AEROSPACE ENGINEERING MAJOR

Aerospace engineering concerns processes involved in design, manufacture and operation of aerospace vehicles within and beyond planetary atmospheres. Vehicles range from helicopters and other vertical takeoff aircraft at the low-speed end of the flight spectrum, to spacecraft traveling thousands of miles per hour during launch, orbit, trans-planetary flight or re-entry at the high-speed end. Between are general aviation and commercial transport aircraft flying at speeds well below and close to the speed of sound, and supersonic transports, fighters and missiles. Although each speed regime and each vehicle poses its special problems, all aerospace vehicles can be addressed by a common set of technical specialties or disciplines.

Sub-disciplines of Aerospace Engineering are: aerodynamics, flight dynamics, propulsion, structures, and design. Aerodynamics addresses the flow of air and associated forces, moments, pressures, and temperature changes. Flight-dynamics addresses the motion of vehicles including trajectories, rotational dynamics, sensors, and control laws required for successful accomplishment of missions. Propulsion addresses the engines that have been devised to convert chemical (and occasionally other forms) energy into useful work to produce the thrust needed to propel aerospace vehicles. Structures addresses material properties, stresses, strains, deflection, and vibration along with manufacturing processes required to produce very light weight and rugged elements needed in aerospace vehicles. Aerospace design addresses the process of synthesizing vehicles and systems to meet defined missions and more general needs. This process draws on information from other sub-disciplines while embodying its own unique elements. The Aerospace Engineering program is designed to provide a firm foundation in various sub-disciplines.

Courses offered by this department may be found under the acronym: ENAE

The Bachelor of Science in Aerospace Engineering is accredited by the Engineering Accreditation Commission of ABET, www.abet.org (http://www.abet.org).

Program Objectives

1. Our graduates will be successful in their professional careers, including industry, government service, and academia, in the State of Maryland and beyond.
2. Our graduates will contribute to the creation of useful new products, or the generation of original research, by analyzing and implementing solutions to relevant problems in the component disciplines of Aerospace Engineering.
3. Our graduates will contribute effectively when part of an integrated team, clearly communicating with team members, supervisors, and clients.
4. Our graduates will understand the societal context in which their profession is practiced, and will successfully adapt to future developments in both technology and the employment market.

Program Learning Outcomes

As a result of completing our undergraduate program, our students should have developed the following skills:

1. Ability to apply knowledge of mathematics
2. Ability to apply knowledge of basic science (chemistry, physics)
3. Ability to apply knowledge of engineering principles
4. Ability to use computers to solve engineering problems
5. Ability to identify, formulate, and solve engineering problems
6. Ability to design and conduct experiments
7. Ability to analyze and interpret data
8. Ability to design a component, system, or process to meet desired needs under realistic constraints
9. Ability to use the techniques, skills, and tools of modern engineering practice
10. Ability to write effectively
11. Ability to speak effectively
12. Ability to function effectively as part of a multidisciplinary team
13. Understanding of professional and ethical responsibility
14. Knowledge of contemporary issues in engineering
15. Understanding of the impact of engineering solutions in a global, economic, environmental, and societal context
16. Awareness of the need to continually upgrade my technical knowledge base and skills

Requirements

A minimum of 124 credits are required for an Aerospace Engineering degree:

<table>
<thead>
<tr>
<th>Semester</th>
<th>First Semester</th>
<th>Credits</th>
<th>Second Semester</th>
<th>Credits</th>
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<tr>
<td>Freshman</td>
<td>ENES100(^1)</td>
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<td>MATH141</td>
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<td></td>
<td>ENAE100</td>
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<td>PHYS161</td>
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<tr>
<td></td>
<td>CHEM135</td>
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<td>ENAE102(^1)</td>
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<td>MATH140</td>
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<td>ENAE202</td>
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<td>General Education Program Requirements</td>
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<td>General Education Program Requirements</td>
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<tr>
<td>Sophomore</td>
<td>ENES220</td>
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<td>ENAE200</td>
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<td></td>
<td>ENAE283</td>
<td>3</td>
<td>ENAE232</td>
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<td>MATH241</td>
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<td>MATH246</td>
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<td>PHYS260 &amp; PHYS261</td>
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<td>PHYS2461 or 240</td>
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<td>General Education Program Requirements</td>
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<tr>
<td>Junior</td>
<td>ENAE311</td>
<td>3</td>
<td>ENAE324</td>
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<td>ENAE301</td>
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<td>ENAE432</td>
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<td>ENAE362</td>
<td>3</td>
<td>ENGL393</td>
<td>3</td>
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</table>
Aerospace Engineering Major

