Aerospace Engineering - PLTW
The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Aerospace Engineering - PLTW Program of Study. The academic standards in this document are theoretical and performance-based. The standards contain content from Colorado, Maryland, Tennessee, and Texas and were validated by D.C. business and industry partners. All content is used with permission.

In addition to academic standards, OSSE has incorporated into this document Labor Market Information (LMI) definitions and explanations for the Program of Study; program aligned Industry Recognized Credentials; and Work-Based Learning resources and requirements by course level.

This document is intended for use by educational administrators and practitioners. A similar document is available for each state-approved CTE Program of Study.
Aerospace Engineering - PLTW

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## Course Descriptions: Aerospace Engineering - PLTW

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<tr>
<th>Course Level</th>
<th>Course Information</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Level I</strong></td>
<td><strong>Introduction to Engineering - PLTW</strong>&lt;br&gt;<strong>Design - PLTW</strong>&lt;br&gt;<strong>OSSEID:</strong> 5150101&lt;br&gt;<strong>Grades:</strong> 9-12&lt;br&gt;<strong>Prerequisite:</strong> None&lt;br&gt;<strong>Credit:</strong> 1</td>
<td>Students in Introduction to Engineering – PLTW dig deep into the engineering design process, applying math, science, and engineering standards to hands-on projects. They work both individually and in teams to design solutions to a variety of problems using 3-D modeling software, and use an engineering notebook to document their work.</td>
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<tr>
<td><strong>Level II</strong></td>
<td><strong>Principles of Engineering - PLTW</strong>&lt;br&gt;<strong>OSSEID:</strong> 5150102&lt;br&gt;<strong>Grades:</strong> 10-12&lt;br&gt;<strong>Prerequisite:</strong> Introduction to Engineering Design&lt;br&gt;<strong>Credit:</strong> 1</td>
<td>Through problems that engage and challenge, students in Principles of Engineering – PLTW explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students develop skills in problem solving, research, and design while learning strategies for design process documentation, collaboration, and presentation.</td>
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<tr>
<td><strong>Level III</strong></td>
<td><strong>Aerospace Engineering - PLTW</strong>&lt;br&gt;<strong>OSSEID:</strong> 5150103&lt;br&gt;<strong>Grades:</strong> 11-12&lt;br&gt;<strong>Prerequisite:</strong> Principles of Engineering&lt;br&gt;<strong>Credit:</strong> 1</td>
<td>Aerospace Engineering – PLTW propels students’ learning in the fundamentals of atmospheric and space flight. As they explore the physics of flight, students bring the concepts to life by designing an airfoil, propulsion system, and rockets. They learn basic orbital mechanics using industry-standard software. They also explore robot systems through projects such as remotely operated vehicles.</td>
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<td><strong>Level IV</strong></td>
<td><strong>Engineering Design and Development - PLTW</strong>&lt;br&gt;<strong>OSSEID:</strong> 5150104&lt;br&gt;<strong>Grades:</strong> 12&lt;br&gt;<strong>Prerequisite:</strong> Aerospace Engineering&lt;br&gt;<strong>Credit:</strong> 1</td>
<td>The knowledge and skills students acquire throughout PLTW Engineering come together in Engineering Design and Development – PLTW as they identify an issue and then research, design, and test a solution, ultimately presenting their solution to a panel of engineers. Students apply the professional skills they have developed to document a design process to standards, completing Engineering Design and Development ready to take on any post-secondary program or career.</td>
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### Industry Certifications
- Autodesk Certified Professional (ACP) in AutoCAD
- Autodesk Certified User (ACU) in AutoCAD
Work-Based Learning Examples and Resources

<table>
<thead>
<tr>
<th>Level I Course</th>
<th>Level II Course</th>
<th>Level III Course</th>
<th>Level IV Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career Exploration</td>
<td>Career Awareness</td>
<td>Career Preparation</td>
<td>Career Preparation</td>
</tr>
<tr>
<td>Industry Visits</td>
<td>All of Level I, plus: Postsecondary Visits Program-Specific Site Tours Mock Interviews</td>
<td>All of Level I and II, plus: Job Shadow Paid/Unpaid Internships</td>
<td>Paid/Unpaid Internships Apprenticeships</td>
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<tr>
<td>Guest Speakers</td>
<td></td>
<td></td>
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<tr>
<td>Participate in a CTSO</td>
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</table>

Several resources are available to help instructors meet the Level I and Level II WBL requirements, including:

Career Coach DC ([http://careercoachdc.emsicc.com](http://careercoachdc.emsicc.com)). Online site designed to help students find and connect to a career pathway by providing the most current local data on wages, employment, job postings, and associated education and training. The resource includes a Career Assessment for students.

