Logout Syllabus **Jesse Wilson** browser to end your session. (http://www.acns.colostate.edu/single-sign-on-using-shibboleth/#1471272725675-5603b487-ebab)

Important information for Students: All students should fill out a student-specific symptom checker each day before coming to class (**https://covidrecovery.colostate.edu/daily-symptom-checker/ (https://covidrecovery.colostate.edu/daily-symptom-checker/)**). In addition, please utilize the symptom checker to report symptoms, if you have a positive test, or exposed to a known COVID contact. If you know or believe your have been exposed or are symptomatic, it is important for the health of yourself and others that you report it through this checker. You will not be in trouble or penalized in any way for reporting. If you report symptoms or a positive test, you will receive immediate instructions on what to do and CSU's Public Health Office will be notified. Once notified, that office will contact you and most likely conduct contact tracing, initiate any necessary public health requirements and/or recommendations and notify you if you need to take any steps.

For the latest information about the University's response, please visit the CSU COVID-19 site (**https://covidrecovery.colostate.edu** **(https://covidrecovery.colostate.edu/)**

Please familiarize yourself with the required public health precautions before arriving on campus: **https://covidrecovery.colostate.edu/public-health-precautions-during-the-semester/ (https://covidrecovery.colostate.edu/public-health-precautions-during-the-semester/)** .

ECE 604: Nonlinear Optics Fall 2020 Syllabus

General Info

Instructor: Jesse W. Wilson
Office[MS Teams chat: jessew]
Office Hours: TBD; please fill out doodle poll
E-mail: jesse.wilson@colostate.edu
Phone: [voice over MS Teams]
Lecture time: MWF, 1:00--1:50 PM Mountain Time;
Location: Engineering B4

- Lectures in person and live streaming via MS Teams until Fall break.,
- Lectures live online via MS Teams (after Fall break).
- Recordings will be made available on Echo360, typically < 4 hours after live lecture.

Prerequisite Background: Electromagnetics, optics, partial differential equations.

Course Description: Nonlinear optical science has revolutionized laser sources of radiation. With nonlinear optics, a bright, coherent radiation source at a particular frequency can be transferred to a new frequency through nonlinear interactions in matter. This course will introduce the principles of nonlinear optics, symmetry properties and various order nonlinear phenomenon. Upon completion of the

course, students will be able to design an experimental apparatus that will produce efficient frequency conversion.

Course Materials

Required Text: *Introduction to Nonlinear Optics*, by Geoffrey New, Cambridge University Press 2011, ISBN 78-0521877015.

Other Helpful References:

- *Introduction to Modern* Optics. Grant R. Fowles, Dover Publications. 1989
- *Physics of Light and* Optics. Peatross & Ware. Brigham Young University. Available online at **http://optics.byu.edu/textbook.aspx**   **(http://optics.byu.edu/textbook.aspx)** .
- *Nonlinear Optics*, Third Edition by Robert W. Boyd, Academic Press 2008, ISBN 978-0-12-369470-6.
- *The Principles of Nonlinear Optics* (Wiley Classics Library) by Y. R. Shen, ISBN

Required Software

- **SNLO from AS-Photonics**   **(http://www.as-photonics.com/snlo)** (free).
- **Wolfram Player**   **(https://www.wolfram.com/player/)** (free)

Recommended Software

- **Mathematica**   **(https://www.wolfram.com/mathematica/pricing/students/)** (student licenses start at $54/semester)
- MATLAB (Installed on all ETS computers; available for your home computer through **CSU's license (https://www.mathworks.com/academia/tah-portal/colorado-state-university-40638290.html)**)

Grading and Homework

Grading *[not finalized]:*

- Quizzes: 10%
- Homework and Numerical Simulations, 25%
- Exams, 40%;
- Final Paper and Presentation, 25%

Homework Policy: Due by end of due date, by upload to Canvas. A correct homework solution is a narrative that describes the physical situation, the equations and variables used and their physical importance, and finally draws a conclusion in a way that builds intuition about the topic under study. **A mere list of equations will not be graded.** Although late or improperly done homework will not be accepted, one ``redo'' will be allowed during the semester. Each homework must be submitted as a single PDF file via canvas.

