This course will cover the operation and characteristics of the laser. The following topics will be covered:

- Introduction, Basic Operation and History
- Stability of Optical Cavities
- Gaussian Beams
- Resonant Cavities
- Atomic Radiation
- Laser Oscillation
- Types and Operation of Lasers
- Properties of Laser Radiation
- Intro to Nonlinear Optics
- Nanolaser
- Intro to Metamaterials and Nanophotonics

Knowledge of Quantum Mechanics is not a prerequisite for this course.

Text: Joseph T. Verdeyen, Laser Electronics, 3rd edition
(Prentice-Hall, Inc., 1995)

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TA: Rohith Chandrasekar; email: chandrar@purdue.edu; office: BRK1226; office hours: Thu 4:30 – 5:30 pm (please, ask TA your questions on homework).

Grading:

Homework 25%
Report 20%
Mid Semester Test (Feb 17) 25%
Homework is essential for this course. Working on homework solutions together is encouraged, if this helps you learn the material. I strongly suggest working individually at first, then meeting to compare results and help each other. Your solution should not appear to be a copy of your studymate's solution. Copying solutions from classmates or other sources is, of course, not acceptable, and no credit will be assigned for copied work. I will make homework solutions available for your reference. Experience indicates that completion of the homework on a timely basis is essential to learning the material covered in this course. Assignments can be long and time-consuming, but there is no alternative to doing them. Do not wait to the last minute before starting.

**Homework schedule**

- #1 – 2.3, 2.6, 2.7, 2.9, 2.11 (due 1/27)
- #2 – 3.2, 3.4, 3.14, 3.15, 3.18 (due 2/3)
- #3 – 5.1, 5.3, 6.5-6.10, 6.16, 6.19 (due 2/10)
- #4 – 7.6, 7.10, 7.11, 7.13, 7.14 (due 2/26)
- #5 – 8.1, 8.2, 8.4, 8.17, 8.27 (due 3/5)
- #6 – 9.1, 9.5, 9.9, 9.12, 9.20 (due 3/26)

One literature report will be required. For this you will read one journal article having to do with lasers, and write a short critical review (2-4 pages, typewritten, 1.5-spaced). The article should be technical, from journals such as JOSA B, Optics Letters, Optics Communications, IEEE J. of Quantum Electronics, Physical Review, or IEEE J. Lightwave Technology. You might choose an article from the list of “References and Suggested Readings” at the end of any chapter in Verdeyen, or by looking through recent or old issues of journals. Articles from trade magazines such as Photonics Spectra or Laser Focus World are not acceptable. Please include a photocopy of the article with your report. In your report, you should provide a brief summary and critique of the article. Discuss whether you feel the article is valid, significant, and readable. Try to relate what you have read to topics we have discussed in class or read in the text. If you have questions about the article (I expect you should!) you can include them in your report as well. (I do not expect that you understand the article completely!!) Your reports will be due on 4/28. Good luck!

*All the fifty years of conscious brooding have brought me no closer to the answer to the question, ‘What are the light quanta?’ Of course today every rascal thinks he knows the answer, but he deluding himself.*

Albert Einstein (1951)