

EE 421 – Fiber Optic Communication Systems

Designation: EE elective course for electrical engineering majors.

University Bulletin Description: EE 421: (3) Light propagation in optical fibers, fiber optic transmitters, fiber optic receivers, and fiber optical communication networks.

Prerequisites: EE 210, EE 320.

Prerequisites by Topics:

1. Proficiency in the basic geometric optics, including light propagation, reflection, and refraction. (EE 320)
2. Proficiency in basic knowledge of physical optics, including interference, diffraction, and polarization.
3. Familiarity with basic working principle of semiconductor p-n junctions, forward and inverse bias, and light emitting process (EE 210).

Textbook/Required Materials: *Fiber-Optic Communication Systems*, 2nd ed., Govind P. Agrawal, John Wiley & Sons, Inc. (1997), Ajoy Ghatak and K. Thyagarajan, *Introduction to Fiber Optics*, Cambridge University Press, New York, 1998.

Topics:

1. General aspects of fiber optic communications (2 classes)
2. Principle of light propagation in optical fibers and waveguides (waveguide theory) (6 classes)
3. Fiber growth (2 classes)
4. Dispersion and losses in optical fibers (7 classes)
5. Critical optical components in fiber-optic communications
 - i. Fiber optic transmitters and receivers (6)
 - ii. Fiber optic modulations and amplifiers (5)
 - iii. Passive components (wavelength division multiplexer and demultiplexer), dispersion compensator. (5 classes)
6. Fiber optic networks (7 classes)
7. Midterm 1 and Midterm 2 reviews (2 classes)

Class/laboratory schedule: Three 50-minute lectures per week.

Computer usage:

MathCAD and Matlab are required for homework.

Contribution to Meeting the Requirements of Criterion 5. Curriculum:

This course contributes to both the engineering topics and design components.

This course provides an introductory to senior students and graduate students on fiber optic communication. It is a general education component that provides the students with in-depth technical knowledge in the area of fiber optic communication and complements the technical contents of the curriculum. This course enables students to gain theoretical and practical background in both physics and engineering aspects of fiber optic communications, including the fundamental principle of light propagation in optical fibers and waveguides, the critical components of fiber optic networks, and fiber optical network systems.

Relationship to Program Outcomes:

- O.1.1. Graduates will possess mathematics skills necessary for electrical engineering.
- O.1.2. Graduates will have a theoretical and practical background in both physics and chemistry.
- O.1.3. Graduates will have attained computer proficiency.

- O.2.2. Graduates will understand electronic devices.
- O.2.3. Graduates will understand the basic concepts of linear systems and how they interact with continuous-time signals.
- O.2.4. Graduates will understand fundamental electricity and magnetism concepts and be able to use them in applications.
- O.3.1. Graduates will have in-depth technical knowledge in one or more areas of specialization.
- O.3.2. Graduates will have practical understanding of the major electrical engineering concepts and demonstrate application of their theoretical knowledge of the concepts.
- O.4.1. Graduates will interact with industry both within and outside of a classroom setting.

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