

Guidelines on PhD AE Qualifying Exams

Purpose of Qualifying Exams

Prior to being formally admitted to candidacy for the PhD AE degree, the student must demonstrate knowledge of aerospace engineering fundamentals by passing qualifying exams (QE). The purposes of the qualifying exams are:

- To motivate students to review course work learned that lays foundations for PhD research
- To determine the student's ability to understand fundamental concepts and potential to pursue doctoral research
- To identify areas that need to be strengthened for the student to be successful in PhD research

Subject Areas of Qualifying Exams

The qualifying exams cover core areas of aerospace engineering and fundamentals of mathematics. A student is required to take:

- Qualifying exam in mathematics
- Qualifying exam in a the chosen Area of Concentration

Specifically, the qualifying exams will be offered annually in Mathematics and all three areas of concentration: a.) Aerodynamics and Propulsion, b.) Structures & Materials, and c.) Dynamics & Control

Qualifying subject exam in Mathematics

This exam is composed of required topics and elective topics.

Required Topics

1. Mathematics for engineers
2. Ordinary differential equations

Elective Topics (select two):

1. Partial differential equations
2. Numerical analysis
3. Optimization
4. Linear algebra

Reference Courses for Qualifying Exam Preparation in Mathematics

Ordinary differential equations	MA 345
Mathematics for engineers	MA 441
Partial differential equations	MA 502
Optimization	AE 526 and MA 510
Numerical analysis	EP 501
Numerical linear algebra	MA 532

Qualifying subject exam in Aerodynamics & Propulsion

This exam is based on three graduate core courses in the concentration:

1. Advanced Compressible Flow (AE 504)
2. Advanced Incompressible Aerodynamics (AE 528)
3. Viscous flow (AE 521)

A student is required to select two out of the three topics.

Reference Courses for Qualifying Exam Preparation in Aerodynamics & Propulsion

Compressible flow	AE 504
Incompressible aerodynamics	AE 528
Viscous Flow	AE 521

Qualifying subject exam in Structures & Materials

This exam is based on three graduate core courses in the concentration:

1. Introduction to Continuum Mechanics (AE 548)
2. Introduction to the Finite Element Method (AE 514)
3. Analysis of Aircraft Composite Materials (AE 522)

A student is required to select two out of the three topics.

Reference Courses for Qualifying Exam Preparation in Structures & Materials

Continuum Mechanics	AE 548
Finite element method	AE 514
Composite materials	AE 522

Qualifying subject exam in Dynamics & Control

This exam is based on three graduate core courses in the concentration:

1. Linear Systems (AE 523)
2. Modern Control Systems (AE 527)
3. Analytical Dynamics (AE 544)

A student is required to select two out of the three topics.

Reference Courses for Qualifying Exam Preparation in Dynamics & Control

Linear Systems	AE 523
Modern control systems	AE 527
Analytical Dynamics	AE 544

Qualifying Exam Schedule

The qualifying exams are offered in May, usually the week right after the spring semester's final exams period. The qualifying exams are offered in two consecutive days with concentration QE on day one and Math QE on day two.

A student must take both Math QE and concentration QE within one year of being admitted to PhD AE program, including those admitted to the program with BS degree.

Exceptional master students may be allowed to take the qualifying exams after one year in the master program, provided that they have taken the GRE test and have the permission of their advisor.

A student who plans to take the qualifying exams must file a request form at least one month before the exams. If a student plans to take a Math QE, he/she must select two topics from the list of Math electives above. The request form must be signed by the student's dissertation advisor.

Grading of Qualifying Exam

One of the following grades will be assigned to a student for each QE taken:

- Pass
- Pass with conditions
- Fail

2 *Guidelines on PhD AE Qualifying Exams*

If a student fails both the Math QE and the concentration QE, the student will be dismissed from the PhD AE program.

If a student fails either the Math QE or the concentration QE, the student must take and pass the make-up exam in the immediate following August, during the first week of the fall semester. Otherwise, the student will be dismissed from the PhD AE program. Oral exams may be given as part of the make-up exam.

If a student receives "Pass with Conditions" in an exam, the QE committee may decide to put conditions (e.g. taking an additional course) for a passing grade. After the conditions are satisfied, the grade becomes a "Pass".