Date	Details	
Fri Aug 26, 2016	▤ **Quiz P3** (https://colostate.instructure.com/courses/111095/assignments/1296473)	due by 11:59pm
Mon Aug 29, 2016	▤ **Quiz 01** (https://colostate.instructure.com/courses/111095/assignments/1296461)	due by 11:59pm
Wed Aug 31, 2016	▤ **Quiz 02** (https://colostate.instructure.com/courses/111095/assignments/1296462)	due by 11:59pm
Fri Sep 2, 2016	▤ **HW 01** (https://colostate.instructure.com/courses/111095/assignments/1296436)	due by 11:59pm
Fri Sep 9, 2016	▤ **Quiz 03** (https://colostate.instructure.com/courses/111095/assignments/1296463)	due by 11:59pm
Mon Sep 12, 2016	▤ **Quiz 04** (https://colostate.instructure.com/courses/111095/assignments/1296464)	due by 11:59pm
Fri Sep 16, 2016	▤ **HW02: index perturbations, Kerr lensing, and noncollinear phase matching** (https://colostate.instructure.com/courses/111095/assignments/1296438)	due by 11:59pm
Wed Sep 28, 2016	▤ **Quiz 05** (https://colostate.instructure.com/courses/111095/assignments/1296465)	due by 9:22am
	▤ **Quiz 06** (https://colostate.instructure.com/courses/111095/assignments/1296466)	due by 11:59pm
Fri Sep 30, 2016	▤ **HW03: Wave propagation, phase matching** (https://colostate.instructure.com/courses/111095/assignments/1296441)	due by 11:59pm
Fri Oct 14, 2016	▤ **HW04: ode45, coupled SHG equations, QPM** (https://colostate.instructure.com/courses/111095/assignments/1296442)	due by 11:59pm
Fri Nov 11, 2016	▤ **Quiz 08** (https://colostate.instructure.com/courses/111095/assignments/1296469)	due by 11:59pm
Mon Nov 14, 2016	▤ **Quiz 07** (https://colostate.instructure.com/courses/111095/assignments/1296467)	due by 10:14am

Topics and Schedule:

ECE604 FA2020

Today	September 2020 ▾				Print Week **Month** Agenda ▾

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	Sep 1	2	3	4	5
◀ Introduction (New CH 1)						▶
6	7	8	9	10	11	12
◀ Introduction (New CH 1)	NO CLASS		Review		Exam 1	
13	14	15	16	17	18	19
	Quantum (Mukamel for Dummies?)					▶
20	21	22	23	24	25	26
◀ Quantum (Mukamel for Dummies?)			Review		Exam 2	
27	28	29	30	Oct 1	2	3
	Frequency Mixing (New CH 2)					▶

Events shown in time zone: Mountain Time - Denver

Calendar

Course Summary:

Date	Details	
Mon Aug 22, 2016	📝 **Quiz P1** **(https://colostate.instructure.com/courses/111095/assignments/1296471)**	due by 11:59pm
Wed Aug 24, 2016	📝 **Quiz P2** **(https://colostate.instructure.com/courses/111095/assignments/1296472)**	due by 11:59pm

