Course Syllabus
ECE 666L -Fiber Optic Communications Lab

Department: Electrical & Computer Engineering
Course Number: ECE 666L
Course Title: Fiber Optic Communications Lab
Credit Units: 1

Course Description
This lab accompanying ECE 666 covers fiber optic communication design, measurements and simulations. This includes numerical aperture, fiber attenuation, power distribution in single mode fibers, mode distribution in multimode fibers, fiber coupling efficiency and Connectors/ splices losses. Also design, construction and simulation of WDM communication system components are covered. Individual and group projects are assigned to students in the Lab: 3 hours per week.

Prerequisite by Topic
Introduction to communication systems and electromagnetic fields and waves. Specifically students should be familiar with analog and digital communication systems, frequency-division and time-division multiplexing techniques. Maxwell's equations and waveguides

Text, References & Software
Recommended Text:
Optical Fiber Communications by John Senior, 3rd Edition, Prentice Hall, 2009.

Additional References:
Fiber Optic Communications,by Joseph Palais, fifth edition, Prentice Hall, 2004
Fiber optics : principles and practices, by Abdul Al-Azzawi,CRC press,2006

Software:
Optiwave (OptiSystem, OptiBPM & OptiFiber software instruction manuals)

Course Objectives– After completing this course the students should be able to:
1. Align light waves into small optical components with high precision
2. Use modern hardware/software design tools to develop modern communication systems
3. Calculate and simulate the attenuation and signal degradation due to intermodal and intramodal distortion.
4. Calculate power coupling losses due to connectors, splices, source output pattern and fiber numerical aperture
5. Understand, compute and simulate the modes in step index fiber and graded index fiber.
6. Design, implement and test WDM communication system using its basic components
7. Participate in team projects including design, inspection and optimization
8. Understand the reliability issues of the highly delicate optical devices

Topics Covered:
- Introduction to fiber optics Measurements
- Introduction to OptiSystem, OptiBPM, and OptiFiber
- Fiber Numerical Aperture Measurements

- Fiber attenuation and dispersion measurement
- Single Mode Fiber Characteristic
- Mode distribution in Multimode Fiber
- Fiber coupling efficiency to Optical Components
- Connectors/Splices construction and loss measurements
- Construction of MUX and DEMUX for WDM systems
- Design of Fiber Optic WDM link

Relationship to Program Outcomes

This course supports the achievement of the following outcomes:

a) Ability to apply knowledge of advanced principles to the analysis of electrical and computer engineering problems.

b) Ability to apply knowledge of advanced techniques to the design of electrical and computer engineering systems.

c) Ability to apply the appropriate industry practices, emerging technologies, state-of-the-art design techniques, software tools, and research methods of solving electrical and computer engineering problems.

d) Ability to use the appropriate state-of-the-art engineering references and resources, including IEEE research journals and industry publications, needed to find the best solutions to electrical and computer engineering problems.

e) Ability to communicate clearly and use the appropriate medium, including written, oral, and electronic communication methods.

f) Ability to maintain life-long learning and continue to be motivated to learn new subject.

h) Ability to be competitive in the engineering job market and/or be admitted to an excellent Ph. D. program.

Prepared by:

Nagwa Bekir
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