Nepris ([https://dc.nepris.com/](https://dc.nepris.com/)). Connects educators and learners with a network of industry professionals virtually, bringing real-world relevance and career exposure to all students. Nepris also provides a skills-based volunteering platform for business and industry professionals to extend their educational outreach.

Virtual Job Shadow ([https://virtualjobshadow.com](https://virtualjobshadow.com)). Provides interactive tools which empower students to discover, plan, and pursue their dreams. Rich video library presents a “day in the life of” view for thousands of occupations.

Labor Market Information Definitions and Data

Career and Technical Education programs of study in the District of Columbia must meet at least one of the High Wage, High Skill, and In-Demand definitions below to be considered appropriate for our students and the regional labor market. These definitions were created in collaboration with Career and Technical Education leaders from District of Columbia LEA’s, the University of the District of Columbia Community College, and national guidance from Research Triangle International (RTI) and Education Northwest. Additionally, previous work was consulted from researchers at MIT’s Labor Wage Index Project and the DC CTE Task Force’s 2012 Strategic Plan for the District of Columbia.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Definition</th>
<th>Data for the Aerospace Engineering - PLTW Program of Study (source: EMSI, August 2021)</th>
</tr>
</thead>
</table>
| High Wage | Those occupations that have a 25th percentile wage equal to or greater than the most recent MIT Living Wage Index for one adult in the District of Columbia, and/or leads to a position that pays at least the median hourly or annual wage for the Washington, DC, metropolitan statistical area. | Standard Occupational Code (SOC): 17-2011.00 Aerospace Engineers  
Hourly Wages  
25th Percentile: $55.15  
50th Percentile: $72.51  
75th Percentile: $85.64 |

Updated December 9, 2020
<table>
<thead>
<tr>
<th>High Skill</th>
<th>Those occupations located within the Washington, DC, metropolitan statistical area with the following education or training requirements: completion of an apprenticeship program; completion of an industry-recognized certification or credential; associate’s degree, or higher.</th>
<th>Typical Entry-Level Education: Bachelor’s Degree</th>
</tr>
</thead>
</table>
| In-Demand | Those occupations in the Washington, DC, metropolitan statistical area having more than the median number of total (growth plus replacement) annual openings over a five-year period. 

*Note: An occupation is required to have an annual growth plus replacement rate of 105 openings, or greater, between 2020-25 to meet this definition.* | Annual Openings: 137 |
**Model Six-Year Plan: Aerospace Engineering - PLTW**

**College:** University of the District of Columbia Community College  
**Program/CIP:**  
**Plan:**

**Entity:** Office of the State Superintendent of Education  
**Career Cluster:** STEM  
**Program of Study:** Aerospace Engineering - PLTW

<table>
<thead>
<tr>
<th>Subject</th>
<th>9th Grade</th>
<th>10th Grade</th>
<th>11th Grade</th>
<th>12th Grade</th>
<th>Semester I</th>
<th>Semester II</th>
<th>Semester III</th>
<th>Semester IV</th>
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<tbody>
<tr>
<td>English (4)</td>
<td>English I</td>
<td>English II</td>
<td>English III</td>
<td>English IV</td>
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<tr>
<td>Math (4)</td>
<td>Algebra I</td>
<td>Geometry</td>
<td>Algebra II</td>
<td>Math</td>
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<tr>
<td>Science (4)</td>
<td>Biology</td>
<td>Lab Science</td>
<td>Anatomy and Physiology</td>
<td>Science</td>
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<tr>
<td>Social Studies (4)</td>
<td>World History and Geography I: Middle Ages</td>
<td>World History and Geography II: Modern World</td>
<td>U.S. History</td>
<td>U.S. Government (.5) and D.C. History (.5)</td>
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<tr>
<td>Health (.5) and Physical Ed (1)</td>
<td>Health (.5) Physical Ed (.5)</td>
<td>Physical Ed (.5)</td>
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<tr>
<td>World Languages (2)</td>
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<td></td>
<td>World Language I</td>
<td>World Language II</td>
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<tr>
<td>Art (.5)</td>
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<td>Art (.5)</td>
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<tr>
<td>Music (.5)</td>
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<td>Music (.5)</td>
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</table>

