AEROSPACE ENGINEERING, PHD

for the degree of Doctor of Philosophy in Aerospace Engineering

department head: Gregory Elliott (elliottg@illinois.edu)
director of graduate studies: Daniel Bodony (bodony@illinois.edu)
overview of admissions & requirements: https://aerospace.illinois.edu/admissions/graduate
overview of grad college admissions & requirements: https://grad.illinois.edu/admissions/apply
department website: https://aerospace.illinois.edu/
program website: https://aerospace.illinois.edu/academics/graduate/phd-program
department faculty: https://aerospace.illinois.edu/directory/faculty
college website: https://grainger.illinois.edu/
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The Department of Aerospace Engineering offers both a traditional doctoral program and a direct doctoral program (https://aerospace.illinois.edu/academics/graduate/phd-program/phd-student-status-and-requirements/direct-phd). Students in both programs are required to have a research advisor and applicants are encouraged to contact department faculty (https://aerospace.illinois.edu/directory/faculty) in their areas of interest to inquire about possible research and funding opportunities.

Opportunity exists for specializing in computational science and engineering via the Computational Science & Engineering (http://catalog.illinois.edu/graduate/engineering/concentration/computational-science-engineering) optional graduate concentration.

Admission Requirements

The Department of Aerospace Engineering accepts applications for admission to both the traditional doctoral program and the direct doctoral program per the following deadlines:

Fall Admission
For admission and full consideration for funding opportunities: January 1

Spring Admission
For admission and full consideration for funding opportunities: October 8

Typically, the prerequisite for graduate study is the equivalent of the BS in Aerospace Engineering (https://aerospace.illinois.edu/academics/undergraduate); however, graduates of curricula leading to degrees in other fields of engineering, the physical sciences, or mathematics may also be admitted to advanced study. A minimum grade point average of 3.00 (A = 4.00) for the last two years of undergraduate study is required. However, having a GPA higher than the minimum is no guarantee of admission. Scores on the Graduate Record Examination (GRE) (http://ets.org) general test are required of all applicants. There are no GRE minimum score requirements.

Applicants to the Aerospace Engineering graduate program are asked to complete a supplemental form that will capture additional information about their specific interests. Applicants receive an email after submitting the online application which contains the link to the supplemental form. Applicants may select up to three areas from the following list:

- additive manufacturing
- aeroacoustics
- aerodynamics
- aeroelasticity
- autonomous vehicles
- aerospace structures
- aerospace systems design and simulation
- applied aerodynamics
- astrodynamics
- combustion and propulsion
- composite materials
- computational fluid mechanics
- dynamical systems and estimation
- experimental fluid mechanics
- flow control
- fracture mechanics and fatigue
- GPS
- hypersonics
- information technology
- laser and optical diagnostics
- nanomechanics
- nanosatellites
- plasma physics
- robotics
- space environment and space mission design
- spacecraft systems
- structural mechanics
- structural dynamics
- structural design
- additive manufacturing
- aeroacoustics
- aerodynamics
- aeroelasticity
- autonomous vehicles
- aerospace structures
- aerospace systems design and simulation
- applied aerodynamics
- astrodynamics
- combustion and propulsion
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- dynamical systems and estimation
- experimental fluid mechanics
- flow control
- fracture mechanics and fatigue
- GPS
- hypersonics
- information technology
- laser and optical diagnostics
- nanomechanics
- nanosatellites
- plasma physics
- robotics
- space environment and space mission design
- spacecraft systems
- structural mechanics
- structural dynamics
- structural design

All applicants whose native language is not English are required to submit the results of the TOEFL (http://www.toefl.org) or International English Language Testing System (IELTS) (http://www.ielts.org) as evidence of meeting the English proficiency requirements for full admission status (http://grad.illinois.edu/admissions/instructions/04c). Under certain circumstances applicants may be exempt (https://grad.illinois.edu/admissions/instructions/04c) from the TOEFL/IELTS requirement.

Applicants who are non-native speakers of English and who wish to be considered for teaching assistantships must provide evidence (https://grad.illinois.edu/admissions/taengprof.htm) of spoken English language proficiency. Specifically, they must score 24 or higher on the SPEAK portion of the TOEFL exam and 8 or higher on the speaking sub-section of the IELTS.

For full information on admission requirements and how to apply, see the department's graduate programs Web site (https://aerospace.illinois.edu/academics/graduate).

Financial Aid

Financial aid for graduate students in thesis graduate programs is available in the form of fellowships (https://grad.illinois.edu/fellowships/about), as well as teaching and research assistantships (https://grad.illinois.edu/assistantships). Starting in Fall 2020, Grainger Engineering PhD students in their first five years of enrollment who meet the minimum eligibility requirements (https://grainger.illinois.edu/academics/graduate/phd-funding-guarantee) are guaranteed a funded appointment for fall and spring that includes a full tuition waiver, a partial fee waiver, and a stipend. A block grant from the National Aeronautics and Space Administration supports a multidisciplinary research and training program. Qualified candidates are considered for financial support upon application. In addition, graduate students making
satisfactory progress toward their degrees may also be considered for financial support.

All applicants, regardless of US citizenship, whose native language is not English and who wish to be considered for teaching assistantships must demonstrate spoken English language proficiency (http://www.grad.illinois.edu/admissions/taengprof.htm) by achieving a minimum score of 24 on the speaking subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the TOEFL or IELTS, a minimum score of 4CP is required on the EPI test (http://cte.illinois.edu/testing/oral_eng/epi_overview.html), offered on campus. All new teaching assistants are required to participate in the Graduate Academy for College Teaching (https://citl.illinois.edu/citl-101/teaching-learning/grad-academy-for-college-teaching) conducted prior to the start of the semester.

