

Optical Science and Engineering, PhD

Optical Science and Engineering, PhD Degree

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Mission

The mission of the Optical Science and Engineering Doctoral Program is to provide a competitive graduate education and research opportunity in the rapidly advancing and expanding fields of optical science and engineering, to provide students with a unique technical learning environment, to involve students in fundamental and applied research, and to prepare these students for productive and fulfilling optics and optics related careers.

OSE Program

Optics and photonics are major fields in science and technology today, with electro-optic and opto-electronic components being found in practically all modern devices. Through cooperation between the colleges of Engineering and Science and under the direction of the Graduate School, the Optical Science and Engineering (OSE) doctoral program was formally approved at UAH in 1992. This unique program is highly multi-disciplinary and comprises a combination of advanced coursework and research in both fundamental and applied subjects. The OSE faculty is made up of optical scientists and engineers from the departments of Physics, Electrical and Computer Engineering, and the Center for Applied Optics. In addition, the program enlists members of the strong Huntsville optics community for giving seminars and teaching specialty courses.

Degree Requirements

Because students will come into this program with diverse undergraduate and graduate training, the multidisciplinary curriculum has been structured on a common basis for all entering students, but can compensate for individual differences while providing depth in specific areas. A total of 48 semester hours of graduate coursework are required, of which most are in designated optics courses. An additional 18 semester hours must be taken in dissertation research. Students must also satisfy any Seminar class attendance requirements of their home department (typically Physics or one of the Engineering departments). In addition, all general 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. Applicants may be unconditionally admitted to the program if they have:
2. A bachelor's degree in science or engineering from an approved college or university;
3. A minimum grade point average (GPA) of 3.0 overall;
4. 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).
5. For international students, TOEFL (iBT): All sub-scores greater than or equal to 18; Or IELTS: All sub-scores greater than or equal to 6.5.
6. Three letters of reference.

The first step for any potential OSE student is to be accepted into the graduate school of UAH. The applications received by the graduate school will then be evaluated by a subcommittee of the OSE faculty before being recommended for admission to the program. An applicant whose scholastic record reveals a deficiency may, upon recommendation of the Program Director and the approval of the Graduate Dean, be admitted on a conditional basis, as per Graduate School regulations (https://www.uah.edu/images/colleges/graduate-studies/graduate_student_handbook_eighth_edition_-_3.2016.pdf). However, that student must follow the Graduate School's policies in achieving unconditional admission status prior to taking the written OSE Preliminary Examination, normally given at the end of the spring semester.

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

Phase I

New full-time students typically come into the OSE program via a one academic year teaching assistantship in the department of physics or in one of the engineering departments. The core phase of instruction consists of 19 semester hours of coursework and lab work in the following classes: Geometrical Optics (PH/OSE 541), Physical Optics (PH/OSE 542), Fourier Optics (PH/OSE 632), Lasers (PH/OSE 645), Radiometry (PH/OSE 546), Optical Testing (OSE 654), and Optical Testing Lab (OSE 653 (<https://catalog.uah.edu/grad/course-descriptions/ose/>)). To complete this phase and become eligible to continue, the student must pass the written Preliminary Examination (typically administered at the end of the spring semester) on the above topics. Only two attempts will be permitted. After successful completion of this phase, the student should have acquired the common optics

background necessary for continuing in the doctoral program. It is the student's responsibility to seek out a dissertation advisor during this first year and complete a draft Program of Study. Once the Preliminary Examination has been passed, a graduate committee will be formed and a final Program of Study will be completed and submitted to the OSE Program Director for review. The Program of Study will then be submitted to the Graduate School for final approval.

Phase II

Consists of completing coursework in the Program of Study. Much of this coursework will support the dissertation research to be conducted in Phase III. Credits earned toward a thesis based master's degree (including up to 9 hours of master's thesis) may be applied to the doctoral degree. Phase II is completed when the student has passed the Qualifying Examination which is prepared and administered by the student's graduate committee. This exam consists of both written and oral parts. Written questions are typically drawn from material covered in the courses listed on the Program of Study and may be written by any or all of the committee members. The student will be given a time limit for submitting the solutions (typically a week). The oral part of the exam consists of defending a proposal for dissertation research prepared by the student and distributed to the graduate committee at least two weeks prior to the exam. The proposal will demonstrate that the student is intimately familiar with the research to be done, 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. Only two attempts are allowed.

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 with input from the supervisory committee obtained during regular meetings. There must be at least two supervisory committee meetings with the student before the dissertation defense. Since the Ph.D. is a research degree, recipients must demonstrate the ability to perform independent original research and to clearly communicate this work both in written and oral formats. A paper on the dissertation research must have been submitted to a recognized refereed technical journal before the Final Examination, which consists of a public, oral presentation and defense of the dissertation.

Advisement

A student admitted to the program will schedule a meeting with the OSE Program Director for initial advisement and it is the student's responsibility to consult with all OSE faculty members in the intended area of specialization in order to arrive at a permanent advisor for dissertation research.

A graduate supervisory committee will be assembled when the student has passed the Preliminary Examination and selected 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, which is typically Physics. The fifth member may also be from another university or outside any university as long as approval to serve has been granted by the School of Graduate Studies. The composition of the committee will follow the rules governing such committees as set forth by the graduate school catalog (https://www.uah.edu/images/colleges/graduate-studies/graduate_student_handbook_eighth_edition_-_3.2016.pdf). The graduate committee is charged with supervision and approval of the student's research and course of study leading to the completion of all requirements for the degree.

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

Code	Title	Semester Hours
Electrical Engineering		
EE 532	OPTICAL SYSTEMS DESIGN	3
EE 543	OPTICAL COMM SYS & NETWORKS	3
EE 570	OPT & PHOTONIC SYSTEMS DESIGN	3
EE 604	DIGITAL IMAGE PROCESSING	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 642	OPTICAL PHYSICS	3
PH 651	QUANTUM MECHANICS I	3
PH 652	QUANTUM MECHANICS II	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