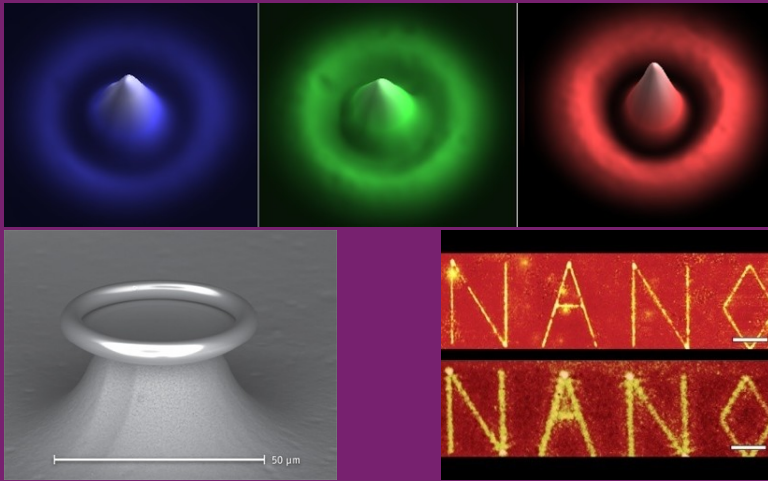# Introduction to Photonics
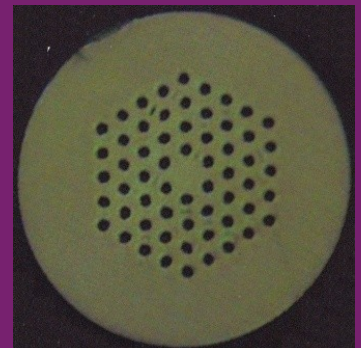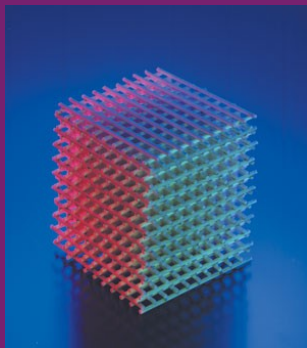
PHYC 302 ~ Fall 2017, T-Th 2:00-3:30

Dr. Arash Mafi
Physics & Astronomy
Center for High Technology Materials

Photonics is the science of generating, controlling, and detecting light in the UV, visible, and near IR spectrum. Applications of photonics include but are not limited to scanners, printers, CD/DVD/Blu-ray, telecommunications, medicine, laser surgery, welding, drilling, cutting, lithography, aviation, navigation, sensing, information processing, meteorology, and optical computing. We will explore the basics of photonics with an emphasis on the fundamentals, geometrical optics, wave optics, and lasers. Some modern topics such as photonics crystals, slow and fast light, and negative refraction will also be discussed. Students are expected to be familiar with basic Electromagnetics as well as Optics, both at the level of General Physics.
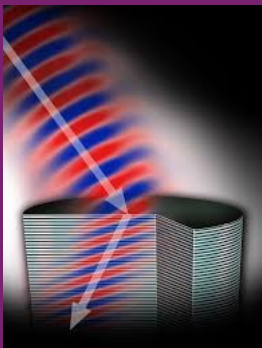
PHYC 262 is a prerequisite.

Tentative Syllabus for UNM PHYC 302, Introduction to Photonics   **Fall 2017**

THE UNIVERSITY *of*
NEW MEXICO

Department of Physics and Astronomy

Instructor:
Dr. Arash Mafi
Office: CHTM room 145 and Physics & Astronomy room 1117
Phone: 505-405-5574
Email: mafi@unm.edu
Office Hours: TBD, Likely Wednesdays, 11:00AM–12:00 PM; Other times, by appointment
Problem Session: TBD, Likely Fridays, 2:00PM–3:00 PM.

Teaching Assistant: TBD
Email: TBD@unm.edu

Prerequisites: PHYC 262: General Physics, which consists of Optics and modern physics.

Course description: Photonics or Optics is the science of generating, controlling, and detecting light over the whole spectrum from ultraviolet, the visible, to the near-, mid- and far-infrared. Applications include but are not limited to scanners, printers, CD/DVD/Blu-ray devices, telecommunications, medicine, laser surgery, endoscopy, welding, drilling, cutting, lithography, aviation, navigation, sensing, information processing, meteorology, and optical computing. In this course, we will explore the basics of optics and photonics with emphasis on the fundamentals. Students are expected to be familiar with fundamentals of Electromagnetics, as well as Optics at the level of General Physics PHYC 262.

Time and place: Tuesdays and Thursdays, 2:00PM–3:30PM , PANDA room 184

Required Textbook: Optics (5th Edition) by Eugene Hecht, Pearson, ISBN-13: 978-0133977226

Recommended book: Schaum's Outline of Optics by Eugene Hecht, McGraw-Hill Education, ISBN-13: 978-0070277304

Class participation: Class participation counts as 5% of the final grade. Anyone absent without a legitimate excuse for more than two sessions, or arriving late in class without a legitimate excuse for more than three sessions risks losing the entire grade for class participation.

There will be simple single-question quizzes in the beginning of almost every session to ensure that students have read the assigned material before attending the class. The grades count towards class participation.

Homework: Problem sets are assigned on a regular basis (weekly) throughout the semester. No late homework will be accepted. As an assignment, students are required to carefully read through the chapters in the textbook. It is strongly recommended that the students read through the chapters once before and at least once after each lecture.

Homework counts as 20% of the total grade.

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Tests and exam: The first midterm exam date will be tentatively on Thursday September 21 and will count as 25% of the final grade. I will be on the material covered up to a week prior to the test.

The second midterm exam date will be tentatively on Thursday November 2 and will count as 25% of the final grade. I will be on the material covered up to a week prior to the test. The exam will be mainly based on what will be covered after the first midterm.

The dates of the midterms can change at the discretion of the instructor.

The final exam will include all the material covered after the second midterm. It will count as 25% of the final grade. The exam will be mainly based on what will be covered after the second midterm.

Grading: No makeup tests or examination will be given without prior agreement with the instructor before the date of examinations. Class participation as defined above counts as 5%, Homework as 20%, midterm1 as 25%, midterm2 as 25%, and final as 25% of the total grade.

Student misconduct:

Do not cheat: Any form of cheating will be dealt with strongly. I encourage you to check out the UNM Student Code of Conduct.

http://pathfinder.unm.edu/code-of-conduct.html

Do not disrupt your classmate's learning in anyway. **Arriving late or leaving early disrupts the classroom and is not acceptable without a legitimate excuse.**

Be respectful to others.

Turn off electronic devices and put them away.

Course Outline This will be a fast-paced course. Students are required to contribute by reading the material before the class and I will teach the key highlights. Some of the lecture time will be spent on solving problems in class by students. Everyone is expected to contribute actively.

Lecture Topics/Chapters, and approximate time spent on each
1. *A Brief History*, 0 classes
2. *Wave Motion*, 2 classes
3. *Electromagnetic Theory, Photons, and Light*, 3 classes
4. *The Propagation of Light*, 3 classes
5. *Geometrical Optics*, 2 classes
6. *More on Geometrical Optics*, 2 classes
7. *The Superposition of Waves*, 2 classes
8. *Polarization*, 2 classes
9. *Interference*, 2 classes
10. *Diffraction*, 2 classes
11. *Fourier Optics*, 0 classes
12. *Basics of Coherence Theory*, 1 class
13. *Modern Optics: Lasers and Other Topics*, 3 classes