field.

Room: TV Center OHE 100

Hours: M, W 9-10:15 am

Instructor: Prof. Alan Willner

Office: Room EEB 538, (213) 740-4664, FAX: 740-8729, willner@solar.usc.edu, (Home) (310) 274-8192

Office Hours: T: 11 am - 1 pm

Required Text:

1. Optical Fiber Communication Systems, Kazovsky, Benedetto, and Willner, Artech House

Other Suggested Texts: (To be put on reserve in Seaver Science and Engineering Library)

2. Introduction to Optical Fiber Communication Systems, W.B. Jones, HRW
3. Optical Communications Systems, Gowar, Prentice-Hall
5. Introduction to Optical Electronics, Yariv, HRW
6. Fiber Optic Communication, Killen, Prentice-Hall
7. Fiber Optic Communications, Palais, Prentice-Hall

Grading:

40% - Midterm (covers Part I of next page)
5%  - Homework
40% - Project (~60% written and ~40% oral)
15% - Mini-final (covers Part II of next page)

Project: To study a recent research topic in detail and clearly convey results to audience.

- Topics to be chosen near the end of January or beginning of February.
- Project will require 2 consultations with instructor. First one to decide on parameters and direction of topic and second one for preview of oral presentation. These will be scheduled individually.
- Oral presentations to begin mid-March. 15 minutes plus discussion time per presentation.
- Written presentation to be submitted at time of presentation. 10-20 typed pages in length plus relevant references and figures.
EE558 COURSE OUTLINE

I. Lectures on Major Areas of Optical Fiber Communications (~60% term)

A. Component Issues

1. Sources (LED and lasers)
2. Fiber types and beam propagation
3. Detectors and Receivers
4. Connectors, couplers, isolators, polarization controllers
5. Amplifiers, filters, modulators, and regenerators
6. Optoelectronic integrated circuits

B. System Issues

1. Signal modulation formats and techniques
2. Detection schemes
3. Signal fidelity (signal-to-noise ratio and bit-error-rates)
4. Optical switching (time-, wavelength-, and space-division-multiplexing)
5. System topologies (bus, ring, star) and evolution (.86, 1.3, and 1.5 µm)
6. Network considerations (circuit vs. packet switching, contention resolution, cost)

II. Term projects on recent advances in Optical Fiber Communications
(complete list to be distributed near the end of January)

- Lasers: multiple-quantum-well, multi-electrode, micro-lasers, multiple-wavelength arrays, photonic-integrated-circuits
- Fiber: dispersion-shifted, polarization-preserving, pigtailing, splicing, packaging, integrated and monolithic couplers, fiber-Bragg gratings
- Filters: wavelength-tunable, fiber-Fabry-Perot, liquid-crystal, acousto-optic, wavelength-division multiplexers
- Receivers: high-speed, arrays, addressable, optoelectronic integrated circuits
- Amplifiers: semiconductor, Erbium-doped fiber, applications to long distance and distribution
- Optical Switching: electronic, space, time, and wavelength
- Long distance communications: amplifier applications, solitons, loop experiments, dispersion and nonlinearities
- Latest detection-scheme results: direct, heterodyne, homodyne
- Networks: time-, space-, code-, and wavelength-division-multiplexing, multi-hop, circuit- and packet switching, contention resolution, FDDI
- Distribution systems: fiber to the curb and/or home, broadband integrated services digital network, network control, SONET and ATM standards
- Subcarrier multiplexing: FM, AM, digital, analog, cable-TV applications

- Each project will deal with a subset of each topic heading -