DOCTOR OF PHILOSOPHY IN THE FIELD OF MECHANICAL AND AEROSPACE ENGINEERING

George Washington University's mechanical and aerospace engineering program boasts areas of excellence in nanotechnology, biomimetics, biomedical engineering, and energy, in addition to its strengths in the discipline's traditional fields. Doctor of philosophy (PhD) students can pursue the following focus areas: aerospace engineering; design of mechanical engineering systems; fluid mechanics, thermal sciences and energy; robotics, mechatronics, and controls; solid mechanics and materials science; and structures and dynamics. The PhD program is designed to provide students with the training to perform original research.

Visit the departmental website (https://www.mae.seas.gwu.edu/) for additional information.

ADMISSIONS

Article	Requirement
Admission deadlines:	Fall – January 15
	Spring – September 1
	Summer* – March 1 (non-F1 visa seeking applicants)
Standardized test scores:	The GRE General Test is optional for all applicants. For applicants who want to submit scores, they must be submitted officially from ETS using the institutional code 5246.
	The Test of English as a Foreign Language (TOEFL), the academic International English Language Testing System (IELTS), or the PTE Academic is required of all applicants except those who hold a bachelor's, master's, or doctoral degree from a college or university in the United States or from an institution located in a country in which English is the official language, provided English was the language of instruction. Minimum scores:
	- Academic IELTS: an overall band score of 6.0 with no individual score below 5.0; applicants requesting funding consideration must have an overall band score of 7.0 with no individual score below 6.0; or
	- TOEFL: 550 on paper-based or 80 on Internet-based; applicants requesting funding consideration must have 600 on paper-based; or 100 on Internet-based; or
	- PTE Academic: 53; applicants requesting funding consideration must have 68.
Recommenda required:	Three (3) recommendations required. If possible, one recommendation should be from your advisor at the institution from which you earned your highest degree.
Prior academic records:	Transcripts are required from all colleges and universities attended, whether or not credit was earned, the program was completed, or the credit appears as transfer credit on another transcript. Unofficial transcripts from all colleges and universities attended must be uploaded to your online application. Official transcripts are required only of applicants who are offered admission.
	If academic records are in a language other than English, a copy in the original language and an English language translation must be uploaded. Transcript evaluations should not be uploaded. Applicants who have earned a degree from an Indian university are required to submit individual semester marksheets.
Statement of purpose:	Please write a comprehensive essay of 400 to 600 words, indicating your primary and supporting fields of study, your specialized interests, and the general subject area of your planned dissertation or professional project.
Additional requirements:	Applicants whose highest earned degree is a bachelor's degree should have a grade point average of at least 3.3 (on a 4.0 scale). Applicants whose highest earned degree is a master's degree should have a grade point average of 3.4. Applicants must demonstrate proficiency in a programming language.
	All applicants must choose an area of focus that most closely matches their interests and note this on the online application. Applicants to doctoral programs must have a bachelor's or master's degree in engineering or a related field and must demonstrate a capacity for original scholarship. Applicants to the doctoral program should identify one to three faculty members whose research interests most closely match their own and note this on the online application.
International applicants only:	Please review International Applicant Information (https://graduate.admissions.gwu.edu/international-student-application-requirements (https://graduate.admissions.gwu.edu/international-student-application-requirements/)) carefully for details on required documents, earlier deadlines for applicants requiring an I-20 or DS-2019 from GW.
	A limited number of doctoral applicants are accepted for the summer. Please contact the admissions office for details. International applicants who require a visa from GW are eligible to apply for admission in fall and spring only (not summer).

For additional information about the admissions process visit the SEAS Admissions Frequently Asked Questions (https://graduate.engineering.gwu.edu/admissions-frequently-asked-questions/) page.

Contact for questions:

engineering@gwu.edu
202-994-1802 (phone)
202-994-1651 (fax)

Hours: 9:00 am to 5:00 pm, Monday through Friday

REQUIREMENTS

The following requirements must be fulfilled:

The general requirements stated under School of Engineering and Applied Science, Doctoral Program Regulations (https://bulletin.gwu.edu/engineering-applied-science/#Doctor_of_Philosophy).

