OPTI/ECE 503B

Software Tools for Photonics (3 units). Many photonics software tools are available as off the shelf modeling programs, encompassing both photonics components and optical networking systems. These products are now in use by a wide number of telecoms companies and laboratories around the world, helping to develop the next generation of telecoms components and systems. Experience in modeling enables the development of custom solutions for specialized industry telecommunication and photonics requirements.

Prerequisites: Familiarity with wave propagation analysis, component design, and network architecture as taught in Photonic Communications Engineering I (OPTI/ECE 500 A, B, C).

Meeting Times:
Lectures: T & Th 9:30-10:45

Objective: To learn software tools and techniques commonly used in the telecom industry

Course Outline: This class will introduce students to industry recognized software packages for fiber-optic communications including fiber propagation/transmission, linear and nonlinear effects, component simulation (active and passive) as well as optical networking simulation. General modeling and simulation strategies suitable for the fast and accurate analysis of a fiber optical Wavelength Division Multiplexed (WDM) system will be presented, and will also include multi-span systems. Noise, fiber dispersion, and nonlinear effects like four wave mixing, self-phase modulation and cross-phase modulation will be simulated. Software tools will include:

- MATLAB
    - General modeling and simulation strategies
- OPNET
    - Modeling a broad scope of network technologies and protocols to automate network design
- VPISYSTEM
    - Introduction to fiber-optic communications
    - Modeling of optical components including optical Transmitters, optical receivers, and optical amplifiers
    - Modeling of fiber propagation, polarization effects, chromatic dispersion, and Kerr nonlinearities
    - Modeling of optical modulators and modulation formats
    - WDM systems and optical networking modeling
    - Photonic measurements

Recommended Textbooks:

1. Rajiv Ramaswami, Kumar Sivarajan, and Galen Sasaki (2009). *Optical Networks: A Practical Perspective, 3rd Edition*. Morgan Kaufmann.
2. Govind P. Agrawal (2010). *Fiber-Optic Communication Systems, 4th Edition*. Wiley-Interscience.

Exams: Two assigned coding projects and one final project that is individually designed and agreed upon by the student and instructor. No term papers will be required.

Grading Criteria:

- 2 assigned projects (take home, open book, open notes, each counting for 20% of the total grade)
- final project (take home, open book, open notes, counting for 30% of the grade)
- quiz, homework, and lab assignments (30% of the total grade)

The grade will be determined according to the percentage earned such that 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, below 60% = E.

Academic Integrity

According to the **Arizona Code of Academic Integrity**, "Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own." Unless otherwise noted by the instructor, work for all assignments in this course must be conducted independently by each student. Co-authored work of any kind is unacceptable. Misappropriation of exams before or after they are given will be considered academics misconduct.

Misconduct of any kind will be prosecuted and may result in any or all of the following:

- Reduction of grade
- Failing grade
- Referral to the Dean of Students for consideration of additional penalty, i.e., notation on a student's transcript re: academic integrity violation, etc.

Students with Learning Disabilities

If a student is registered with the **Disability Resource Center**, he/she must submit appropriate documentation to the instructor if he/she is requesting reasonable accommodations.