Date	Details	
Fri Nov 18, 2016	📝 **HW05: Birefringent Phase Matching** **(https://colostate.instructure.com/courses/111095/assignments/1296444)**	due by 11:59pm
Mon Nov 28, 2016	📝 **Quiz 09: Index ellpisoids and normal surfaces** **(https://colostate.instructure.com/courses/111095/assignments/1296470)**	due by 11:59pm
Fri Dec 2, 2016	📝 **HW06: Polarization-resolved nonlinear phenomena** **(https://colostate.instructure.com/courses/111095/assignments/1296446)**	due by 11:59pm
Fri Dec 9, 2016	📝 **HW07: SHG Azimuth Angle** **(https://colostate.instructure.com/courses/111095/assignments/1296449)**	due by 11:59pm
Mon Sep 3, 2018	📝 **HW03: Intensity-dependent refractive index** **(https://colostate.instructure.com/courses/111095/assignments/1296440)**	due by 11:59pm
Mon Sep 10, 2018	📝 **HW04: SH phase slip** **(https://colostate.instructure.com/courses/111095/assignments/1296443)**	due by 11:59pm
Fri Sep 21, 2018	📝 **HW05: SHG conservation of energy** **(https://colostate.instructure.com/courses/111095/assignments/1296445)**	due by 11:59pm
Mon Sep 24, 2018	📝 **HW06: SHG intensity calculation** **(https://colostate.instructure.com/courses/111095/assignments/1296447)**	due by 11:59pm
Mon Oct 1, 2018	📝 **Project Proposal** **(https://colostate.instructure.com/courses/111095/assignments/1296460)**	due by 11:59pm
	📝 **HW07: QPM** **(https://colostate.instructure.com/courses/111095/assignments/1296448)**	due by 11:59pm
Mon Oct 8, 2018	📝 **HW08: Parametric Gain** **(https://colostate.instructure.com/courses/111095/assignments/1296451)**	due by 11:59pm
Mon Oct 15, 2018	📝 **Midterm 1** **(https://colostate.instructure.com/courses/111095/assignments/1296458)**	due by 11:59pm

Date	Details	
Mon Oct 22, 2018	📝 **HW09: deff under type II phase matching** [(https://colostate.instructure.com/courses/111095/assignments/1296452)](https://colostate.instructure.com/courses/111095/assignments/1296452)	due by 11:59pm
Mon Oct 29, 2018	📝 **HW10: Poynting Walkoff** [(https://colostate.instructure.com/courses/111095/assignments/1296454)](https://colostate.instructure.com/courses/111095/assignments/1296454)	due by 11:59pm
Mon Nov 5, 2018	📝 **HW11: Circular-polarized THG** [(https://colostate.instructure.com/courses/111095/assignments/1296455)](https://colostate.instructure.com/courses/111095/assignments/1296455)	due by 11:59pm
Mon Nov 12, 2018	📝 **HW11: Gaussian beams, revisited** [(https://colostate.instructure.com/courses/111095/assignments/1296456)](https://colostate.instructure.com/courses/111095/assignments/1296456)	due by 11:59pm
Fri Nov 16, 2018	📝 **Midterm 1 Extra Credit** [(https://colostate.instructure.com/courses/111095/assignments/1296459)](https://colostate.instructure.com/courses/111095/assignments/1296459)	due by 11:59pm
Mon Nov 26, 2018	📝 **HW12: Raman photon flux conservation** [(https://colostate.instructure.com/courses/111095/assignments/1296457)](https://colostate.instructure.com/courses/111095/assignments/1296457)	due by 11:59pm
Tue Dec 11, 2018	📝 **Final Project Presentation** [(https://colostate.instructure.com/courses/111095/assignments/1296435)](https://colostate.instructure.com/courses/111095/assignments/1296435)	due by 11:59pm
Fri Aug 28, 2020	📝 **HW01: Introductory Reading** [(https://colostate.instructure.com/courses/111095/assignments/1296437)](https://colostate.instructure.com/courses/111095/assignments/1296437)	due by 11:59pm
Fri Sep 4, 2020	📝 **HW02: SFG Polarization E^2 Expansion** [(https://colostate.instructure.com/courses/111095/assignments/1296439)](https://colostate.instructure.com/courses/111095/assignments/1296439)	due by 11:59pm
Fri Sep 11, 2020	📝 **HW03: New 1.5 phase matching?** [(https://colostate.instructure.com/courses/111095/assignments/1339747)](https://colostate.instructure.com/courses/111095/assignments/1339747)	due by 11:59pm
	📝 **Final Grade, Curved** [(https://colostate.instructure.com/courses/111095/assignments/1296434)](https://colostate.instructure.com/courses/111095/assignments/1296434)	