**ELEN 4565 – Optical Fiber Communications**

**Class Schedule:**  3 credits

**Course Coordinator:** Dr. Fabien Josse

**Course Materials:**

* Joseph C. Palais, Fiber Optic Communications, 5th Ed., Prentice-Hall, Englewood Cliffs, N.J., 2005
* Gerd Keiser, Optical Fiber Communications, 4th Ed., McGraw-Hill, New York, 2000

**Course Description:** Fundamental principles and theories of optical fiber systems are introduced and developed. Review of electromagnetic principles of waveguides. Step-Index and Graded-Index, single and multimode fibers. Signal analysis in optical fibers: mode interaction, attenuation, dispersion and pulse spreading. Operating characteristics of optical sources and photo-receivers with impact on system performance. Coupling to a fiber and distribution system. Optical fiber communication system design.

**Prerequisites:** Senior Standing and ELEN 3110

**Selected Elective** in the "Electronic Devices and Systems", "Signals, Systems, and Control", and "Electromagnetic Fields and Communication" areas.

**Professional components:**

Engineering Science – 50%

Engineering Design – 50%

**Course Goals:**

To give seniors and first year graduate students fundamental principles on the theory and design of optical fiber systems.

**Course Objectives:**

*By the end of this course, you should be able to ...*

* Apply the basics of electromagnetic theory as related to lightwave signals.
* Apply the fundamental principles and theories of optical fibers as dielectric waveguides.
* Describe and apply the characteristics of Step-Index, Graded-Index fibers, the design equations and principles of single mode and multimode propagation.
* Analyze signals in optical fibers. This analysis includes:
  + Mode interaction
  + Signal attenuation
  + Signal dispersion and pulse spreading
* Use basic operating characteristics of semiconductor light sources and photoreceivers for system design. Emphasis is placed on their impact on system performance.
* Identify and specify the various couplers and connectors for optical fibers.
* Assess various distribution systems used in the design of networks (local area network (LAN)).
* Choose and evaluate system components such as fibers, light sources, detectors and couplers.
* Design and analyze basic optical fiber communication networks, including the criteria for system information-handling capability as well as the criteria for future expansion.

**Contribution to Program Objectives**: partial fulfillment of Criterion 3 objectives: A, C, E, G, K

**Course**  **Topics** **In the Text**

Introduction to Optical Communication and Palais: Chap.1, 2, 3

Optical Fiber.

Keiser: Chap. 1

Optical Dielectric Waveguides- Optical Fibers Palais: Chap. 4, 5

-Step Index

Keiser: Chap. 2

-Graded Index

-Modes

Signal Analysis in Optical Fibers Palais: Chap. 4, 5

Keiser: Chap.3

Light Sources and Detectors Palais: Chap.6, 7

Coupling to a Fiber; Distribution Systems Palais: Chap.8, 9

Optical Fiber Communication Design Palais: Chap. 12

Keiser: Chap. 8, 11