

ACOUSTICS

Graduate Program Head	Andrew Barnard
Program Code	ACS
Campus(es)	University Park (Ph.D., M.S., M.Eng) World Campus (M.Eng.)
Degrees Conferred	Doctor of Philosophy (Ph.D.) Master of Science (M.S.) Master of Engineering (M.Eng.)
The Graduate Faculty	View (https://secure.gradsch.psu.edu/gpms/?searchType=fac&prog=ACS)

The aim of this program is to enable the student interested in acoustics to obtain an integrated program covering acoustical science and engineering applications of acoustics.

Student curricula are individually tailored and integrated through a selection of core and elective courses in areas such as:

- fundamentals of sound and vibration
- sound radiation and propagation
- signal analysis
- electroacoustic transducers
- physical acoustics
- nonlinear acoustics
- computational acoustics
- architectural acoustics
- medical ultrasonics
- structural acoustics and vibration
- aeroacoustics and flow noise
- audio engineering and spatial sound
- musical acoustics
- psychoacoustics
- speech and communication
- experimental techniques
- underwater acoustics

The courses are offered by the graduate program in Acoustics and by other participating University departments, including:

- Aerospace Engineering
- Architectural Engineering
- Bioengineering
- Communication Sciences and Disorders
- Electrical Engineering
- Engineering Science and Mechanics
- Geosciences
- Mechanical Engineering
- Meteorology
- Physics

Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (<https://gradschool.psu.edu/graduate-admissions/how-to-apply/>). Requirements listed here are in addition to

Graduate Council policies listed under GCAC-300 Admissions Policies (<https://gradschool.psu.edu/graduate-education-policies/>).

Entering students should hold a bachelor's degree in physics, engineering, mathematics, or a closely related field that would provide substantial preparation in mathematics (a minimum of two semesters of calculus-based physics and mathematics to include complex variables and differential equations). In addition, an undergraduate knowledge of statics and dynamics, linear algebra, and electronic circuit analysis, and the ability to use mathematical analysis software is expected. Students with a 3.00 junior/senior average (on a 4.00 scale), appropriate course backgrounds, and a B+ or better average in mathematics, physical science, and engineering courses will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. An individual with nontechnical background may also apply, but acceptance into the program will depend significantly on the applicant's undergraduate background and motives to pursue advanced study in acoustics. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds and abilities.

Graduate Record Exam (GRE) scores will be considered if provided, but they are neither required nor expected.

The language of instruction at Penn State is English. English proficiency test scores (TOEFL/IELTS) may be required for international applicants. See GCAC-305 Admission Requirements for International Students (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/gcac-305-admission-requirements-international-students/>) for more information.

In addition, the Acoustics Program requires a minimum speaking score on the TOEFL internet based test (iBT) of 25 or a minimum acceptable composite score from the International English Language Testing System of 6.5.

Admission to the Ph.D. program is a two-step process. First, the candidate must apply to the Acoustics Program via the Graduate School application for admission (<http://gradschool.psu.edu/prospective-students/how-to-apply/>) as a Ph.D. student, and the application is reviewed by the Admissions Committee. Admission will permit the student to begin working toward a doctoral degree. However, the student is not a doctoral candidate until he or she has passed the comprehensive examination and been admitted to candidacy.

Degree Requirements

Master of Engineering (M.Eng.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-700 Professional Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>).

The Master of Engineering (M.Eng.) degree is a non-thesis professional master's degree, and it may be earned by resident students at University Park or through distance education. The Master of Engineering degree is based on graduate course work and a written paper or a developmental study must be submitted to the Acoustics program. Normally, such a paper represents a study of a particular topic that is more limited than that necessary for a thesis. The paper is free of any formal requirements of the Graduate School, but it is expected that the student will use the Thesis Guide as an example of the appropriate format. The total number of credits required for the M. Eng. degree is 30 of which 18 credits must be from 500-level approved core courses in Acoustics. The 12 non-core

course credits may be selected from the "Required and Approved" list of courses issued by the Acoustics Program Office. Students may take more than one credit of Colloquium (ACS 590) and more than six credits of Individual Study (ACS 596), but such additional credits cannot be applied to the total number of course credits required. Master of Engineering students may not apply research credits (ACS 600) to the total number of course credits required. The expected duration to complete the M.Eng. degree is 2 years for resident students.

Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

The Master of Science (M.S.) degree program is based on a combination of graduate course work and research training that is documented and culminates (a) in a Master of Science thesis or (b) in a scholarly paper. The M.S. degree in Acoustics is only available for resident students at University Park. For track (a) both the course selection and research are directed by an adviser. When the student is working on the thesis research, at least two other faculty members, upon the adviser's suggestion, will be recommended to the Program Chair who will approve the thesis committee. The total number of credits required for the M.S. degree is 30, and at least 20 of those credits must be taken at University Park. 24 course credits are required, of which 18 must be from approved 500-level acoustics core courses. 6 Thesis Research credits (ACS 600) are required for students writing a Master of Science Thesis.

