ECE 5132: Photonics

Course Description

Fiber optics, optical systems and devices, optical detection, photonic band gaps, holography, and optical data storage.

Transcript Abbreviation: Photonics
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Junior, Senior, Masters, Doctoral
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Even Years
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 3010 (312), 3010.01, or 3010.02, and 3030 (432) or 3030.01; or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.
Exclusions: Not open to students with credit for 5132.01 or 731.
Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001
Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Master principles of fiber optics, including optical modes, attenuation, and dispersion
Become competent physics of optical detection and noise
Master full link budgets from laser, through fiber, to detector
Master states of optical polarization, including the Poincare sphere and Jones calculus
Become competent using paraxial ray matrices for analyzing imaging systems

Become familiar with the physics of holography and optical data storage

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Wave propagation in isotropic media	1.0							
Polarization and Jones calculus	2.0							
Imaging, rays, and paraxial ray matrices	4.0							
Lenses, aberrations	2.0							
Modes in cylindrical waveguides	6.0							
Intermodal dispersion, waveguide, chromatic dispersion	2.0							
Noise in optical detection	5.0							
Heterodyne detection	2.0							
Photomultipliers, photoconductors, photodiodes	3.0							
Link budgets	1.0							
Holography	4.0							
Optical data storage	2.0							
Photonic Band Gaps	2.0							

Representative Assignments

Homework
Midterm examinations
Final examination

Grades

Aspect	Percent
Homework	15%
Midterms (two)	50%
Final examination	35%

Representative Textbooks and Other Course Materials

Title	Author
Fundamentals of Photonics	B. E. A. Saleh and M. C. Teich

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
*	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
*	c	An ability to design a system, component, or process to meet desired needs.
	d	An ability to function on multi-disciplinary teams.
*	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.

Course Contribution		College Outcome
	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
**	i	A recognition of the need for, and an ability to engage in life-long learning.
	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

Added exclusion to include 731. Updated rereqs and course goals to match university format.

Rewrdd course goals to reflect level of mastery; add course goal about link budgets. 4/29/14 BLA

Changed ABET h to *. RMR 4/22/16

Changed text to Sleh and Teich 11/30/2016 BLA

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