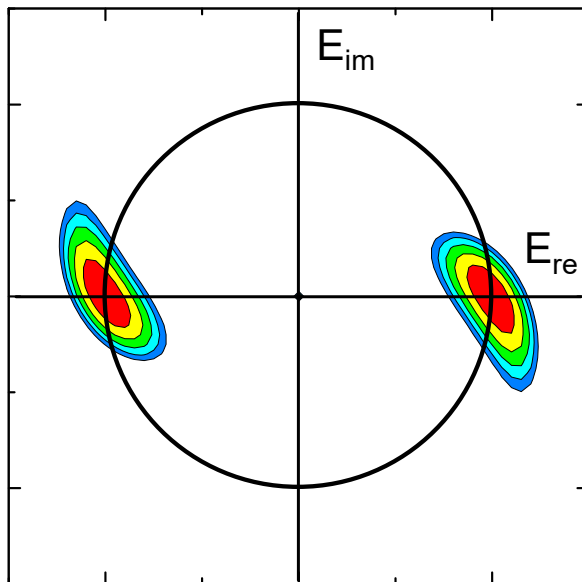


OSE 6143

Fiber-Optic Communication



Dr. Guifang Li
Room 53-278
(407) 823-6811
li@creol.ucf.edu

A system-oriented course that emphasizes end-to-end performance

Flipped Classroom

https://en.wikipedia.org/wiki/Flipped_classroom

1. You view lecture videos outside the class.
2. You will be asked to view lecture videos for both OSE 6143 and OSE 6474.
3. You must submit questions for discussions during class time for every lecture (2 times a week). You will be graded on the questions you submit.
4. Class times are reserved for answering your questions, and go through homework problems, etc.

This is a first-time teaching experiment for me as well!!

Topics

- **Part I: Introduction: Where optical communication fits in networks**
- **Part II-1: Loss-Limited Optical Transmission**
 - Sensitivity Limits for Direct Detection
 - Optical Amplifiers
 - Sensitivity Limits for Preamplified Direct Detection
- **Part II-2: Dispersion-Limited Optical Transmission**
 - Dispersion Penalties
 - Dispersion Compensation
- **Part II-3: Advanced Modulation Formats**
 - Differential Detection
 - Coherent Detection
- **Part II-4: Long-Haul Optical Transmission**
 - Linear Noise Limit
 - Nonlinearity Limit
- **Part III: Multi-Channel Transmission (WDM)**
 - Components for WDM
 - Nonlinearities in WDM Transmission
- **Part IV: Advanced Topics (2 topics)**
 - Wavelength λ -Conversion
 - Optical Regeneration
 - Digital Coherent Transmission
 - Polarization Mode Dispersion
 - Analog Links

Pre-requisites: Fundamentals of Photonics or equivalent; Nonlinear Optics a plus

Preliminary Schedule

1. Introduction & Optical Transmission: Brief History
2. Link Budgets
3. Quantum Sensitivity Limit, Noise Sources & Gaussian BER Estimation
4. Thermal Noise-Limited Sensitivity & EDFA Basics
5. Noise Figure of EDFAs
6. Sensitivity of Pre-Amplified Receivers
7. EDFA Chains, High-Speed Operation (Dynamics), Pumping Choice
8. Pulse Propagation in Fiber and Dispersion Tolerance
9. Dispersion Compensation: Pre-chirp & Duobinary Transmission (other DC approaches)
10. Review and Homework Solutions
11. Advanced Modulation Formats (BPSK and DPSK)
12. Noise Statistics in ASE-Dominated Direct-Detection Receivers (OOK+xDPSK)
13. Midterm 1
14. Sensitivity of IMDD, DPSK and DQPSK
15. Introduction to Long-Haul Transmission and Fiber Third-Order
16. Goldilocks Theory (Interplay between dispersion and nonlinearity)
17. Review and Homework
18. Multi-Channel Transmission
19. Splitters and Combiners, PON Reach calculation
20. Midterm 2
21. Multiplexers and Demultiplexers (Interleavers)
22. AWG
23. Advanced Topics
24. Advanced Topics
25. Advanced Topics
26. Advanced Topics
27. Advanced Topics
28. Advanced Topics

Spring Holidays/Travel Days

Holidays

- **MLK Day Monday, January 21**
- **Spring Break: March 11 – 16**

Travel Days:

- **Feb 4, 6 (Photonics West): Make-up classes TBD**
- **March 4,6 (OFC): Make-up classes TBD**

Reading Materials

- **Elements of Photonics by Keigo Iizuka (Wiley 2002)**
- **Fiber-Optic Communication Systems, 3rd Edition by Govind P. Agrawal (Wiley 2002)**

Grading

- **Homework: 20%**
- **Midterms: 30%**
- **Final Exam: 25%**
- **Class Participation (including submission of questions) 25%**

Office Hours: TBD