

**„Studentenseminar Elektronik und Photonik“ #5273**

**Please note:**

Elektronik und Photonik #5273 is given by Prof. Dr. Hillmer, Prof. Dr. Witzigmann and Prof. Dr. Bangert. Each professor has individual topics but the same examination number which is 119003. Please make sure that you register for the professor you want to do your seminar with.

**The following list with the proposed topics is only for those students who registered for the seminar with Prof. Dr. Hillmer.**

**Topics:**

- (1) Ultrafast transmitter devices for high bitrate fibre data communication: Basics and modern trends
- (2) Fibres in optical communication: types, characterization, connectors and trouble shooting
- (3) Current problems in the proceeding of electronic circuit integration
- (4) Chirped distributed feedback (DFB) semiconductor lasers: structures and operation principles
- (5) Moore's law: a trend without any limit?
- (6) Mounting of laser devices: self-aligning versus fine-placing techniques
- (7) Nonlinear optics: basics and applications
- (8) Polymers and organic materials in optoelectronics: basics and applications
- (9) Semiconductor laser generated ultra short optical pulses: basics
- (10) Structure and operation principles of the metal-semiconductor-transistor (MESFET)
- (11) Technological implementation of buried semiconductor DFB lasers
- (12) Spot size converters: a key-principle for fibre-chip coupling?
- (13) MEMs and MOEMs for medical applications
- (14) Macro-, micro- and nanospectrometers: fundamentals, fabrication, comparison
- (15) Application of ultra short optical laser pulses
- (16) Introduction to optical communication networks: active components
- (17) Introduction to optical communication networks: passive components
- (18) Foundations and fabrication of fibre Bragg gratings
- (19) Applications of fibre Bragg gratings: optical filters
- (20) Applications of fibre Bragg gratings: external cavity semiconductor lasers
- (21) Applications of fibre Bragg gratings: all-glass fibre lasers
- (22) Compar. of direct modulation, external modulation and principles of coherent transmission systems
- (23) Rare earth doped fibres: basics and applications in optoelectronic systems

- (24) Doped fibre amplifiers (all except Er<sup>3+</sup>)
- (25) Er<sup>3+</sup> doped fibre amplifiers (describe the design process!)
- (26) Design aspects of vertical cavity 1.55µm filters (relation to practicum Opto I)
- (27) Foundations of holography: 3D images, 2D gratings
- (28) Comparison of Schrödinger Equation and Helmholtz equation
- (29) Foundations of materials for gas sensing
- (30) Photonic applications of rare-earth-doped materials
- (31) CD's, DVD's and Blue Ray Discs: foundations, operation principles, applications
- (32) Laser radar: foundations, principles, applications
- (33) Gas Sensorics: Introduction into foundations, applications and perspectives
- (34) From Electronics to Photonics
- (35) Nanotechnology: fabrication ,characterization and perspectives
- (36) Chaos in Semiconductor Lasers: Transitions between Stability, Instability and Chaos
- (37) AWS – Arrayed Waveguide Grating
- (38) Directly generated laser light versus harmonically generated laser light
- (39) Yield aspects in the fabrication of optoelectronic devices
- (40) Influence of end facet phases on the properties of DFB lasers
- (41) Frequency chip in directly modulated lasers: intuitive aspects and system consequences
- (42) Foundations of dispersion compensating optical communication systems
- (43) Introduction in external modulation technologic of Semiconductor Lasers
- (44) Comparison of external modulators based on SOA, Mach Zehnder Fabry Péro and 2x2 splitter principles
- (46) Field effect transistors based on GaN, GaAs, InP and related compounds: material aspects, material comparison and applications
- (47) Bipolar transistors based on GaN, GaAs, InP and related compounds: material aspects, material comparison and applications
- (48) Introduction into the single electron transistor
- (49) Coulomb Blockade: Foundation and applications in next generations nanoelectronics
- (50) Symmetries in the triple of Josephson Effect, Quantum Hall effect and Coulomb Blockade
- (51) Spintronics: materials, foundations and future perspectives
- (52) Nanoelectronics, Spintronics Photonics: Basic of next generation
- (53) Methodologies to translate properties to be measured such as temperature, fields, pressure and others into changes of the “optical length” in Mach Zehnder Interferometers
- (80) Entangled Photons: foundations, famous experiments, applications in quantum cryptography
- (104) Laser processing: Two photon polymerization laser printing and laser ablation
- (107) Two Photon Polymerization: foundations - resolution limit and application
- (109) Embossing and Nanoimprint: Classification of different methodologies - resolution limits and applications
- (110) Foundations of Holography with visible light: 3D images, 2D gratings
- (113) Optical mulitbeam holography
- (114) Optische Speichermedien: Phaseninformation in 2D und 3D Konfigurationen