ESE363 -FIBER OPTIC COMMUNICATIONS

COURSE DESCRIPTION:

Fiber optic technology has been responsible for the communication age and is now central to the grown high speed, high capacity information transport systems. This course presents the fundamental principles for understanding and applying fiber optic technology to modern telecommunication systems. The course examines the behavior of optical components, basics of analog and digital optical communication links, and examines the performance of complex optical links and networks.

The accompanying laboratory component is significantly different from regular laboratory courses. Students are given a set of specifications for design, fabricating and testing of a digital fiber optic communication link. Each group works independently to learn every aspect of product development from concept, planning, feasibility, design, component selection, purchase, fabrication, and testing. Students demonstrate a working prototype, give oral and written presentations.

GOALS:

Establish fundamental understanding of a fiber optic communication system.

SPECIFIC OBJECTIVES:

1. Basics of digital communication
2. Properties of semiconductor sources
3. Design of optical receivers
4. Optical characterization of single and multimode optical fibers
5. Properties of optical fibers
6. Design of single wavelength communication systems

	Lecture Component
Week 1.	Temporal, spatial and spectral properties of signals
Week 2.	Characterization of digital signals for communications
Week 3.	Photons and photon streams
Week 4.	Semiconductor sources - LED
Week 5.	Laser diodes
Week 6.	Optical detection
Week 7.	Pin and APD
Week 8.	Noise processes in semiconductor devices
Week 9.	Optical receiver design
Week 10.	Modal concepts in optical fibers
Week 11.	Attenuation and dispersion in optical fibers
Week 12.	Link design – power and rise time budget
Week 13.	Optical amplifiers and Wavelength division multiplexing
Exams	3 lecture hours
Presentations	Project demonstration and oral presentations

	Laboratory Component
Week 1.	Characterization of voice signals
Week 2.	Characterization of headset microphone and ear piece
Week 3.	Concepts of sampling and ADC selection
Week 4.	ADC/DAC circuit design
Week 5.	Serializer/deserializer
Week 6.	LED spectrum, rise time, and responsivity
Week 7.	LED driver design
Week 8.	PD responsivity, rise time and receiver design
Week 9.	System testing and clock recovery issues related to DAC
Week 10.	optical fiber characteristics
Week 11.	Fabrication
Week 12.	Fabrication
Week 13.	Presentations

TEXTBOOK:

Optical Fiber Communications, Gerd Keiser, 4rd edition, McGraw Hill (2011). ISBN: 978-0-07-338071-1