Direct-to-PhD students should complete a minimum of 36 credits of coursework and 18 credits of research. Students who enter the program with an MS degree should complete a minimum of 12 credits of coursework and 18 credits of research. The student and advisor design the curriculum to meet the student's needs and goals and can choose from the following areas of focus: aerospace engineering; design of mechanical engineering systems; fluid mechanics, thermal sciences, and energy; industrial engineering; solid mechanics and materials science; structures and dynamics; robotics, mechatronics, and controls.

Academic Procedures for MAE Doctoral Students

There are three distinct phases in the program of doctoral study in mechanical and aerospace engineering (MAE): 1) the period of preparation for the qualifying examination; 2) the qualifying examination; and, 3) the period after admission to candidacy for the PhD degree during which the student performs research leading to the doctoral dissertation. After admission to doctoral study, students in MAE are subject to specific procedures as outlined below in each of these program phases.

A. Period of preparation for the qualifying examination:

As early as possible after their admission students should identify the faculty member who will serve as their coursework and research advisor. For research assistants, the faculty member providing the financial support is also the advisor. At the beginning of each semester, the doctoral student meets with the MAE faculty advisor to evaluate the progress towards taking the qualifying examination. Coursework consists of core courses and electives that are specific to the major area of research. The qualifying examination is given twice each year, once during the first two weeks of the fall semester and once during the first two weeks of the spring semester. All students should take the examination as early as possible after they complete at least 6 credits of core courses and 6 credits of electives and maintain a minimum GPA of 3.4 Students are recommended to take the examination no later than the beginning of their third semester. In case a student does not fulfill the above requirements, they should develop a plan of action with the academic advisor, which needs to be approved by the department chair. The student should be advised of any additional coursework to be undertaken, or any additional preparation.

B. The doctoral qualifying examination:

All PhD students are required to take the doctoral qualifying examination (DQE) held in the first two weeks of each semester. They must submit the DQE notification form provided by the department by the end of the preceding semester. The examination is distributed electronically. A written proposal and an oral presentation of the chosen problem are required. The goals of the examination include the following:

1. To determine the student's aptitude and ability to do original and independent research at the doctoral level;
2. To assess the student's ability to review previous work from the literature; and,
3. To determine the student's ability to understand and apply fundamental concepts in their technical area.

Participation and subject areas—In consultation with their advisor (or faculty sponsor) the graduate student should notify the Graduate Curriculum Committee that they are taking the DQE before the end of the preceding semester by filling the DQE Notification form. The student also selects a major subject area that reflect their background and dissertation fields. The date/time of the examination will be announced by the end of the preceding semester.

Examination committee selection—The committee comprises the student's advisor (or faculty sponsor), an examination committee chair, and a third member. Co-advisors may participate as silent observers during the first attempt. The members of this committee are selected by the graduate curriculum committee in consultation with the student's advisor (or faculty sponsor). At least two out of three members of the committee should be regular faculty of the MAE department.

Topic selection—Ten calendar days before the date of the qualifying examination, each student will be assigned a research topic and one to two references related to one or more of the subject areas selected by the student. The topic is selected by the chair of the examination committee in consultation with both the student's advisor (or faculty sponsor) and the third committee member. The topic may be relevant to the student's future doctoral work but is different for each student. The topic cannot be directly related to or be part of the student's ongoing doctoral work.

Written proposal— The objective of the written proposal is to communicate how a specific research problem may be investigated. The proposal is not to exceed five pages using an 11pt Arial font, 1-inch margins, and 1.0 line spacing. The five-page limitation covers the proposal body text, as well as any figures and tables. The title page and cited references are the only sections that do not count toward the 5-page limitation. A typical written proposal has the following structure (the proposal format has been adapted from the required standard NSF proposal format):

Title page—The first page should include your name, title of your proposal, and signed academic integrity pledge (one page).

Motivation and objectives—Explain the importance of the problem, review the state of the art, and discuss critical barrier to progress in the field that the proposed project addresses. Outline the objectives of the proposed work.

Technical approach—This is the core of the proposal, where you describe the overall methodology and analyses to be used to accomplish the objectives of the project. Include how the data will be collected, analyzed.

Cited references—Cite sources for background information and technical plan (does not count towards the 5-page limit).

Oral examination—The student prepares a brief PowerPoint presentation describing their proposed approach. The examination begins with a 20-minute presentation by the student, which will be the starting point for the oral examination discussion. The presentation may lead to questions (based on the chosen subject areas and sometimes unrelated to the assigned topic and of a broader nature) related to the goals of the exam. The duration of the examination is two hours.

