Twin Cities Campus

Aerospace Engineering and Mechanics Ph.D.

Aerospace Engineering & Mechanics

College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
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- Program Type: Doctorate
- Requirements for this program are current for Fall 2019
- Length of program in credits: 66
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Aerospace Engineering and Mechanics offers a PhD degree in aerospace engineering and mechanics. The PhD program emphasizes engineering sciences that are basic to fluid mechanics, aerospace systems, and solid mechanics. Theoretical, analytical, experimental, and computational aspects of these fields are covered by the courses and research opportunities offered by the department.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

The preferred undergraduate GPA for admittance to the program is 3.20.

A four-year BS degree in an engineering, basic science, or mathematics program is required.

Other requirements to be completed before admission:
Admission depends primarily on the applicant's undergraduate record, personal statement, and letters of recommendation.

Special Application Requirements:
GRE scores are not required but are strongly recommended for students applying for graduate fellowships. In all cases, these test scores are taken into account if provided. Students are admitted fall semester only. Only under unusual circumstances are students allowed to begin their studies at another time during the academic year.

The application deadline is December 15. Additional information is available at aem.umn.edu/teaching/graduate/.

International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations(TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of March 29, 2024

Program Requirements

12 to 30 credits are required in the major.
12 to 30 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

The PhD program emphasizes coursework and research in engineering sciences that are basic to this field. Options include coursework and research in aerodynamics and aerospace systems, dynamical systems, material properties, and fluid and solid behavior.

The PhD requires about two years of coursework, but the heart of the program is the student's thesis research. The first year of the PhD program is similar to the master's program and most PhD students receive the master's degree. The second year is devoted to more advanced courses and beginning research. Subsequent years include some coursework with increased focus on research. The time required to complete a research project varies, but most students finish the PhD within five years after the bachelor's degree.

The program must include a minimum of 42 credits of approved courses; of these, a minimum of 12 credits must be in AEM courses at the 5xxx or 8xxx level and a minimum of 12 credits outside the major are required. Four semesters of seminar attendance are required (AEM 8000), but only one credit may be used towards the course credit requirements. The remaining 18 course credits may be taken in the major or in any supporting field. No more than 8 credits of 4xxx level courses and no more than 13 credits taken as S/N are allowed.

Required Courses

Take one 2-course sequence in fluids, solids or dynamics

Fluids

AEM 8201 - Fluid Mechanics I (3.0 cr)
AEM 8202 - Fluid Mechanics II (3.0 cr)

Solids

AEM 5501 - Continuum Mechanics (3.0 cr)
AEM 5503 - Theory of Elasticity (3.0 cr)

Dynamics

AEM 5401 - Intermediate Dynamics (3.0 cr)
AEM 8411 - Advanced Dynamics (3.0 cr)

Additional Major Credits

Take an additional 6 credits in AEM at the 5xxx or 8xxx level. The following sequences in controls or computational fluid mechanics may be used, or any other AEM courses chosen in consultation with adviser.

Controls

AEM 5321 - Modern Feedback Control (3.0 cr)
AEM 5451 - Optimal Estimation (3.0 cr)
AEM 8421 - Robust Multivariable Control Design (3.0 cr)

Computational Fluid Dynamics

AEM 5253 - Computational Fluid Mechanics (3.0 cr)
AEM 8253 - Computational Methods in Fluid Mechanics (3.0 cr)

Minor or Supporting Program

Take 12 credits in a minor or supporting program outside AEM

Seminar

1 credit of AEM 8000 may be used towards program credit requirements.
AEM 8000 - Seminar: Aerospace Engineering and Mechanics (1.0 cr)

Thesis Credits

Take 24 credits after passing preliminary oral exam
AEM 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

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