FSK3883 Fiber-Optic Communication 9.0 credits

Fiberoptisk kommunikation

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSK3883 valid from Autumn 2018

Grading scale

Education cycle

Third cycle

Specific prerequisites

Enrolled as PhD student.
It is anticipated that the students are acquainted with:

- Waveguides: Wave equation and the concept of modes.
- Solid-state electronics: p-n-junction
- Circuit theory: Impulse response, convolution, transfer function of linear systems.
- Signal theory: Auto correlation function, power spectral density

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

Knowledge of fiber-optical components and systems with applications to communications. Parameters of devices that are relevant for the system performance are derived from physical descriptions, and form the input parameters for the design of fiber-optic links.
After a completed course, the participants should be able to:

- understand, describe, analyse, and compare the most important devices: optical transmitters, optical fibers, and optical detectors
- design digital fiber-optic links.
- simulate a multilevel coherent fiber-optic communication system using computer software

Course contents

Dielectric waveguides: Attenuation, wavelength dispersion, modes, fields.
Light sources and optical amplifiers: Semiconductor laser, light-emitting diode, rate equations, output power, modulation response, chirp, noise, optical amplifiers.
Detectors: PIN-diode, avalanche diode, responsivity, bandwidth, noise.
Transmission systems: Optical links, direct detection systems, soliton systems, coherent systems, multilevel signaling, dispersion limitations, attenuation limitations, additive noise, signal dependent noise, bit error rate, optical networks, simulation and design

Disposition

The course is given in a traditional way, i.e. with lectures (28h) followed by corresponding exercises (16h). There are also two laboratory works (2*4h) and one project assignment. The course follows the undergraduate course SK2811 but includes also a project assignment where the student will design and simulate a fiber-optic system. If the total number of students of both courses is less than 10, the exercise sessions will be replaced with corresponding self studies. The language is English.

Course literature

Fiber-Optic Communication Systems by Govind Agrawal, 4th edition, Wiley.

Equipment

Calculator and access to a computer for the project assignment

Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

TEN1: written exam, 6 hp, grading: P/F
Calculator, mathematic handbook, the course book and the lecture notes (but NOT exercise notes) are allowed and recommended aids
LAB1: laborations, 1.5 hp, grading: P/F
PRO1: projekt task, 1.5 hp, grading: P/F

Other requirements for final grade

To pass the course the student should pass the written exam, the lab exercises and the project assignment.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.