

ECE452: Electromagnetic Waves and Electro-Optics Semester: Fall 2020

CRN: 29954 **Credit:** 3 hours **Prerequisite:** ECE350
Meeting Time & Classroom: TR 12:30-13:50, ECEB 3015

Instructor: Professor Yuri Vlasov, Office: MNTL 1250
Phone: 3-1870 E-mail: yvlasov@illinois.edu
Office Hours: by appointment at MNTL 1250 (3-1870)

Grader: TBD, E-mail: @illinois.edu
Office Hours: TBD

Catalog description: Electromagnetic waves, polarizations, and applications to photonic and electrooptical devices, metallic and optical waveguides

Course Outline:	Hours (approx.)
1. Electromagnetic fields: Maxwell's equations, Boundary conditions, Time-harmonic fields and duality principle, Poynting's theorem, Plane wave solutions, Propagation in isotropic media	5
2. Reflection and refraction of uniform plane waves, boundary conditions, polarizations, oblique incidence, Brewster angle, critical angle, multilayered media, matrix optics	8
3. Wave propagation in anisotropic media: index ellipsoid, ordinary and extraordinary waves, characteristic polarizations, polaroid and quarter-wave plate, applications	5
4. Waveguide theory: metallic waveguides, optical dielectric waveguides, surface plasmonic waveguides, optical fibers, numerical aperture, signal attenuation and dispersion	9
5. Waveguide couplers, coupled-mode theory, coupled waveguides, directional couplers, optical ring resonators and add-drop filters	6
6. Electro-optics: linear electro-optical effects, wave propagation in electro-optic crystals, amplitude modulators, phase modulators, photonic or electro-optical waveguide modulator devices	7
Midterm exams	3
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	TOTAL = 43

Text:

S. L. Chuang, *Physics of Photonic Devices*, 2nd Edition, Wiley, New York, 2009.

Reference:

B. E. A. Saleh and M. C. Teich, *Fundamentals of Photonics*, 2nd ed., Wiley, New York, 2007.

Basis for grade:

Homework and participation	25%
Exam I	25%
Exam II	25%
Final Exam	25%
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Total	100%

Unless specified otherwise, homework will be assigned weekly on Thursdays. No late homework will be accepted unless there are special circumstances and subject to approval by instructor.