ECE 441: Optical Electronics

IN

OUT

Mathematics Concepts

- Calculus
- Matrix algebra

Physics Concepts

- Electromagnetic waves
- Waveguides
- Basic geometric optics laws
- Diffraction
- Interference

Pre-requisites

- ECE 342 with a minimum grade of C

Concepts:
- Review of geometric Optics
- Optical resonators
- Stability criteria for optical resonators
- Transverse and longitudinal modes in optical resonators
- Light-matter interaction
- Einstein coefficients
- Optical gain, population inversion
- Three and four levels systems
- Semiconductor lasers: principles and characteristics; single mode semiconductor lasers; vertical cavity surface emitting lasers
- Light emitting diodes
- Optical detectors: signal to noise considerations
- Pin photodiodes
- Photoelectric effect and photomultipliers
- Charge couple device detectors
- Principles of optical waveguides

Applications:
- Optics communications and design of an optical data link

Tools:
- MATLAB - Optional

Building Blocks of Optoelectronic Systems

- Know the fundamental concepts and devices that are the building blocks of lasers
- Know the fundamental concepts and devices that are the building blocks of detectors
- Know the fundamental concepts and devices that are the building blocks of fiber optics

Optical Electronics Design and Experimentation

- Identify, formulate and solve engineering problems
- Apply engineering design process to produce solutions that meet specified needs
- Develop and conduct appropriate experimentation, analyze and interpreter data
- Design a high bit rate optical data link using commercially available components