CEEN4790/8790 Optical Fiber Communications

UNO, Fall 1999 *W 4-6:30pm, PKI160*

Fundamentals of lightwave communication in optical fiber waveguides, physical description of fiber optic systems. Properties of optical fiber and fiber optic components. Electro-optic devices: light sources and modulators, detectors and amplifiers; optical transmitter and receiver systems. Fiber optic link design and networks.

1. Instructor: Dr. Lim Nguyen, PKI 201F, ext. 4-2752, nguyenl@unomaha.edu; office hrs M 11am/1pm, T/R 1pm, W11am.

2. Text: J. Powers, *An Introduction to Fiber Optic Systems,* 2nd edition, Irwin 1997.

3. References: G. P. Agrawal, *Fiber-Optic Communication Systems*, 3nd edition, Wiley 1997.

4. Problem sets: there will be approximately 10 problem sets assigned weekly and due the following week in class. Late turn-in (within 1 week of due date) without prior arrangement will be 50% off; no credit after 1-week late. Discussion and collaboration are strongly encouraged. However you must turn in solutions of your own (no division of work, please).

5. Exams and quizzes: one mid-term exam and one final exam (take home or in-class TBD), in addition to in-class quizzes.

6. Grading: problem sets and quizzes 30%, laboratory 20%, mid-term 25%, final 25%.

7. Course outline:

   - Optical fiber waveguides: Physical structure and propagation in single-mode and multi-mode glass fibers; fiber losses, dispersions and nonlinearities; measurements of optical fiber characteristics.
   - Fiber components: Fiber connectors, couplers, gratings.
   - Optical transmitter system: Light emitting diodes, diode lasers, fiber sources; noise, modulation and coupling.
   - Optical receiver: Photodetection, PIN and avalanche diode detectors; fiber amplifier and post detection amplifiers; receiver noise, sensitivity, and bit-error rates.
   - Fiber optic link/networks: Power budget, capacity, distortion; multiple access, time, wavelength and code division multiplexing.

8. Laboratory: laboratory assignments employ a wide range of state-of-the-art fiber optic instruments that include beam profiler, fusion splicer, optical time-domain reflectometer, optical spectrum analyzer, laser diode and photodetector systems, erbium-doped fiber amplifier, tunable semiconductor fiber source. The lab assignments employ these instruments to perform measurements of laser beam and optical fiber characteristics as well as fiber-optic devices and systems.