The scholarly paper track (b) is only available for students participating in the one-year M.S. program that requires 12-month continuous registration. As part of the one-year M.S. program students must take one credit of Research Topics (ACS 594) in both the fall and spring semesters, and take a special summer course, Contemporary Research Topics in Acoustics (ACS 580). The scholarly paper will be developed in the ACS 594 classes and will normally be completed as part of ACS 580. This paper will typically be a study of a particular topic that is more limited than that necessary for a thesis. The paper is free of any formal requirements of the Graduate School, but it is expected that the student will use the formatting as described in the Thesis Guide. Students in the one-year M.S. program will not take any Thesis Research credits (ACS 600). The total number of credits required for the M.S. degree is 30, and at least 20 of those credits must be taken at University Park. 24 course credits are required, of which 18 must be from approved 500-level acoustics core courses.

The 6 non-core course credits for either track may be selected from the "Required and Approved" list of courses issued by the Acoustics Program Office. Students may take more than one credit of Colloquium (ACS 590) and more than six credits of Individual Studies (ACS 596) for the paper track or Thesis Research (ACS 600) for the thesis track, but such additional credits cannot be applied to the total number of course credits required for the M.S. degree. The expected duration to complete the M.S. degree with thesis is 2 to 2.5 years and approximately 1 year for students in the one-year resident M.S. program.

Doctor of Philosophy (Ph.D.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

The Doctor of Philosophy (Ph.D.) degree is conferred in recognition of high attainment and productive scholarship. A candidate for the Ph.D. degree must pass the English proficiency and qualifying examinations,

prepare and defend a dissertation proposal as part of the comprehensive examination, pass the final oral examination (dissertation defense), and the dissertation must be approved by the Ph.D. committee. Ph.D. students are required to take 21 credits of 500-level Acoustics core courses, but the Ph.D. committee may require the doctoral candidate to take specific additional courses. In addition, a Ph.D. candidate must satisfy the Graduate Council residency requirement by registering for two consecutive semesters, fall and spring, as a full-time student. Post-comprehensive exam, continuous registration is required until the thesis has been approved. Penn State's Graduate School allows eight years from successful completion of the qualifying exam for completion of a doctoral degree. The expected duration to complete the Ph.D. degree is 3 years after the completion of a master's degree or 5 years without a master's degree.

Minor

A graduate minor is available in any approved graduate major or dual-title program. The default requirements for a graduate minor are stated in Graduate Council policies listed under GCAC-600 Research Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>) and GCAC-700 Professional Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>), depending on the type of degree the student is pursuing:

- GCAC-611 Minor - Research Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-611-minor-research-doctorate/>)
- GCAC-641 Minor - Research Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-641-minor-research-masters/>)
- GCAC-709 Minor - Professional Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-709-professional-doctoral-minor/>)
- GCAC-741 Minor - Professional Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-741-masters-minor-professional/>)

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (<https://gradschool.psu.edu/graduate-funding/>) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (<https://gradschool.psu.edu/graduate-education-policies/gsad/gsad-900/gsad-901-graduate-assistants/>) set by The Graduate School.

World Campus students in graduate degree programs may be eligible for financial aid. Refer to the Tuition and Financial Aid section (<https://www.worldcampus.psu.edu/tuition-and-financial-aid/>) of the World Campus website for more information.

Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Acoustics (ACS) Course List (<https://bulletins.psu.edu/university-course-descriptions/graduate/acs/>)

Learning Outcomes

Master of Engineering (M.Eng.)

1. **KNOW:** Graduates will demonstrate understanding of fundamental core principles and methods in Acoustics.
2. **APPLY/CREATE:** Graduates will apply their knowledge of Acoustics to analyze and solve engineering problems.
3. **THINK:** Graduates will synthesize concepts from multiple courses to solve open-ended engineering problems.
4. **COMMUNICATE:** Graduates effectively communicate through written and oral methods.
5. **PROFESSIONAL PRACTICE:** Graduates will demonstrate high standards of ethics and apply best practices in their professional activities.

Master of Science (M.S.)

1. **KNOW:** Graduates will demonstrate understanding of fundamental core principles and methods in Acoustics.
2. **APPLY/CREATE:** Graduates will apply their knowledge of Acoustics to formulate and solve complex engineering problems.
3. **THINK:** Graduates will synthesize knowledge of fundamental and applied acoustics concepts through a research experience.
4. **COMMUNICATE:** Graduates will effectively communicate their research through written and oral methods.
5. **PROFESSIONAL PRACTICE:** Graduates will demonstrate high standards of ethics related to education, research, and apply best practices in their research.

Doctor of Philosophy (Ph.D.)

1. **KNOW:** Graduates will demonstrate a thorough understanding of fundamental and advanced principles and methods of Acoustics.
2. **APPLY/CREATE:** Graduates will apply knowledge of advanced core principles and methods in formulating and executing novel research.
3. **THINK:** Graduates will conduct an analytical and critical review of existing literature related to new research areas.
4. **COMMUNICATE:** Graduates will create technical written and oral reports that meet professional presentation and publication standards in Acoustics.
5. **PROFESSIONAL PRACTICE:** Graduates will demonstrate high standards of ethics and application of best practices in their research and professional activities.

Contact

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