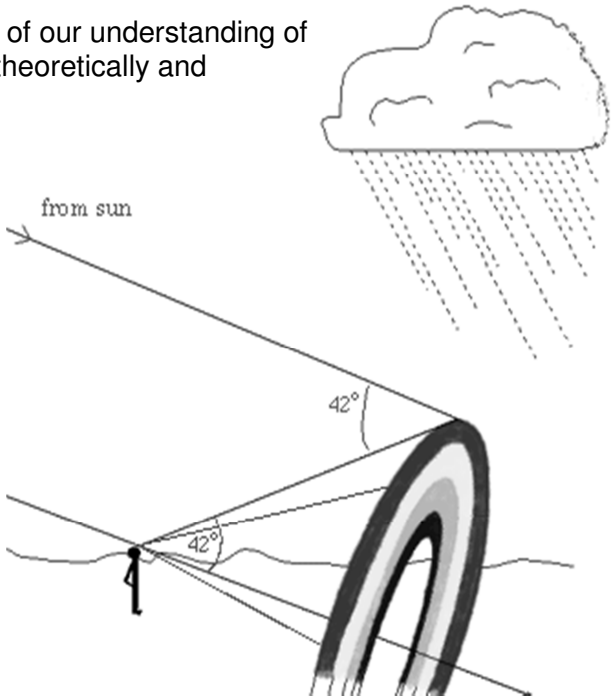
Class: Physics 106: Light and Color Dr. Marcus
Time and Place: MWF 10:30-11:20 ISC 131

Physics 106 – Light and Color : Lecture Spring 2014



In this class you will study the historical development of our understanding of light. You will learn about the behavior of light, both theoretically and experiementally.

You will occasionally need high-school level math skills, including algebra as well as some trigonometry and geometry. I will review some of these skills as we start to use them.

Learning Outcomes

By the end of the course, students will

- Demonstrate an understanding of optical phenomena such as reflection, refraction, dispersion, interference, and polarization and relate these ideas to natural phenomena.
- Observe and quantitatively analyze the behavior of light
- Demonstrate knowledge of the historical development of several scientific models of light.
- See how scientific models are developed and how experimental results may cause models to be discarded or revised.
- Develop a scientific view the physical world.

Physics 107 Light and Color Lab

You must be simultaneously registered for a Physics 107 lab section. There will be significant crossover and overlap between the lecture and lab componenents of this class.

Required Materials:

Textbooks: ***Newton to Einstein: the Trail of Light***. by Ralph Baierlein & ***Light*** by Michael Sobel
Lab Manual: Available at the campus bookstore
Logbook: A quad-ruled notebook available at the campus bookstore
Calculator with trigonometric functions

Your responsibilities

You should read the relevant sections of the textbooks (as listed in the schedule on the next page or as announced in class) **prior** to lecture so that you will get a better grasp of the material we discuss in class.

Be curious! You should ask questions and seek help when you need it.

You should learn from your classmates as well as me. I encourage you to work together with classmates on your assignments. However, you may not copy someone else's work. This will come back to haunt you during exams.

Resources for you

The Department of Physics and Astronomy maintains the Physics Learning Center located in the Integrated Science Center, room 233. It is staffed by physics majors who can provide you with assistance. Details are at http://www.geneseo.edu/~pogo/Tutors/Tutors.htm

I am available to answer questions or clarify course material in my office (ISC 228A) during office hours and by appointment at other times. My schedule is on my webpage (www.geneseo.edu/marcus) and on my office door. I am always glad to answer any questions you might have about the calss.

My office hours are posted on my office door (ISC228A) and on my webpage. Please take advantage of this resource.

Coursework

Homework

You will use the CAPA system for your regular homework sets (see the CAPA handout for more information). CAPA homework is due by 8:00 am on the due date as indicated on the schedule. The solutions for the homework sets will be available on CAPA after the due date. Late homework will not be accepted.

In-class quizzes

There will be announced quizzes in class. Two are on the calendar of events and more may be scheduled as appropriate.

Papers

You will be asked to write one paper for this class. You will select the topic of the paper which must be related to an application of optical technologies. Your selected topic must be approved by me. Further details about the guidleines and requirements for this paper will be provided in class.

Exams

There are two exams that will be conducted in class. They are scheduled for Friday Feb 21st and Monday March 31st .

The final exam will be a 3-hour comprehensive exam held on Wednesday May 14th from 8:00-11:00.

