

**Graduate Mathematics Requirement
Department of Aeronautics and Astronautics
September 2023**

The Department's policy regarding the math requirement is as follows. For SM students, 12 units of total credit are required, and for PhD students, 24 units of total credit are required.

The following subjects may be used to fulfill the graduate math requirement:

- 1) Any subject offered by the Department of Mathematics designated as graduate level (or as being graduate level for students who are not Mathematics majors). Typical classes taken include:

- 18.0851: Comp Science & Engineering 1
- 18.0651: Matrix Methods
- 18.335: Intro: Numerical Methods
- 18.1021: Intro to Functional Analysis
- 18.408: Topics in Theoretical Comp Sci
- 18.1002: Real Analysis
- 18.6501: Fundamentals of Statistics
- 18.657: Topics in Statistics

- 2) Selected subjects offered by departments other than Mathematics can also be used toward the math requirement. The list of acceptable subjects is as follows:

A. Probability and Statistics

- 6.7710 (6.262) Discrete Stochastic Processes
- 6.7720J (6.265J)/15.070J Advanced Stochastic Processes
- 6.3702 (6.431) Intro to Probability
- 6.7770J (6.436J) /15.085J Fundamentals of Probability
- 14.382 Econometrics I
- 16.391 Statistics for Engineers and Scientists (formerly co-listed with 6.434)
- 16.470J/ESD.756J Statistical Methods in Experimental Design
- IDS.147J/15.077J Statistical Learning and Data Mining
- IDS.700J/1.203J/15.073J Applied Probability and Stochastic Modeling

B. Optimization

- 6.7210J (6.251J)/15.081J/Intro to Mathematical Programming
- 6.8160 (6.881) Advanced Topics in AI, when taught as Optimization for Machine Learning
- 15.083J/6.8530J (6.859J) Interactive Data Visualization
- 15.084J/6.7220J (6.252J) Nonlinear Optimization
- 15.093J/6.7200J (6.255J) Optimization Methods
- 15.094J/1.142J Robust Modeling, Optimization & Computation
- 15.095 Machine Learning under a Modern Optimization Lens

C. Numerical Methods

- 16.858: Intro to Discrete Math and Systems Theory for Engineers
- 16.920J/2.097J/6.7330J (6.339J) Numerical Methods for Partial Differential Equations
- 16.940 Numerical Methods for Stochastic Modeling & Inference

The faculty acknowledge that mathematics is an integral part of all engineering curricula, but it is our experience that taking additional math subjects can add significantly to a student's problem-solving capabilities. Thus, the intent of this graduate math requirement is to give students exposure to new, advanced, mathematical concepts taught at the graduate level in a rigorous and mostly mathematical context, rather than as applied to aeronautics and astronautics problems.

In cases where a Course 16 subject is jointly listed, AeroAstro students would register under the Course 16 number. Also, please check the current MIT Course Catalogue for course descriptions and years offered.

The course list given above is a living document that will be frequently updated by the Graduate Committee. Student petitions to add courses will not be accepted. Faculty can ask to add a course to the list through a discussion within one of the three Sectors. After approval by the Sector, the petitions would then come to the Graduate Committee from the Sector Heads at least 2 weeks prior to the Fall registration date.

For PhD students, the subjects used to fulfill this math requirement may also be used in the student's major and minor program (subject to approval by the student's doctoral committee and, if appropriate, minor advisor). Further, subjects from an SM earned at MIT can be used to satisfy this PhD math requirement.

