

Name of programme: International Semester Information Technology / System Engineering

Title of Module	Optical communications
Responsible person	Prof. Dr. Karl-Friedrich Klein (campus FB), Prof. Dr. Ubbo Ricklefs (campus GI)
Teacher	Prof. Dr. Karl-Friedrich Klein (campus FB), Prof. Dr. Ubbo Ricklefs (campus GI)
Module Code	E312
Type of Module	O obligatory module (Pflichtmodul), x elective module (Wahlpflichtmodul)
Level (BA / MA)	Bachelor
Language	English (German on demand)
Related Degree Programme/s	Information and Communication Engineering
Department	EI / IEM
Location	x Gießen, x Friedberg
Availability/frequency of module	only in summer semester 2017
Hours per Week / Workload	4 HpW, contact hours per week 150 H in total
Number of CrP/ECTS	5 ECTS/CrP
Forms of instruction	x lecture O seminar O supervised training O Laboratory Practical Course
Qualifications and Goals	Learning outcomes: Knowledge: basic knowledge of optics, light power and transport, function of optical waveguide structures, basics in optoelectronic transmission for telecommunication signals, components of the transmission links Skills: Application of simple systems using optoelectronic and fiber-optic components Competencies: design and evaluation of simple transmission links.
Short Description of Contents	Maxwell equations, Fresnel formulas, polarization, planar and coaxial fibers, Laser diodes / optical amplifiers, Optoelectronic receivers and amplifiers, connectors, Bragg gratings, modulators, switches, add-and-drop, MUX, MOEMS, OXOS Transmission links, Optional: measurement techniques
Description of Contents	Content: Fundamentals of optics: Maxwell equations, Fresnel formulas, polarization, current account planar and coaxial Optical fiber: structure, transverse modes, characteristics Laser diodes / optical amplifiers: resonator, laser condition, Four-level laser, optical gain, longitudinal modes, double-hetero-, quantum well, quantum dot- LD, electric LD mode, LD - fiber coupling, VCSEL, DFB-LD , Optoelectronic receiver and amplifier: photodiodes materials, diode assembly, replacement model, stability conditions noise: types of noise, noise optimization, SNR Components: connectors, Bragg gratings, modulators, switches, add-and-drop, MUX, MOEMS, OXOS Transmission links: attenuation budget, dispersion, CWDM, DWDM, optical signal regeneration Optional chapter: measurement of fiber optic components, photonic crystals, all optics, integrated components, BER.
Prerequisites	English level B2, basics of optics, telecommunications and information technology.
Assessment	O oral (O examination of xx minutes, O presentation), x written (x examination of xx minutes, O term paper), other: exam

Literature/Textbooks	<p>Bludau W.: Halbleiter-Optoelektronik, Hanser 1995 Bludau, W.: Lichtwellenleiter in Sensorik und optischer Nachrichtentechnik, Springer, 1998 Brunner, W., Junge, K.: Lasertechnik, Hüttig Glaser, W.: Photonik für Ingenieure, Verlag Technik GmbH, 1997 Herter, E.: Optische Nachrichtentechnik, Carl Hanser, 1994 Opielka D.: Optische Nachrichtentechnik, Vieweg, 1995 Reider, G. A.: Photonik, Springer, 1997 Wrobel, Ch.: Optische Übertragungstechnik in Industr. Praxis, Hüttig, technical magazines: Laser Focus World; Fibre Systems Europe; Photonics Spectra; WDM Solutions; lightwave; Opto & Laser Europe</p>
Other	