UNIVERSITY OF CENTRAL FLORIDA

OSE 6143 - Fiber Optic Communication Systems

Section: 0001

Optics and Photonics

Course Information

Term: Spring 2026
Class Meeting Days: MW
Class Meeting Time: 01:30PM - 02:45PM
Class Meeting Location: CROL A214
Modality: P
Credit Hours: 3.00

Instructor Information

Name: Guifang Li
Office Location: CREOL A239
Email: li@ucf.edu

Course Description

OSE 6143 OPT-OPT 3(3,0)Fiber Optic Communication Systems: PR: GS, and OSE 6111 and OSE 6474, or C.I. Use of fiber optics as a communication channel. Principles of fiber optics. Mode theory, transmitters, modulators, sensors detectors and demodulators. Spring.

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

Student Learning Outcomes

- **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**

Required Course Materials and Resources

Fiber-Optic Communication Systems

Course Assessment and Grading Procedure

•Homework: 40%

•Midterms: 30%

•Final Exam: 15%

•Class Participation (including submission of questions) 15%

Grading Scale

Grading Scale

Letter Grade	Percentage
A	94-100%
A-	90-93%
B+	87-89%
B	84-86%
B-	80-83%
C+	77-79%
C	74-76%
C-	70-73%
D+	67-69%
D	64-66%
D-	61-63%
F	0-60%

Policies for Course Grade

Makeup Work Policy: permission by instructor required

Missed/Late Assignments: No allowed unless permission by instructor was given

Attendance: required

Artificial Intelligence (AI) Use Policy

- **Use of Generative AI (GenAI) is freely permitted but must be disclosed**. Students are allowed to use Generative Artificial Intelligence (GenAI) tools on assignments if the usage is properly disclosed and credited. For example, text generated from Copilot should include a citation such as: “Copilot. Accessed 2023-12-03. Prompt: ‘Summarize the Geneva Convention in 50 words.’ Generated using Copilot.” Any attempt to represent GenAI output inappropriately as your own work will be treated as plagiarism. Ultimately, students are responsible for the accuracy and veracity of submitted work whether AI-generated or not.

Disability Access & Accommodations

The University of Central Florida is committed to providing equal access to all students with disabilities (ADHD, learning disabilities, Autism, chronic medical conditions, physical disabilities, etc.). To receive consideration for reasonable disability-related course accommodations, disabled students must contact Student Accessibility Services (SAS) and complete the steps required for SAS to review accommodation requests. More information can be found on the UCF Student

Accessibility Services website under the Start Here tab or by contacting SAS directly (Ferrell Commons 185; sas@ucf.edu; Phone - 407-823-2371).

Approved accommodations are shared with course instructors via the SAS Course Accessibility Letter. Implementing certain accommodations may require discussion about specific considerations of the course design, course learning objectives, and the individual academic and course challenges experienced by the student. While students with disabilities or chronic health needs are also encouraged to discuss any course concerns with professors in addition to contacting SAS, professors are not required to facilitate disability-related adjustments to the course unless the professor has received a Course Accessibility Letter from SAS that outlines approved accommodations.

Academic Integrity

Students should familiarize themselves with UCF's Code of Conduct at Student Conduct and Integrity Office. According to Section 1, "Academic Misconduct," students are prohibited from engaging in:

1. Academic misconduct is defined as any submitted work or behavior that obstructs the instructor of record's ability to accurately assess the student's understanding or completion of course materials or degree requirements (e.g., assignment, quiz, and/or exam). Examples of academic misconduct include but are not limited to: plagiarism, unauthorized assistance to complete an academic exercise; unauthorized communication with others during an examination, course assessment, or project; falsifying or misrepresenting academic work; providing misleading information to create a personal advantage to complete course/degree requirements; or multiple submission(s) of academic work without permission of the instructor of record.
2. Any student who knowingly helps another violate academic behavior standards is also in violation of the standards.
3. Commercial Use of Academic Material. Selling of course material to another person and/or uploading course material to a third-party vendor without authorization or without the express permission of the University and the instructor of record. Course materials include but are not limited to class notes,

the instructor of record's slide deck, tests, quizzes, labs, instruction sheets, homework, study guides, and handouts.

