

FD '00

CHAMINADE UNIVERSITY OF HONOLULU

PHYSICS 121 PHYSICS OF PHOTOGRAPHY - SYLLABUS

Fall Semester, 2000

Instructor: Dr. David Cooke

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, and color. You will then see how these effects 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.

Later in 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.

The "Physics of Photography" course offers interesting insights into the nature of scientific thought and methods, and teaches practical photography in - 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 which 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 COURSE:

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

1. Basic principles of photography; the law of reciprocity; film speed, contrast and latitude; H & D curves.
2. 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.
3. The nature of light; electromagnetic waves; relationship of wave speed, frequency and wavelength; color.

4. Determining position of image for an object lying in front of a curved mirror using the ray tracing technique; image characteristics.
5. Relating focal length, object and image distances for a mirror using the "lens" equation; image magnification;
6. Determining position of image for an object lying in front of a lens using the ray tracing technique.
7. Relating focal length, object and image distances for a lens, using the lens equation; image magnification.
8. Refraction; Snell's Law; total internal reflection; critical angle.
9. Color - additive and subtractive color components; color mixing.
10. Color photography; dye destruction and kodachrome film processes.
11. Film characteristics and light sources; use of light meter, gray card; color temperature; artificial light sources - photo floods and flash.
12. Camera lenses and film format; wide angle, fisheye, telephoto and PC lenses; taking close-up photographs.
13. Effects of wave nature of light; minimizing lens reflections.
14. Diffraction;
15. Digital imaging;

D. EVALUATION:

There will be homework assignments 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 approximately October 4th and November 8th. The final exam will be held at 10:30 a.m. on Tuesday, 12th December. Makeups for quizzes and exams will only be given if the absence during the original assigned exam time is by an athlete involved an official school sports event, or for medical reasons (with a doctor's certificate).

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 which 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.

5. **LABORATORY:**

The laboratory course, PHY 121L, is taken concurrently with the class work. The experiments introduce you to darkroom techniques in black & white photography - how to develop, print, and to manipulate images. In addition, later on in the semester you will be taught about digital imaging in the Wiegand physics lab. Appropriate instructions and notes are issued to you.

The lab assignments will include making and using a pinhole camera, loading and using 35 mm reflex cameras, indoor and outdoor photography, and a special assignment - one involving putting together a photo essay on a multicultural theme for a contest at the end of the semester.