

Phy 655 Course Description:

Exploration of laser holography as a tool in art and science. Students learn the basic techniques of 3D image making, create and display holograms, construct a diode laser and use it to make holograms.

Course Objectives:

This course will introduce and encourage exploration of holography as an artistic and scientific tool. The student will create and evolve three-dimensional holographic imagery using created and found objects to produce an artistic experience for the viewer.

Upon successful completion of the course, the student will:

- understand the basic science concepts and techniques of holography
- understand the basics of creating artistic imagery using holography as an art tool
- construct and use a basic diode laser
- understand some uses of science and art in society
- apply holography in the study of Material Culture

Textbook:

The Holography Handbook by Unterseher, Hansen and Schlesinger

Practical Holography by Outwater and Hamersveld

Phy 655 Methods of Evaluation

Work in the course will be evaluated on the basis described below:

Evaluation:

Project 1: Diffraction Grating	10%
Project 2: One-step Rainbow Hologram	10%
Project 3: Split Beam Transmission Hologram	10%
Project 4: Single Beam Reflection Hologram	10%
Final Exhibition Piece (5"x7")	15%
Research/Teaching Lecture	20%
Final Exam	15%
Class Participation and Attendance	10%

Projects (40%): The four projects represent the four types of holograms. For each project you are required to present your work to the class discussing the concepts you have chosen as the basis for the project.

Final Exhibition Piece (15%): The final exhibition piece must be large format (5"x7" or larger) presented for display in the final class show.

Research/Teaching Lecture (20%): During the class you are required to research a scientific topic related to the uses of holography or waves in Material Culture and present a 2 hr lecture on your research topic. For this project you will work alone. You will meet with the faculty member teaching the course on a bi-weekly basis to help in your research progress.

Final Exam (15%): During the last week of class you will be given a final exam covering the material which was presented to you during the quarter in lectures and discussions. The exam will be closed book.

Participation and Attendance (10%): Student contribution to the class discussion during the quarter is important to making the class interesting and informative. Attendance at presentations by other students or discussion is required.

Relation and Differences Between Physics H455 and Physics 655

The two courses (Physics H455 and Physics 655) would meet at the same time but the requirements for Physics 655 would differ and be greater than the requirements for Physics H455 in the following way:

<u>Requirement</u>	<u>Phy H455</u>	<u>Phy 655</u>
Final Project (4"x5")	x	
Final Project (5"x7")		x
Research/Teaching Lecture		x

The difficulty of a final project in 5"x7" format is roughly 2-5 times harder than in 4"x5" format. The larger format is usually reserved for students taking 555 or higher classes and demands a greater understanding and control of the equipment. The level of accomplishment is appropriate for graduate students.

The graduate students will also have to preform research during the quarter in the uses of holography or waves in Material Culture and teach a 2 hr lecture on their research. This would involve quite a bit of research on their part and individual feedback from the instructor. To facilitate this the graduate students would have to meet regularly (bi-weekly) with the Faculty member during the quarter to discuss their progress. Their lecture would be graded by the Faculty member who would be present during their lecture. This requirement is not present at the 455 or 555 level but is appropriate at the 655 level.

Phy 655 Topical Outline

The material discussed in the lectures is listed below.

Lecture	Topic(s) considered
I	Introduction - What is Holography?
II	Stereoscopic Vision. The Eye: How do we see?
III	Waves and Wave Properties. Light and Sound
IV	Propagation of Waves, Interference and Diffraction
V	Waves and Survival
VI	Holography Rules
VII	The Grating Equation, Diffraction Gratings
VIII	Wave-Particle Duality, Intro to Quantum Mechanics
IX	Bohr Theory, Quantization
X	Lasers, Construction of a Diode Laser
XI	One Step Rainbow Holograms
XII	The Optics of Mirrors
XIII	Index of Refraction, Lenses, Shock waves
XIV	Space Dimensions and $1/r^2$
XV	Are Human Beings Special?
XVI	Transmission Holograms
XVII	Depth of Field
XVIII	Reflection Holograms
XIX	Problems



Department of Physics

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Sam Short
Associate Professor
Chair, Steering Committee
Interdisciplinary Specialization
Analysis of Material Culture

December 15, 2006

Dear Professor Short,

The department of Physics is pleased to endorse the department of Art Education's Interdisciplinary Specialization in the Analysis of Material Culture, which has been planned with the assistance of Prof. Harris Kagan from our department. Prof. Kagan's involvement in this Interdisciplinary Specialization is endorsed by the department and we will, to the best of our ability, participate in the Specialization by supporting, if it is ultimately deemed of value to the specialization, a request by Prof. Kagan to create a 600-level version of our 400-level holography course that would be offered concurrent with this 400-level course whenever it is taught.

Best wishes,

A handwritten signature in cursive script that reads "Thomas Humanic".

Thomas Humanic
Professor, and
Vice Chair for Graduate Studies
Department of Physics



October 12, 2007

Elliot Slotnick
Associate Dean
Graduate School
250D University Hall
230 N. Oval Mall

Dear Associate Dean Slotnick:

This letter confirms my support of the proposal presented by the Department of Art Education to create an interdisciplinary specialization in the Analysis of Material Culture.

The College of Mathematical and Physical Sciences encourages interdisciplinary programs and initiatives at every level. The proposed specialization will allow students to study in-depth the creation and use of objects from multiple perspectives: historical, scientific, aesthetic, and cultural.

I will permit MAPS Ph.D. students to pursue this specialization should they and their advisors so choose.

Sincerely,

Matthew S. Platz
Distinguished University Professor and Interim Dean

C: Sam Short