Exam outcome—Immediately after the end of the oral examination the committee deliberates and reach a decision on the examination outcome and convey it by email to the Graduate Curriculum Committee. All students are notified in writing of the outcome of the examination by the chair of the Graduate Curriculum Committee, one week after all exams have been completed. The notification may include conditions that the student must fulfill prior to attaining candidacy or suggestions on certain skills or areas that may need strengthening. Passing the examination requires a unanimous decision from all three committee members. Students who fail the examination in their first attempt may, upon recommendation of the examination committee and review by the Graduate Curriculum Committee, take it again later in the semester.

C. Period of Dissertation Research

After successful completion of the qualifying examination the student is admitted as a candidate for the PhD degree program and begins specialized research under the supervision of their thesis advisor. Research direction may be shared by a full-time faculty member and an outstanding external scientist or engineer, but the final responsibility for the academic aspects of the dissertation work lies with the MAE faculty thesis advisor.

Dissertation Research Proposal—During the research phase, each doctoral candidate is required to give a research proposal presentation to the Dissertation Committee. The student's research progress is assessed by the committee and appropriate suggestions for continuing research directions are solicited from those in attendance. Scheduling of the research proposal presentation is done at a minimum of one year before the final PhD defense by the student's director of research in consultation with the MAE chairman. Under no circumstances is a doctoral thesis defense allowed to proceed prior to one year after the research proposal presentation. The committee helps the student to define the research topic, and ultimately approves the research proposal. The dissertation advisor should propose the membership of the dissertation research committee, which must be approved by the department chair. Final approval rests with the Dean's office. At least three individuals should serve on the committee; the research advisor is the dissertation director (also called the advocate) and two others. Two of the committee members must be full-time faculty. Students are required to present the written dissertation proposal to the committee (two of the members must be full-time faculty) and to successfully defend the proposal in an oral defense after performing the bulk of their dissertation research. The request for proposal defense form must be filed and approved two weeks prior to the defense. The Form 5 dissertation form is presented at the proposal defense and, after a successful defense, is signed by all committee members. After the proposal defense, the student submits the revised proposal, complying with all suggestions, clarifications, and corrections, as required by the dissertation committee, along with the signed Form 5 to the director of doctoral research, i.e. thesis advisor and to the departmental advanced degree program coordinator for the PhD program. They forward the Form 5 to the department chair for signature.

Dissertation Defense: The research advisor may decide that the research achieved by the doctoral student is sufficient to satisfy the requirement of the degree. They propose an examining committee for the purpose of administering the final dissertation examination (dissertation defense). The committee of examiners must consist of a minimum of five members, at least three of whom are normally full-time faculty members with scholarly specialties within the area of concentration; at least one member will normally be from an academic specialty outside the area of concentration. It is required that an external examiner be invited. The research advisor serves on the examining committee both as advocate and as a non-voting committee member. The committee elects its own chairman, who should not be the research advisor, or if different, the student's faculty advisor, as its first order of business. The dissertation examining committee must be approved by the department chairperson prior to the date of the defense. Each member of the examination committee, no later than 3 weeks prior to the defense, should receive a copy of the dissertation. At the same time, the candidate must provide a 350-word abstract and other information to the department office for the purpose of preparing an announcement of the defense.

The dissertation defense is an oral examination, which is open to the public. When the dissertation is accepted as complete, it should be submitted electronically no later than the date specified by the Office of the Registrar.

Seminar and Colloquia Requirements—Prior to graduation, doctoral students must complete the Department of Mechanical and Aerospace Engineering MAE seminar attendance requirement, whereby the student must attend at least 80 percent of the MAE seminars offered during any two semesters of the student's enrollment. For a seminar to count toward the requirement, the student must be present for the duration of the seminar. To track attendance, the student must obtain a certification signature on

the MAE Seminar Attendance Form from an MAE faculty member present at the seminar and submit the completed form to the MAE departmental office at the end of the semester. The student may attempt to fulfill this requirement in as many semesters as needed. This requirement is applicable to doctoral students who matriculate during the 2016-2017 academic year or later.

Graduation and scholarship requirements—Students are responsible for knowing the University's minimum GPA requirement for graduation and scholarships available in the Graduation and Scholarship Requirements (https://bulletin.gwu.edu/engineering-applied-science/#graduation_requirments_phd) section of this Bulletin. Students should contact the department for additional information and requirements.