Overview
This is a first course on electromagnetic waves, optics, and photonics, intended for sophomores who have already completed ENGN0510. Topics to be covered include basic wave phenomena with an emphasis on electromagnetic waves, geometric optics, the interaction of light with matter, and interference and diffraction effects. We will also cover a selected number of more advanced topics, including, Fourier optics and nonlinear optics. As a prerequisite, the curriculum assumes a basic level of understanding of electricity and magnetism, up to and including Maxwell’s equations (i.e., ENGN 051). Familiarity with multi-variable calculus will be a little useful; familiarity with complex arithmetic will be critical.

Over 14 weeks, students will spend 3 hours per week in lecture (42 hours total). Weekly homework assignments should require 9 hours per week (126 hours total). In addition, there are two midterm exams and the end-of-semester final exam for which a total of 12 hours of preparation is assumed.

Course web page: The course web page can be found by selecting the appropriate link on the left side of my group home page: https://www.brown.edu/research/labs/mittleman/
The course site will be frequently updated with course materials and announcements, so check often. In particular, powerpoint lectures delivered in class will be converted to pdf files and posted. This means that you DO NOT have to write down everything you see in lecture, because you’ll be able to download it later. However, it would be extremely unwise to use the online course materials as a substitute for attending lecture – in the past, there has been a strong correlation between regular lecture attendance and success on the exams.

Please note that ENGN1560 is a paper-free course. All course materials will be made available only on the web page: http://www.brown.edu/research/labs/mittleman/engn-1560-spring-2019
No hard copies will be distributed in class. It is your responsibility to check the web page for assignments, handouts, announcements, etc.

Course Schedule
The tentative course schedule can be found on the course web page. This will be updated as the semester progresses, if necessary.

Course Goals
After successfully completing this course you will have learned:
1. The electromagnetic wave equation, and the nature of the solutions.
2. A basic characterization of the interaction of light with matter.
3. The properties of propagating light waves, including Gaussian beams.
4. How light waves diffract and interfere, including elements of coherence theory.
5. How a laser works.
6. An introduction to nonlinear optics

**Textbook**
The required text is *Optics*, 5th edition, by Eugene Hecht. If you decide to buy a used copy, be sure to get the 5th edition and not an earlier one.

**Problem Sets**
Problem sets will be posted on the web page approximately weekly, and will usually be due IN CLASS on Fridays. You are permitted to work with fellow students in solving the problems, as long as your collaboration is compatible with the Brown University Academic Code (e.g., copying someone else's work is not allowed).

**Laboratory module**
This course will include one or two laboratory modules, which may involve building an operational laser, from parts. The schedule and details will be available as the time approaches.

**Office Hours: Thursdays, 1:00pm – 2:30pm (tentative)**
Office hours will be held in my office, which is B&H228. You are strongly encouraged to take advantage of office hours, especially if you are having difficulty completing the problem sets in a reasonable amount of time. Office hours are on Thursdays since the problem sets are generally due on Fridays. Additional office hours can be scheduled by appointment; usually the best way to do this is to send me an email.

*Please take advantage of office hours* – I am happy to work with you if you are having difficulties. If there is something you don’t understand, ask for help!

**Exams**
There will be two midterms and a comprehensive final exam. In the past, the two midterms have been scheduled as one-on-one oral exams; this may be the case again. More details on the nature of the exams and the scheduling will be forthcoming – check the web site. The dates are already posted on the schedule, which is on the course web site. If you anticipate that you might miss an exam, let me know AS SOON AS POSSIBLE so that an alternative can be arranged for you. If you have a foreseeable conflict, you MUST let me know in advance of the exam date. Unforeseeable conflicts will be dealt with on a case-by-case basis.

**Grades**
Your final grade will be determined according to the following weights:

- Homework:  25%
- Two midterm exams: 25% each
- Final exam: 25%

This class will NOT be graded on a curve; however, grade cutoffs may be adjusted slightly.
Grading policy

Regrade policy: If you think a regrade is required on any assignment, you should discuss this with me AS SOON AS POSSIBLE, but not more than one week after the assignment or exam was returned to you. Except in the event of obvious clerical errors, NO regrades will be considered beyond this deadline. It is YOUR responsibility to examine your graded papers carefully to check for any grading errors.

Late assignments: If you have a LEGITIMATE and FORSEEABLE excuse for handing in an assignment late, you will receive permission to do so with no penalty. These situations will be handled on a case-by-case basis. Note that a legitimate excuse such as a medical situation requires a confirming note from your physician. If you do not fall into the aforementioned category, then you can still receive 50% credit on late problem sets, as long as I receive them no later than two weeks after the original due date. Assignments turned in later than that will receive 25% credit, up to the last day of class. The idea here is that, even if you cannot hand in an assignment on time, you still get some credit if you do it before the end of the semester. This is the Better Late Than Never clause. Obviously, using the homework solutions to complete a late assignment would defeat the whole purpose of this clause, so it is a violation of the Brown University Academic Code to do so.

Diversity and inclusion

It is my intention that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength and benefit. Your suggestions for improving and facilitating these goals are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally, or for other students or student groups.

Plagiarism

Plagiarism will not be tolerated. This includes, but is not limited to, copying other students work, solutions manuals, or internet sources, or misrepresenting work as your own by not properly citing or referencing sources. More information on the Brown Academic Code can be found here: http://www.brown.edu/Administration/Dean_of_the_College/curriculum/academic_code.php