

# Optical Science and Engineering, PhD

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## Optical Science and Engineering, PhD Degree

400-A Optics Building

Telephone: 256.824.2525

Program Coordinator: Robert Lindquist (robert.lindquist@uah.edu), Electrical and Computer Engineering

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## Mission

The mission of the Optical Science and Engineering Program is to develop and maintain a world class graduate education and research program in the rapidly advancing and expanding fields of optical science and engineering, to provide our students with exciting opportunities to learn and to do forefront research, and to prepare these students for productive and fulfilling careers.

## OSE Program

Optics is an area of major scientific and technological importance. With cooperation of the College of Engineering and the College of Science, the Optical Science and Engineering (OSE) doctoral program was formally approved at UAH in 1992. This unique program is highly multi-disciplinary and is followed by a wide variety of advanced coursework and research in both fundamental and applied subjects. This diversity is reflected by the OSE faculty, which is drawn from the expertise of optical scientists and engineers from the departments of Physics, Electrical and Computer Engineering, and Mechanical and Aerospace Engineering, and from the Center for Applied Optics.

## Degree Requirements

Because students will come into this program with strong, but diverse undergraduate and graduate training, the multidisciplinary curriculum has been structured on a common basis for all entering students, but will compensate for individual differences and provide depth in specific areas. A total of 48 semester hours of graduate coursework are required, of which 28 semester hours are in designated optics courses. An additional 18 semester hours must be in dissertation research. Students are also required to satisfy the Seminar requirements of their home departments, as required. In addition, all requirements of the School of Graduate Studies must be met in order to remain in good standing.

## Admissions Requirement

Applicants may be unconditionally admitted to the program if they have:

1. A bachelor's degree in science or engineering from an approved college or university;
2. A minimum grade point average (GPA) of 3.0 overall;
3. A combined score of 300 on the verbal, quantitative and analytical sections and at least 3.0 in the writing section of the Graduate Record Examination (GRE).
4. A TOEFL (iBT) score of: all sub-scores equal to or greater than 18 OR IELTS score of: all sub-scores equal to or greater than 6.0 for international students and
5. Three letters of reference.

All entering students will be administered a background evaluation at admission conducted by the Optics Coordinating Committee. An applicant whose scholastic record reveals a deficiency in one or more of the first two categories above, may, upon recommendation of the Program Coordinator and the approval of the Graduate Dean, be admitted on a conditional basis, as provided by Graduate School regulations. However, that student must follow the Graduate School's policies in achieving unconditional admission status prior to taking the Preliminary Examination.

The student will complete three study phases, punctuated by three program examinations.

## Phase I

(The core phase) will consist of 19 semester hours of coursework. To complete this phase and become eligible for continuation in a focus area, the student must pass the Preliminary Examination (only two attempts will be permitted). After successful completion of this phase, the student should have acquired the common optics background that the program faculty believes is necessary for the doctoral program. Full-time students will normally select a dissertation advisor during their first year. Once an advisor has been chosen and the Preliminary Examination passed, a graduate committee will be appointed and a Program of Study completed.

## Phase II

Consists of coursework in the Program of Study (which includes a Focus Area). Much of this coursework will support the dissertation research to be conducted in Phase III. This phase will be completed when the student has completed most of the formal course work as prescribed in the Program of Study and has passed the Qualifying Examination which is prepared and administered by the student's graduate committee. It will contain both written and oral parts. Questions can be drawn from part of the Program of Study (with special emphasis on the student's Focus Area). This exam will also include a proposal for dissertation research prepared by the student and distributed to the graduate committee. The proposal will demonstrate that the

student is intimately familiar with the proposed research, that published research related to the proposal has been reviewed, and that the student has a clear understanding of how to proceed and can set realistic goals. If the student fails the Qualifying Examination, a second attempt will be scheduled. Students who fail in two attempts will be dropped from the program.

### Phase III

Consists of all experimental and/or theoretical work needed to complete the student's dissertation. These activities will be directly supervised by the student's advisor. Since the Ph.D. is a research degree, recipients must demonstrate both the ability to perform independent and original research, and to clearly communicate this work both in written and oral formats. The Final Examination will consist of a public, oral presentation and defense of the dissertation.

### Advisement

A student admitted to the program will have a member of the OSE Program Committee as an advisor. The student will be encouraged to consult with all faculty members in the intended area of specialization in order to develop an appropriate program of study and topic for dissertation research.

A graduate committee will be appointed for the student as soon as the student passes the Preliminary Examination and selects a research project. The committee will include an advisor and at least four other members. At least one of the committee members will be from a department other than the student's "home department." Otherwise, the composition of the committee will follow the rules governing such committees set forth by the School of Graduate Studies. The graduate committee is charged with supervision and approval of the student's research and course of study toward the completion of all requirements for the degree.

The following optics courses are also available to students in the OSE program. See listings under indicated departments.

#### Electrical Engineering

EE 532	OPTICAL SYSTEMS DESIGN	3
EE 633	ELECTRO-OPTICAL ENGINEER	3
EE 634	OPTICAL COMMUNICATIONS	3
EE 733	NONLINEAR OPTICS APPLICATIONS	3
EE 734	FIBER OPTICS	3
EE 735	STATISTICAL OPTICS	3
EE 738	OPT TRANSF/PATTN RECOGNI	3

#### Physics

PH 544	OPTOELECTRONICS	3
PH 570	OPT & PHOTONIC SYSTEMS DESIGN	3
PH 645	LASERS I	3
PH 733	QUANTUM DEVICES	3
PH 745	LASERS II	3

#### Mechanical Engineering

MAE 677	OPTICAL TECH IN SOLID MECH	3
MAE 757	OPT TECH/FLUID MECHANICS	3