4. Soliciting assistance with academic coursework and/or degree requirements. The solicitation of assistance with an assignment, lab, quiz, test, paper, etc., without authorization of the instructor of record or designee is prohibited. This includes but is not limited to asking for answers to a quiz, trading answers, or offering to pay another to complete an assignment. It is considered Academic Misconduct to solicit assistance with academic coursework and/or degree requirements, even if the solicitation did not yield actual assistance (for example, if there was no response to the solicitation).

Responses to Academic Dishonesty, Plagiarism, or Cheating

Students should also familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule*. UCF faculty members have a responsibility for students' education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct and Academic Integrity, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designated on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc.

Let's avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

Title IX

Title IX prohibits sex discrimination, including sexual misconduct, sexual violence, sexual harassment, and retaliation. If you or someone you know has been harassed or assaulted, you can find resources available to support the victim, including confidential resources and information concerning reporting options at Let's Be Clear and UCF Cares.

For more information on access and community engagement, Title IX, accessibility, or UCF's complaint processes contact:

- Title IX – ONAC – Office of Nondiscrimination & Accommodations Compliance & askanadvocate@ucf.edu
- Disability Accommodation – Student Accessibility Services – Student Accessibility Services & sas@ucf.edu
- Access and Community Engagement (including the Ginsberg Center for Inclusion and Community Engagement, Military and Veteran Student Success, and HSI Initiatives)
- UCF Compliance and Ethics Office – Compliance, Ethics, and Risk Office & complianceandethics@ucf.edu
- The Ombuds Office is a safe place to discuss concerns.

Reporting an Incident or Issue

If you believe you have experienced discrimination by any faculty or staff member, contact the Office of Nondiscrimination & Accommodations Compliance via the ONAC website or at 407-823-1336. You can also choose to report using the UCF Integrity Line either anonymously or as yourself at 1-855-877-6049 or by using the online form. UCF cares about you and takes every report seriously. For more information see the Reporting an Incident or Issue Webpage.

Deployed Active-Duty Military Students

Students who are deployed active-duty military and/or National Guard personnel and require accommodation should contact their instructors as soon as possible after the semester begins and/or after they receive notification of deployment to make arrangements.

Campus Safety

At UCF's Public Safety and Police, safety is the top priority. Emergencies on campus are rare, but if one should arise, it's important to be familiar with some basic safety and security concepts.

- In an emergency, always dial 911.
- Every UCF Classroom has an Emergency Procedure Guide posted on a wall near the door, which will show you how to respond to a variety of situations. This guide can also be found online here.
- In the event of an active threat, remember **AVOID, DENY, DEFEND**. Choose the best course of action and act immediately. Watch the video here to learn more.
    - **AVOID**. Pay attention to your surroundings and have an exit plan. Get as much distance and as many barriers between you and the threat as quickly as possible.
    - **DENY**. When avoiding is difficult or impossible, deny the threat access to you and your space. Lockdown by creating barriers, turning the lights off and remaining quiet and out of sight. Make sure your phone is silenced, but do not turn it off.
    - **DEFEND**. When you are unable to put distance between yourself and the threat, be prepared to protect yourself. Commit to your actions, be aggressive and do not fight fairly. Do whatever it takes to survive.
- For emergencies on campus, UCF will utilize the UCF Alert system. All UCF students, faculty, and staff are automatically enrolled to receive these email and text alerts, however, it's a good idea to frequently ensure your contact information is up to date.

Financial Aid Accountability

All instructors are required to document students' academic activity at the beginning of each course. In order to document that you began this course, please complete this activity by the end of the first week of classes or as soon as possible after adding the course. Failure to do so may result in a delay in the disbursement of your financial aid.

Class Schedule

Course Schedule

Week	Topic

Week	Topic
1	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**
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Week	Topic
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