**Graduate Teaching Experience**

PhD students are required to hold a 25% teaching assistantship for at least one semester in order to meet the requirements for the Department of Aerospace Engineering doctoral program. Information about teaching assistantships can be found on the department's teaching assistantships Web site (https://aerospace.illinois.edu/academics/graduate/funding-fees-and-fellowships/teaching-assistantships).

**Department Research**

Research activities in the Department of Aerospace Engineering encompass a wide range of problem areas in aerospace engineering and related engineering disciplines as described on the department’s research area Web site (https://aerospace.illinois.edu/research).

There are several nationally renowned interdisciplinary centers in The Grainger College of Engineering where Aerospace Engineering faculty members engage in research along many other campus faculty. A list of these, along with links to full descriptions, appears at the department’s interdisciplinary centers Web site (https://aerospace.illinois.edu/research/interdisciplinary-centers). Among these are the Beckman Institute for Advanced Science and Technology, Center for Exascale Simulation of Plasma-Coupled Combustion (XPACC), Coordinated Science Laboratory (CSL), Micro and Nanotechnology Laboratory, National Center for Supercomputing Applications (NCSA), Air Conditioning and Refrigeration Center (ACRC), Information Trust Institute (ITI), Center for UAS Propulsion (CUP), and Center for Cryogenic High-Efficiency Electrical Technologies for Aircraft (CHEETA).

Members of the Aerospace Engineering Department have access to a wide range of excellent research facilities. These laboratories support a wide range of activity and are described at the department’s research facilities Web site (https://aerospace.illinois.edu/research/research-facilities).

**Other Graduate Programs in the Department of Aerospace Engineering**

degrees:

Aerospace Engineering, MS (http://catalog.illinois.edu/graduate/engineering/aerospace-engineering-ms)

optional concentrations:

- Computational Science & Engineering (http://catalog.illinois.edu/graduate/engineering/concentration/computational-science-engineering)

concentrations:

Aerospace Systems Engineering (http://catalog.illinois.edu/graduate/engineering/engineering-meng/aerospace-systems) available for:

- Engineering, MENG (http://catalog.illinois.edu/graduate/engineering/engineering-meng)

The Department of Aerospace Engineering (AE) offers graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in Aerospace Engineering and a Master of Engineering in Engineering degree with a concentration in Aerospace Systems Engineering. The AE graduate program provides students with a strong background in engineering and applied science while placing emphasis on aircraft and spaceflight engineering. Students may major in one of the following general areas: aerodynamics, astrodynamics, combustion and propulsion, control systems, dynamical systems, fluid mechanics, structural mechanics, materials, and space systems.

Opportunity also exists for specializing in energy and sustainability engineering via the

Energy and Sustainability Engineering (EaSE) Graduate Certificate Option (http://ease.illinois.edu) for the degree of Doctor of Philosophy in Aerospace Engineering

For additional details and requirements, refer to the department’s Website (http://aerospace.illinois.edu) and the Graduate College Handbook (https://grad.illinois.edu/gradhandbook).

**Entering with an approved M.S. Degree**

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>AE 599</td>
<td>Thesis Research (min-max applied toward degree)</td>
<td>40</td>
</tr>
<tr>
<td>AE 590</td>
<td>Seminar (continuous registration through the 4th semester after the qualifying exam for 0 hours)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>One advanced 500-level mathematics course from an approved list</td>
<td>3-4</td>
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<tr>
<td></td>
<td>Elective courses – chosen in consultation with advisor (subject to Other Requirements and Conditions below)</td>
<td>20-21</td>
</tr>
<tr>
<td></td>
<td>Total Hours</td>
<td>64</td>
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**Other Requirements and Conditions**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
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<tbody>
<tr>
<td>Minimum GPA:</td>
<td>3.0</td>
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<tr>
<td></td>
<td>A minimum of 8 hours of AE course credit overall at the 500-level, beyond the master’s degree.</td>
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<tr>
<td></td>
<td>A minimum of 16 credit hours overall at the 500 level, beyond the master’s degree, including the 8 hours of 500-level AE courses.</td>
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<tr>
<td></td>
<td>A maximum of 4 hours of AE 597 (or other independent study) may be applied toward the elective coursework requirement.</td>
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<td>A 25% or more teaching assistantship for at least one semester.</td>
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</table>
### Qualifying Exam Information

<table>
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<tr>
<td>Minimum GPA</td>
<td>3.0</td>
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<td></td>
</tr>
<tr>
<td>A 25% or more teaching assistantship for at least one semester.</td>
<td></td>
</tr>
<tr>
<td>Qualifying exam</td>
<td>Yes</td>
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<tr>
<td>Preliminary exam</td>
<td>Yes</td>
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<tr>
<td>Final exam or dissertation defense</td>
<td>Yes</td>
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<tr>
<td>Dissertation deposit</td>
<td>Yes</td>
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</tbody>
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### Entering with an Approved B.S. Degree

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 599</td>
<td>Thesis Research (min-max applied toward degree)</td>
<td>48</td>
</tr>
</tbody>
</table>

**Coursework:** 48 Hours of 500-level coursework, including 12 hours of 500-level AE coursework

- 7-8 hours of Math (4 of the 7-8 taken must be at the 500-level and count toward the 24 hour requirement)
- 20-21 hours of 400/500 elective AE coursework per advisor approval

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 590</td>
<td>Seminar (continuous registration through the 4th semester after the qualifying exam for 0 hours)</td>
<td>0</td>
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**Total Hours:** 96

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### Other Requirements and Conditions

- **Qualifying Exam Information**

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*Information listed in this catalog is current as of 06/2020*