OPTI 100H: What is Light?
(Effective Spring 2017)
Locations and Times: TBD

Description of Course
Light is an important aspect of our daily lives, from the lights that we use to see, to the displays that give us information and entertainment, to lasers that are used on optical fibers to transfer information from one place to another. This course will delve into what light is by presenting the technology, phenomena, and systems that we use on a daily basis. It starts with our eyes used to view our smartphone or computer displays. The information for these displays is provided via networks, which in the long haul sector use fiber optics, lasers, and other optical subsystems. Along the way we will discuss the three interpretations of light: as a ray (geometrical), as a wave (physical), and as both known as the wave-particle duality (quantum).

Course Prerequisites or Co-requisites
None

Instructor and Contact Information
John Koshel (manages the course; he and other professors in Optical Sciences will be the lecturers)
403A (Meinel, Academic Programs Office, College of Optical Sciences)
- jkoshel@optics.arizona.edu; 621-6357
- Office is always open to students; meetings can be setup through any AP staff member

Course Format and Teaching Methods
The class is three units and comprised of lecture (60% workload), discussion (20% workload), and laboratory (20% workload)

Course Objectives and Expected Learning Outcomes
1. Demonstrate an understanding of how light through technology, phenomena, and systems are a part of our daily lives, which is done through discussion, laboratories, problem solving, and so forth.
2. Demonstrate an understanding of the three interpretations of light (geometrical, physical, and quantum) through discussion, solving problems, and so forth.
3. Conduct simple experiments to be able to manipulate, measure, and use light.
4. Write a term paper on a student selected topic.

Absence and Class Participation Policy
The UA’s policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored.

Rev. 6/23/2016
See: https://deanofstudents.arizona.edu/absences

**Required Texts or Readings**

Required: none; course notes will be provided
Recommended: SPIE Field Guides (see http://spie.org/publications/books/field-guides; available as free e-books online)

**Required or Special Materials**

None

**Required Extracurricular Activities (if any)**

Various on-campus “field trips” that will take place during the course. Locations include: the Mirror Lab, Optical Sciences, Solar Mirror Lab, Radiology/Bio5, and other TBD locations. Additionally, we will explore the optical phenomena that surrounds us on a daily basis, from the natural (Sun, atmospheric phenomena, etc.) and man made (lighting, displays, etc.) These will be the focus of discussions.

**Assignments and Examinations: Schedule/Due Dates**

Two course exams and one term paper

**Final Examination or Project**

Please see the Final Exam Schedule at: http://www.registrar.arizona.edu/schedules/finals.htm.

**Grading Scale and Policies**

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Midterm exam</td>
<td>15%</td>
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<tr>
<td>Presentation</td>
<td>10%</td>
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<tr>
<td>Term Paper</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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<tr>
<td>Homework (6 assignments total)</td>
<td>25%</td>
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<tr>
<td>Class Participation</td>
<td>10%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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The grade will be determined according to the cumulative percentage earned such that 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, below 60% = E.

**Requests for incomplete (I) or withdrawal (W)** must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

**Scheduled Topics/Activities**

Week 1: Introduction to light: description, properties, ...
  Field Trip: optics in nature around us (tour of campus)
  Lab: Sources and Spectrum
Week 2: Introduction to the human eye: Snell’s Law, refraction, lenses
  Field Trip: Schwiegerling lab
  Lab: the human eye
Week 3: Light is a ray
Week 4: Smartphones I: introduction to the optics in a smartphone
  Field Trip: Optical Design Labs
  Lab: intro to working with software
Week 5: Smartphones II: input devices - camera
Field Trip: Mirror Lab (Mirror Lab)
Lab: working with software – design a lens
Week 6: Smartphones III: input devices – touchscreen display
Discussion and review
Lab: display demo
Week 7: Introduction fiber optics, lasers, optical switches, detectors
Field Trip: CIAN/TOAN (Optical Sciences)
Exam: smartphones, human eye, intro to light
Week 8: light is a wave
Week 9: Networks I: guided wave – fiber optic lab
Field trip: Norwood labs (Optical Sciences)
Lab: fiber optic lab
Week 10: Networks II: optical switches
Discussion and review
Lab: polarization “switch”
Week 11: Networks III: sources – lasers and LEDs
Field Trip: VECSEL lab (Optical Sciences)
Lab: source lab
Week 12: Networks IV: detectors
Field Trip: AIM labs (Optical Sciences)
Lab: detector lab
Week 13: Light is both
Week 14: Quantum Optics: look back at lasers and detectors
Field Trip: Radiology
Lab: laser/detector redux
Week 15: Course wrap up

Classroom Behavior Policy
To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Threatening Behavior Policy
The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations
Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit http://drc.arizona.edu.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity
Students are encouraged to share intellectual views and discuss freely the principles and
applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:  http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

The University Libraries have some excellent tips for avoiding plagiarism, available at http://www.library.arizona.edu/help/tutorials/plagiarism/index.html.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor’s express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

**UA Nondiscrimination and Anti-harassment Policy**

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

**Subject to Change Statement**

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.