ENAE380 3 General Education Program Requirements

General Education Program Requirements 3 ENAE414 or 404

Senior Year

First Semester |
---|---
ENAE423 3 ENAE464 3
General Education Program Requirements 3 ENAE Elective
Complete all 3 courses from one of the following tracks: 9 Technical Elective
AERONAUTICAL TRACK 3 Select one course based on track:
ENAE403 3 ENAE482 (AERONAUTICAL TRACK)
ENAE455 3 ENAE484 (SPACE SYSTEMS TRACK)
ENAE481 2-3 General Education Program Requirements/ Elective

SPACE SYSTEM TRACK
ENAE441
ENAE457
ENAE483

15 16

Total Credits 124-126

1 Can be taken first or second semester
2 Select ENAE414 for Aeronautical Track, or ENAE404 for Space System Track
3 Only ENAE398H, or an approved 400 level ENAE course not required for the student’s specific track, may be used for this elective.
4 One 300/400 level course in Engineering, Mathematics, or Physical Sciences that has been approved for this purpose by the Undergraduate Program Director.
5 Select ENAE482 for Aeronautical Track, or ENAE484 for Space System Track
6 Students may take an additional General Education or elective course to help bring them to the 124 credit minimum required to graduate.

Minimum Degree Requirements

The fulfillment of all department, school, and university requirements. A minimum of 124 credits are required for an Aerospace Engineering degree.

Students must select a track. All courses in either the Aeronautical or Astronautical track must be completed. Students in either track who wish to gain a broader education across the aeronautical or space application areas can take courses required in the other track as electives.

Aerospace Electives

The department offers a range of electives. The following courses have recently been offered as electives for the undergraduate degree:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENAE398</td>
<td>Honors Research Project (ENAE398H - Honors Research)</td>
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<tr>
<td>ENAE415</td>
<td>Helicopter Theory</td>
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</tr>
<tr>
<td>ENAE425</td>
<td>Mechanics of Composite Structures</td>
<td>3</td>
</tr>
<tr>
<td>ENAE471</td>
<td>Aircraft Flight Testing</td>
<td>3</td>
</tr>
<tr>
<td>ENAE488</td>
<td>Topics in Aerospace Engineering (ENAE488B - Intro to Computational Structural Dynamics)</td>
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<tr>
<td>ENAE488</td>
<td>Topics in Aerospace Engineering (ENAE488M - High Speed Aerodynamics)</td>
<td>3</td>
</tr>
<tr>
<td>ENAE488</td>
<td>Topics in Aerospace Engineering (ENAE488P - Product Design)</td>
<td>3</td>
</tr>
<tr>
<td>ENAE488</td>
<td>Topics in Aerospace Engineering (ENAE488R - Hybrid Rocket Design)</td>
<td>3</td>
</tr>
<tr>
<td>ENAE488</td>
<td>Topics in Aerospace Engineering (ENAE488W - Design of Remotely Piloted Vehicles)</td>
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</tr>
<tr>
<td>ENAE499</td>
<td>Elective Research</td>
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Other Requirements for the Major

See https://courseleaf.umd.edu/undergraduate/colleges-schools/engineering/ for minimum grade requirements in key prerequisite courses for engineering students. Students should follow the sequence of courses as outlined in the aerospace engineering degree requirements and four-year plan.

Four Year Plan

Click here (https://eng.umd.edu/four-year-plans) for roadmaps for four-year plans in the A. James Clark School of Engineering.

Additional information on developing a four-year academic plan can be found on the following pages:

- 4yearplans.umd.edu
- the Student Academic Success-Degree Completion Policy (https://academiccatalog.umd.edu/undergraduate/registration-academic-requirements-regulations/academic-advising) section of this catalog