Grading

30% Homework assignments and announced quizzes
15% Paper
30% In-Class Exams
25% Final Exam

A tentative schedule of materials, homeworks and quizzes is printed on the front and back of the next page. This schedule may be subject to change.

Schedule Of Material Subject to Change

January

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Week 1 Lab 1	19	20	21	22 Class 1	23	24 Class 2	25
Week 2 Lab 1 - cont	26	27 Class 3	28	29 Class 4	30	31 Class 5 **CAPA set 1 due**	1

February

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Week 3 Lab 2	2	3 Class 6	4	5 Class 7	6	7 Class 8 **CAPA set 2 due**	8
Week 4 Lab 3	9	10 Class 9	11	12 Class 10	13	14 Class 11, **QUIZ** **CAPA set 3 due**	15
Week 5 Lab 4	16	17 Class 12	18	19 Class 13	20	21 Class 14 **Exam 1 in Class**	22
Week 6 Lab 5	23	24 Class 15	25	26 Class 16	27	28 Class 17	1

March

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Week 7 Lab 6	2	3 Class 18	4	5 Class 19	6	7 Class 20 **CAPA set 4 due**	8
Week 8 Lab 7	9	10 Class 21	11	12 Class 22	13	14 Class 23 **CAPA set 5 due**	15
Week 9 No Labs	16	17 Spring	18 Break	19 Spring	20 Break	21 Spring	22
Week 10 Lab 8	23	24 Class 24	25	26 Class 25	27	28 Class 26 **CAPA set 6 due**	29

April

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Week 11 Lab 9	30	31 Class 27 **Exam 2 in Class**	1	2 Class 28	3	4 Class 29 **Proposal for Paper Due**	5
Week 12 Lab 10	6	7 Class 30	8 **G.R.E.A.T. Day**	9 Class 31	10	11 Class 32 **QUIZ in class**	12
Week 13 Lab 11	13	14 Class 33	15	16 Class 34	17	18 Class 35 **Paper Due**	19
Week 14 No Labs!	20	21 Class 36	22	23 Class 37	24	25 Class 38 **CAPA set 7 due**	26
Week 15 Lab 12	27	28 Class 39	29	30 Class 40	1	2 Class 41 **CAPA set 8 due**	3

May

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Week 16	4	5 Class 42 Last Day	6	7	8	9	10
	11	12	13	14 **FINAL EXAM** **8-11 AM**	15	16	17

1) Light and Color…Why do we care?	
2) Hero, Ptolemy, and Snell	Read Baierlein, Ch. 1
3) Snell's Law	
4) Light Under Water and Critical Angle (θ_c)	
5) Dispersion	**CAPA Set 1 Due**
6) Rainbows	
7) Bending Light Rays	
8) Ray Tracing	Read Sobel, Ch. 2, **CAPA Set 2 Due**
9) The Lens Equation	
10) Optical Instruments:Telescopes & Microscopes	
11) The Speed of Light	**QUIZ**,Read Sobel, Appendix I, **CAPA Set 3 Due**
12) Vision and Perception	
13) Perception and Color	
14) Exam 1	
15) Newton's Particles of Light	Read Baierlein, Ch. 2
16) Impulse-Momentum	
17) Foucault's Expt.	Read Baierlein, Ch. 3, **Paper Proposal Due**
18) Waves	
19) Water Waves & Light	
20) Waves & Interference	**CAPA Set 4 Due**
21) More Interference	Read Baierlein, Ch. 4
22) Applications of Interference	
23) Double Slit Interference	**CAPA Set 5 Due**
Spring Break	
24) Single and Multiple Slits	
25) Examples	
26) Review	**CAPA Set 6 Due**
27) Exam 2	
28) What's Waving?	Read Sobel, Appendix A
29) E and B Fields	Read Baierlein, Ch. 5
30) Faraday's Law of Induction	
31) Polarization by Absorption	Read Sobel, Ch. 1
32) Blue Skies & Polarized Skies	**QUIZ**
33) Polarization by Reflection	
34) The Photoelectric Effect	Read Baierlein, Ch. 6
35) Examples of the Photoelectric Effect	**Research paper Due**
36) Wave-Particle Duality	Read Baierlein, Ch. 7
37) Electron Waves	Read Sobel, Appendix C
38) Atoms	**CAPA Set 7 Due**
39) Fingerprinting Atoms	Read Sobel, Ch. 4
40) Sources of Light	
41) The Principle of Least Time	**CAPA Set 8 Due**
42) Review	