(Syllabus draft 2019-04-24)

ECE 504 Physical Optics

Classical optics from first principles; basic electromagnetic theory to wave and geometric guides. This course lays a foundation for further study in nonlinear and ultrafast optics, lasers, quantum optics.

Fall 2019

Lectures: 10:00-10:50 AM MWF, Scott Building 231

Instructor: Jesse Wilson

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Phone: 970-491-3706

Office Hours: TBD

Your feedback and input is always welcome! You can help shape this class for future students.

PREREQUISITES: ECE341, ECE342 or graduate standing

REQUIRED MATERIALS:

In lieu of purchasing a textbook, this course has a software requirement:

- Mathematica Student Desktop software (version 11 or higher). 1-semester license available for $50. https://www.wolfram.com/mathematica/pricing/students-individuals.php.
- *Physics of Light and Optics* by Peatross & Ware. Free download from http://optics.byu.edu/textbook.aspx

Canvas: canvas.colostate.edu will have the syllabus, links, homework, course grades and other postings. It is your responsibility to check the calendar under the Index tab each week for new postings.

Learning Outcomes: Upon successful completion of this course, students will be able to:

- Derive from Maxwell's equation
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COURSE TOPICS: The planned topics for this course are:

1) Intro, review of E&M, vector calc, and Fourier theory
2) Plane wave propagation, complex index of refraction, Lorentz model
3) Reflection/transmission through single and multiple interfaces, dielectric coatings (e.g. anti-reflection), evanescent coupling
4) Midterm 1

5) Propagation in anisotropic media
6) Polarization effects and manipulation
7) Optical pulses and dispersion, Kramers-Kronig relations between absorption and refractive index
8) Coherence and interference
9) Midterm 2
10) Ray optics, Eikonal equation, Fermat's principle, ABCD matrices
11) Diffraction theory, Helmholtz equation, Fresnel and Fraunhofer approximations, numerical methods
12) Applications of diffraction in imaging & spectroscopy
13) Interferograms and holography
14) Scattering (Rayleigh, Mie, etc.)
15) Final exam

GRADING:

Quizzes (online and in-class): 20%

Homework assignments: 40%

Exams: 30%

Project/presentation: 10%

The final exam date and location is TBD. Check with your instructor and Canvas for updates.

Final grades will be determined by the following scale:

A+	100%	to 96.67%
A	< 96.67%	to 93.33%
A-	< 93.33%	to 90%
B+	< 90%	to 86.67%
B	< 86.67%	to 83.33%
B-	< 83.33%	to 80%
C+	< 80%	to 76.67%
C	< 76.67%	to 70%
D	< 70%	to 60%
F	< 60%	to 0%

HOMEWORK:

Weekly homework will be assigned Monday and due at the end of the day Friday. Each problem should be explained conceptually for full credit.

Links to the homework can be found on Canvas. I request that you record the time spent on each question on your paper. **All late assignments will receive a zero.**

Unless otherwise indicated, all homeworks for this class are to be submitted as Mathematica notebooks.

All submitted homework and code must be your own individual work. Since a large portion of the work will be writing Mathematica code, students are expected to adhere to the Academic Integrity Policies found on the Computer Science Department website: http://www.cs.colostate.edu/cstop/csacademics/student_info.php

ACADEMIC INTEGRITY: Students are expected to adhere to the Academic Integrity Policy of Colorado State University, outlined in the CSU General Catalog. Students are also expected to follow the Student Conduct Code which can be found at www.conflictresolution.colostate.edu. Academic dishonesty is not accepted in this course, and any form of cheating (including plagiarism) will be reported. Penalties may include a lowered course grade, loss of course credit, and expulsion from the university.