OPTI 500B- Photonic Communications Engineering I B

Course Description:

Photonic Communications Engineering consists of two parts. Each course is further broken down into three sections: A, B and C. PCE I A covers optical fiber light guiding, wave propagation characteristics, materials properties, and fabrication. PCE I B covers optical transmitters, receivers and amplifiers. PCE I C covers communications systems, fiber optics networks, and Internet infrastructure. Sections A, B and C are each 1 credit and can be taken in any combination. When all three sections are taken together the course is designed as a survey, from the device to the systems level, of Photonic Communications Engineering. Reference material for the course is in a digital platform to allow dense hyperlinking between topics so that students from various disciplines can customize the reading material to their individual background knowledge.

Grading Policy:

Section B Exam (covering Modules 6-9) will determine the Course Grade.

Each Module will have 3 exam questions of which students select 2 questions to answer (or complete all questions and 2 highest scores are chosen by the instructor). All questions are weighted equally towards the Course 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.

See Office of the Registrar website for courses within a semester with different start and end dates.

Outline

Module 6: Device Physics

- Emission, absorption, and optical transitions
- Population Inversion
- Semiconductor device physics
- Semiconductor lasers
- VCSEL
- Waveguide lasers
- Tunable lasers

Module 7: Source Design

- Noise characteristics

- Mode profile
- Spectral characteristics
- Frequency chirp
- Injection current and external modulation
- Basic laser structures and output characteristics
- Transmitter Design

Module 8: Optical receivers

- Bandwidth
- Responsivity
- Wavelength sensitivity
- Linearity
- Photodetectors - PN, PIN, APD, MSM photodiodes
- Frequency response
- Circuit models

Review

Module 9: Photodetector Design Concerns

- Noise
- Bit error rate (BER), minimum received optical power
- Quantum detection limit
- Receiver Design

Exam