

CHAMINADE UNIVERSITY OF HONOLULU

PHYSICS 121 - PHYSICS OF PHOTOGRAPHY - SYLLABUS

Fall Semester, 2002 Instructor: Dr. David Cooke Tel. 735-4813 (Office) 739-9201 (Home) Office hours: TR 9 - 10:50; WF 11 a.m. - noon, room HH118

A. INTRODUCTION:

The course introduces you to practical photography - with classroom lectures and labs to teach you the techniques involved in setting up and using a camera to take good photographs. The classroom work goes far beyond this, however. As well as learning the basics of photography you will be introduced to the physics of light, which relates to such things as the nature of light, reflection and refraction, the wave properties of light, interference, lenses and mirrors, polarization, color and color film. You will then see how these relate to photography. The accompanying laboratory experiments involve, in part, some simple experiments aimed to help you to understand these physical principles. The main intention of the laboratory sessions is to teach you practical, hands-on photography - including assignments in which you take photographs, and develop and print these by means of more advanced techniques such as dodging, burning-in and the use of polycontrast filters.

During the semester we go beyond the scope of the conventional photography that you will be carrying out in the darkroom and learn about digital imaging and photography (pictures processed and presented in a computer are held in digital form). Digital images are very common now - on the World Wide Web, for example. The special effects sequences in movies are now normally sequences of digital images produced by computer, and what appear to be photographs in magazines - in advertisements and graphics - are very commonly images that have been processed digitally by computer.

We will be learning about the processes of digital photography during class time this semester - how digital photography works, how a digital camera operates and what a digital image actually is. We will take a hand-on approach and take and process digital images ourselves. In addition to capturing images using a digital camera, you will also learn how to use a scanner to convert, for example, a regular photo into a digital image. You will learn how to manipulate digital images within a computer using "Picture Publisher" - a powerful yet easy to use program. You will then learn how to print the finished image on the printers in the Wiegand lab.

The "Physics of Photography" course offers interesting insights into the nature of scientific thought and methods, and teaches practical photography in digital and film-based photography - overall an enjoyable way of taking one of the two science courses (with labs) that students need to undertake as part of their general education requirements.

B. TEXT:

There is no published text that presents the course material in an appropriate way, so you will be issued with Xeroxed notes, one chapter at a time. You will be issued with a folder in which to keep these notes.

C. OBJECTIVES OF THE COURSE:

At the end of the class you will be able to understand and carry out calculations and operations relating to concepts in each chapter. In detail, the chapters cover:

1. Basic principles of emulsion-based photography, the law of reciprocity, film speed, acutance, contrast and latitude, H&D curves, the photography process, production of the photographic image, manipulation of the image in the printing process.
2. Digital photography, understanding the terms and basic principles, comparisons with emulsion based photography.
3. Use of digital camera and scanner, manipulation of the image in "Picture Publisher".
4. Control of exposure in a camera; function of shutter and aperture, and their effect on "freezing" of motion and depth of field; determination of optimum exposure for given situation.
5. The nature of light; electromagnetic waves; relationship of wave speed, frequency and wavelength; color.
6. Determining position of image for an object lying in front of a curved mirror using the ray tracing technique; image characteristics.
7. Relating focal length, object and image distances for a mirror using the "lens" equation; image magnification;
8. Use of the ray tracing technique to determine the position of an image in front of a lens.
9. Using the lens equation to relate focal length, object and image distances for a lens; image magnification.
10. Refraction; Snell's Law; total internal reflection; critical angle.
11. Color - additive and subtractive color components; color mixing.
12. Color photography; dye destruction and Kodachrome film processes.
13. Film characteristics and light sources; use of light meter; gray card; color temperature; filters; artificial light sources - photo floods and flash.
14. Camera lenses and film format; wide angle, fisheye, telephoto and PC lenses; taking close-up photographs, image defects.
15. Effects of the wave nature of light (interference); minimizing lens reflections.
16. Diffraction.

D. EVALUATION:

There will be a homework assignment at the end of each chapter's work. Quizzes are given at the end of each segment of the work. The quiz dates will be assigned in discussion with the members of the class. Two preliminary exams will be held, on October 1st and November 5th. The final exam will be held 12:45 to 2:45 p.m. on Tuesday, 10th December. Makeups for quizzes and exams will only be given if the absence is for valid medical reasons (a doctor's certificate must be supplied), or by an athlete involved an official school sports event. A record is kept of student attendance.

Grades are based on homework quizzes, exams, etc. to the extent presented here:	Attendance:	5%
	Homework:	5%
	Quizzes:	30%
	Midterm Exam	30%
	Final Exam	30%
	TOTAL	100%

It is important to understand the grade definitions that guide the awarding of grades at the end of the semester. Grading criteria as stated in the Chaminade undergraduate catalog are as follows:

- A -- Outstanding scholarship and an unusual degree of intellectual initiative.
- B -- Superior work done in a consistent and intellectual manner.
- C -- Average grade indicating a competent grasp of subject matter.
- D -- Inferior work of the lowest passing grade, is not satisfactory for fulfillment of prerequisite coursework.
- F -- Failed to grasp even the minimum subject matter; no credit given.
- I -- Did not complete a small portion of the work or final examination due to circumstances beyond the student's control. The issuance of an "I" grade is not automatic. Prior to reporting of grades a contract must be made between the student and the instructor for the completion of the course.