The Physics of Light and Color (Physics 153)

Professor: Richard Taylor, Willamette 173  
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Class: W100 Willamette Hall, Tuesday and Thursday at 12.00-1.50pm

Office hours: Wednesday 2:00-4:00 p.m.  
These are the times when I am guaranteed to be available. You can also try my office at other times or pre-arrange a meeting.

Textbooks:
There is no required textbook. However, the following books cover the topics of this course if you find background reading helpful. They are ranked according to overlap with the course.

1. "Seeing the Light" by D. Falk, D. Brill and D. Stork, Published: Wiley
2. "Light Science" by T. Rossing and C. Chiaverina, Published: Springer
3. "Light and Color" by R. Overheim and D. Wagner, Published: Wiley

“Handouts”
Education research shows that students learn more effectively when they write their own lecture notes. Lecture hand-outs will be posted on blackboard in advance of lectures. It is recommended that you print these out and bring them to the lecture so that you can add notes to these print-outs. Blackboard website: https://blackboard.uoregon.edu/

Homework
Weekly homework assignments will be posted on Blackboard on Thursdays and are due the following Thursday at noon. The completed homeworks are to be handed in at the Phys153 box in the basement of Willamette hall. At noon, solutions will be posted online and will be reviewed in class. Consequently, NO LATE HOMEWORKS are accepted. If a problem arises that prevents handing in the homework, please contact me.

Grading: homeworks (40%) + 3 exams (20% each).
Note: the physics department has a zero tolerance policy regarding cheating. If you cheat, you will not receive a grade.

Exam dates: Exam 1 (22nd April), Exam 2 (May 13th), Exam 3 (3rd June)
The three exams will be 50 minutes each and will replace the lecture on those dates. Note: there will not be a final exam in exam week.

Course Topics
What is light? – the basic wonders and properties of light
Making use of light - mirrors and lenses found in optical devices, art and nature
The camera and photography
The human eye and vision (producing and processing the image)
Color

Course Description

Light and color have a dramatic impact on our daily experiences. This course will explore the physics of light and explain how its basic properties produce a diverse range of effects apparent in technology, nature and art. The course is concept driven, highly visual and requires a minimum of mathematics (high school algebra). Undergraduates who take this course are typically drawn from a diverse range of backgrounds (e.g. psychology, art history, art, photography, architecture, journalism) and inter-disciplinary discussions are encouraged.

Students will first be introduced to the fundamental concepts of light and shown how light belongs to a broader range of radiation known as the electromagnetic spectrum. This spectrum spans through gamma rays, X-rays, ultraviolet radiation, light, infra-red radiation, microwaves and radio waves. The manner in which these various forms of radiation interact with the world will be compared and contrasted.

Drawing heavily on practical demonstrations, various optical devices will be described, leading to a detailed examination of cameras and photography. This is followed by a comparison with nature’s equivalent of the camera - the human eye. This includes both an examination of how an image is produced by the eye’s optical system and also how the resulting image is then processed by the retina and brain, including examples of optical illusions. Finally, the various color theories will be introduced, explained and demonstrated.