

# Doctor of Philosophy in Aerospace Engineering

1. A baccalaureate degree in an accredited engineering or related discipline with a GPA of 3.5 or higher or a Master of Science degree in an engineering or related discipline.
2. Satisfy the School of Graduate Studies' English Language Proficiency requirements as published in the Academic Catalog.
3. In addition to meeting the general provisions in the UND Academic Catalog and the minimum requirements in items 1-2 above, candidates are assessed using a holistic process that considers the student's record of publications, transcripts of previous college work, relevant research and work experience, letters of recommendation, research interests, and English language skills. Students are strongly encouraged to contact individual faculty members in their area of research interest prior to applying.
4. Students admitted to the master's in Aerospace Engineering and Mechanical Engineering graduate programs, and meeting the minimum requirements in items 1-2 above, may, after one calendar year and upon the recommendation of his/her advisory committee, request to by-pass the master's degree and work directly toward the Ph.D. degree. If the request is approved by the student's advisory committee, the student will be given the qualifying exam. Passing this exam will advance the student to Approved Status in the Doctoral Program in Aerospace Engineering.

- Fluid Mechanics and Aerodynamics
- Thermodynamics and Heat transfer
- Flight Dynamics and Control
- Robotics
- Materials Science
- Structural Dynamics and Vibration
- Compressible flow and gas dynamics
- Computational Fluid Dynamics

Topics for the examinations should be selected in consultation with the student's advisor.

Qualifying examinations will be offered once per year during the fifth week of the spring semester. Students must notify the Graduate Director no later than the end of the second week of the spring semester of 1) their intention to take the exams, 2) their selected exam topics. No student will be required to complete more than two exams per day. Each exam will be two hours in length. No later than the 10<sup>th</sup> week of each fall semester, faculty that will be administering spring exams will determine what, if any, reference materials students will be allowed to use during their exam. A list of potential exam administrators will be available from the Graduate Director. Students should consult individual faculty as the allowable materials may vary from exam to exam.

Students will be awarded a grade of pass (score of 80% or higher on all exams), conditional pass (80% or higher on three exams), or fail. Students achieving a grade of conditional pass may be required to retake the exam on which they scored <80%, enroll in specific courses, or complete other remedial actions at the discretion of the examining faculty and the student's advisory committee. Students failing (<80%) two or three exams will be required to retake all four exams. Examination retakes must occur during the next regular qualifying examination period. Students failing all four exams will be removed from the PhD program at the end of the semester in which the exams were taken. Students failing an exam area more than once will be removed from the PhD program at the end of the semester in which the exam was retaken.

A direct admit student who fails an exam a second time may request to be reclassified as a Master's student at the discretion of the student's advisor and the Graduate Director.

## Financial Assistance

Financial aid in the form of teaching and research assistantships is available on a competitive basis. Students seeking financial aid should complete their applications by February 15<sup>th</sup> for Fall or Summer admission and September 15<sup>th</sup> for Spring admission to be given full consideration. Assistantships are renewable for up to four years of support if progress toward the degree and instructional/research service are satisfactory, subject to the availability of funding. Students should contact faculty in their area(s) of research interest to inquire about funding availability for upcoming terms.

## Degree Requirements

Students seeking the Doctor of Philosophy degree at the University of North Dakota must satisfy all general requirements set forth by the School of Graduate Studies as well as particular requirements set forth by the Aerospace Engineering Doctoral Program. The following requirements are in addition to the UND School of Graduate Studies general requirements for the Ph.D.:

1. 90 semester credits beyond the baccalaureate degree must be completed.
2. A 3.0 GPA must be maintained for all classes completed as a graduate student.
3. Scholarly Tools: Proficiency in mathematics must be demonstrated by completing nine approved credits of mathematics intensive coursework (equivalent to UND 400-level or higher courses) with a grade of B or better.
4. A maximum of 30 credit hours can be transferred from a master's program.
5. A minimum of 30 credit hours must be doctoral research and dissertation.
6. Exactly 3 credit hours of the ME 562 or ChE 562– Graduate Seminar must be taken.
7. A minimum of 39 credit hours of non-research/dissertation coursework is required (up to 21 credit hours of coursework may be transferred from a master's program in fulfilling this requirement subject to the credit transfer limits described in the general section of this Academic Catalog). The coursework shall include a minimum of 27 credit hours of Aerospace Engineering (or relevant courses with the consent of the student's advisor and advisory committee) coursework selected from the approved list of graduate level courses published in the UND Academic Catalog. Equivalent graduate level coursework may be transferred from a master's program.
8. Four (4) written qualifying examinations must be successfully completed. They must be taken no later than the end of their second year of residence. One of the exam topics must be applied mathematics. The other examination topics must be selected from the following list:
  1. PhD students will complete a preliminary examination at least one year prior to their planned graduation date. The examination will consist of an oral presentation to their thesis committee of their progress to date and expected work to complete their degree. The committee will assess the presentation, progress and plan on a pass/fail basis. The preliminary examination must be passed prior to graduation. A student who fails the process more than once will be removed from the PhD program.
  2. A candidate for the degree must complete the original basic research investigation as documented in the research proposal. Each candidate will complete the research investigation to the satisfaction of the research advisor and the advisory committee and will prepare a written dissertation covering the research. The project must represent an original and independent investigation by the student. It is expected that the results of the research will be submitted for publication in refereed research journals. The candidate will submit the dissertation to the examining committee at least four weeks prior to defense date. The examining committee consists of the student's advisory committee and an external examiner from outside the Department. The Department encourages the addition of a member from outside the University.
  3. The candidate must present and successfully defend the dissertation at the final examination (see School of Graduate Studies requirements (<https://und.edu/academics/graduate-school/>)). Four results of the examination can be obtained: 1) pass; 2) minor revision 3) major revision and 4) fail. For minor revisions there is no need for another defense session and upon revising the dissertation the examining committee can pass the student. For major revisions the student is asked to fundamentally revise the methodologies and schedule another defense session. If failed, the student will not be able to obtain a PhD degree and may request to be reclassified as a master's student and complete a master's degree.
  4. The candidate, with the consent of their advisor, must submit at least one peer reviewed journal article (as the first author), submit one conference paper (as the first author), and make one conference presentation.

## Residence Requirements

The purpose of residence requirements is to provide an opportunity for a sustained and concentrated intellectual effort, to provide for immersion in an academic research environment, and to permit extensive interaction with fellow students and faculty of the department and college. Within the first two years of graduate work at UND, at least two consecutive semesters must be completed in residence. During residency, a student must be taking the appropriate credits to qualify as a full-time student. The student's program of study must be completed within the seven-year period normally allowed for graduate programs.

Under special circumstances, the student in conjunction with his/her advisory committee and the Graduate Faculty, can petition the Dean of the School of Graduate Studies for variances in this policy.