Department of Aeronautics and Astronautics
Graduate Field Evaluation Subjects – AY2023-2024

*Please note, these requirements apply to students who matriculated Fall 2023 or later.

Air Sector

1. Aerospace, Energy and the Environment

Structure: Students are required to take the Core Subject. Students must then choose at most one subject from the other categories for a total of 3 subjects.

A. Core Subject

B. Air Transportation
16.72: Air Traffic Control OR
16.886: Air Transportation Systems Architecting OR
16.781: Planning and Design of Airport Systems

C. Energy and Fuels
2.28: Fundamentals and Applications of Combustion OR
2.62: Fundamentals of Advanced Energy Conversion OR
2.65: Sustainable Energy

D. Aircraft Design
16.110: Flight Vehicle Aerodynamics OR
16.885: Aircraft Systems Engineering

E. Environmental Science
12.806: Atmospheric Physics and Chemistry OR
1.84/10.817/12.807 Atmospheric Chemistry

F. Propulsion
16.511: Aircraft Engines and Gas Turbines
16.530: Advanced Propulsion Concepts (previously offered SP21 as 16.S598)

G. Energy and Environmental Policy
IDS.410: Modeling and Assessment for Policy
2. Air-breathing Propulsion

Students must choose Core Subject, and two Additional Subjects.

Core Subject:
16.511: Aircraft Engines and Gas Turbines

Additional Subjects:
2.25: Advanced Fluid Mechanics
2.28: Fundamentals and Applications of Combustion
16.120: Compressible Flow
16.540: Internal Flows in Turbomachines

3. Aircraft Systems Engineering


16.110: Flight Vehicle Aerodynamics
16.511: Aircraft Engines and Gas Turbines
16.343: Spacecraft and Aircraft Sensors and Instrumentation
16.888: Multidisciplinary Design Optimization

16.422: Human Supervisory Control of Automated Systems OR
16.453: Human Systems Engineering

16.885: Aircraft Systems Engineering OR
16.886: Air Transportation Systems Architecting
4. Air Transportation Systems

Structure: Students must choose the Core Subject and two additional subjects.

Core Subject:
16.71: The Airline Industry

Additional Subjects:
16.763: Air Transportation Operations Research
16.781: Planning and Design of Airport Systems
Computing Sector

5. Aerospace Computational Engineering

Structure: Students must choose the two Core Subjects, and one subject from the remaining sections.

A. Core Subjects
16.920: Numerical Methods for Partial Differential Equations
18.335: Introduction to Numerical Methods

B. Probability and stochastic modeling
6.7700: Fundamentals of Probability OR
16.940: Numerical Methods for Stochastic Modeling and Inference

C. Optimization methods
6.7200: Optimization Methods OR
6.7220: Nonlinear Optimization

D. Fluid mechanics
2.25: Fluid Mechanics OR
16.110: Flight Vehicle Aerodynamics OR
16.13: Aerodynamics of viscous fluids OR
16.540: Internal Flows in Turbomachines

E. Mechanics of solid materials
2.071: Mechanics of Solid Materials OR
16.225: Computational Mechanics of Materials
6. Autonomous Systems

Structure: Students must choose the Core Subject.

Core Subject:
16.413: Principles of Autonomy

Additional Subjects:
6.4212: Intelligent Robotic Manipulation
6.7900: Machine Learning
6.8210: Underactuated Robotics
9.660J: Computational Cognitive Science
16.32: Principles of Optimal Control and Estimation
16.332 Formal Methods for Safe Autonomous Systems
16.412: Cognitive Robotics
16.420: Planning under Uncertainty
16.485: Visual Navigation for Autonomous Vehicles

7. Communications and Networking

Structure: Students must take two Core Subjects.

Core Subjects:
16.393 Statistical Communication and Localization Theory
*and* one of 16.37: Data Communication Networks or 16.363 Communication Systems and Networks

Additional Subjects:
6.3702: Introduction to Probability
6.7200: Optimization Methods
6.7210: Introduction to Mathematical Programming
6.7470: Theory of Information
6.7700: Fundamentals of Probability
16.391: Statistics for Engineers and Scientists
8. Controls

Structure: Students must choose the Core Subject.

Core Subject:
16.31: Feedback Control Systems

Additional Subjects:
6.7100: Dynamic Systems and Control
6.7940: Dynamic Programming and Reinforcement Learning
6.8210: Underactuated Robotics
16.32: Principles of Optimal Control and Estimation
16.420: Planning under uncertainty
16.485: Visual Navigation for Autonomous Vehicles
**Space Sector**

**9. Engineering Systems**

Structure: Students must choose at least two Core Subjects.

Core Subjects:
- 16.842: Fundamentals of Systems Engineering
- 16.863: System Safety Concepts
- 16.888: Multidisciplinary Design Optimization

Additional Subjects:
- 16.851: Satellite Engineering
- 16.89/IDS.339: Space Systems Engineering
- 16.887/EM.427: Technology Roadmapping and Development Technology
- 16.895J: Engineering Apollo: The Moon Project as a Complex System
- 16.453: Human Systems Engineering
- 16.851: Satellite Engineering

**10. Humans in Aerospace**

Structure: Students must choose at least two Core Subjects.

Core Subjects:
- 16.453: Human Systems Engineering
- HST.154/2.792/6.4820 Quantitative and Clinical Physiology*
- 16.422: Human Supervisory Control of Automated Systems (alternate years)
- 16.423: Aerospace Biomedical and Life Support Engineering (alternate years)
- 16.470: Statistical Methods in Experimental Design

Additional Subjects:
- 16.456/HST.582 Biomedical Signal and Image Processing
- 2.183J/9.34J Neural Control of Movement
- 16.413: Principles of Autonomy
- 16.89: Space Systems Engineering
- 16.895: Engineering Apollo: The Moon Project as a Complex System
- 16.893: Engineering the Space Shuttle

*This course will be co-listed as a special Course 16 number for 2023-2024
11. Materials and Structures

All students must take:
2.071: Mechanics of Solid Materials OR ES240: Solid Mechanics (Harvard University)

Plus, two of the following subjects:
16.221: Structural Dynamics
16.223: Mechanics of Heterogeneous Materials
16.225: Computational Mechanics of Materials
16.235: Design with High Temperature Materials

12. Space Propulsion and Plasmas

Structure: Students must choose at least one Core Subject.

Core Subjects:
16.522: Space Propulsion
16.55: Ionized Gases

Additional Subjects:
2.25: Fluid Mechanics
2.28: Fundamentals and Applications of Combustion
2.62: Fundamentals of Advanced Energy Conversion
5.68: Kinetics of Chemical Reactions
6.210: Electromagnetic Fields, Forces and Motion
8.311: Electromagnetic Theory I
16.346: Astrodynamics
16.512: Rocket Propulsion
22.611: Introduction to Plasma Physics I
22.612: Introduction to Plasma Physics II
22.67: Principles of Plasma Diagnostics
13. Space Systems

All students need to take the sequence*
16.842 Fundamentals of Systems Engineering
16.851 Introduction to Satellite Engineering
16.89/IDS.339: Space Systems Engineering

Plus at least one of the following subjects:
16.343: Spacecraft and Aircraft Sensors and Instrumentation
16.346: Astrodynamics
16.363: Communication Systems and Networks
16.853: Advanced Satellite Engineering
16.863: System Safety Concepts
16.888: Multidisciplinary Design Optimization
16.89: Space Systems Engineering