**Total possible college credits completed in high school:** XX  
**Credit hours required to complete the AAS program:** XX
Course Standards

Introduction to Engineering Design - PLTW

1. **General requirements.** This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

2. **Introduction.**
   A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
   
   B. The Science, Technology, Engineering & Mathematics (STEM) Career Cluster focuses on the planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.
   
   C. Students in Introduction to Engineering – PLTW dig deep into the engineering design process, applying math, science, and engineering standards to hands-on projects. They work both individually and in teams to design solutions to a variety of problems using 3-D modeling software, and use an engineering notebook to document their work.
   
   D. Students will participate in at least two Career Exploration Work-Based Learning experiences in this course, which might include guest speakers and work-place tours relevant to the program of study.
   
   E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

3. **Knowledge and Skills.** Content requirements for Project Lead the Way Introduction to Engineering Design are prescribed in the Project Lead the Way Introduction to Engineering Design publication: Introduction to Engineering Design, published by Project Lead the Way.
Principles of Engineering - PLTW

1. **General requirements.** This course is recommended for students in Grades 10-12. Prerequisite: Introduction to Engineering Design. Students shall be awarded one credit for successful completion of this course.

2. **Introduction.**
   A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
   
   B. The Science, Technology, Engineering & Mathematics (STEM) Career Cluster focuses on the planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.
   
   C. Through problems that engage and challenge, students in Principles of Engineering – PLTW explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students develop skills in problem solving, research, and design while learning strategies for design process documentation, collaboration, and presentation.
   
   D. Students will participate in at least two Career Awareness Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
   
   E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

3. **Knowledge and Skills.** Content requirements for Project Lead the Way Principles of Engineering are prescribed in the Project Lead the Way Principles of Engineering publication: Principles of Engineering, published by Project Lead the Way.
Aerospace Engineering - PLTW

1. **General requirements.** This course is recommended for students in Grade 11-12. Prerequisite: Principles of Engineering. Students shall be awarded one credit for successful completion of this course.

2. **Introduction.**
   A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
   
   B. The Science, Technology, Engineering & Mathematics (STEM) Career Cluster focuses on the planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.
   
   C. Aerospace Engineering – PLTW propels students’ learning in the fundamentals of atmospheric and space flight. As they explore the physics of flight, students bring the concepts to life by designing an airfoil, propulsion system, and rockets. They learn basic orbital mechanics using industry-standard software. They also explore robot systems through projects such as remotely operated vehicles.
   
   D. Students will participate in a Career Preparation Work-Based Learning experience in this course, which might include paid or unpaid internship experiences relevant to the program of study.
   
   E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

3. **Knowledge and Skills.** Content requirements for Project Lead the Way Aerospace Engineering are prescribed in the Project Lead the Way Aerospace Engineering publication: Aerospace Engineering, published by Project Lead the Way.
Engineering Design and Development - PLTW

1. **General requirements.** This course is recommended for students in Grade 12. Prerequisite: Aerospace Engineering; Civil Engineering and Architecture; Computer Integrated Manufacturing; Computer Science Principles; Digital Electronics; or Environmental Sustainability. Students shall be awarded one credit for successful completion of this course.

2. **Introduction.**
   A. Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

   B. The Science, Technology, Engineering & Mathematics (STEM) Career Cluster focuses on the planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

   C. The knowledge and skills students acquire throughout PLTW Engineering come together in Engineering Design and Development – PLTW as they identify an issue and then research, design, and test a solution, ultimately presenting their solution to a panel of engineers. Students apply the professional skills they have developed to document a design process to standards, completing Engineering Design and Development ready to take on any post-secondary program or career.

   D. Students will participate in a Career Preparation Work-Based Learning experience in this course, which includes paid or unpaid internship, pre-apprenticeship, or apprenticeship experiences relevant to the program of study.

   E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

3. **Knowledge and Skills.** Content requirements for Project Lead the Way Engineering Design and Development are prescribed in the Project Lead the Way Engineering Design and Development publication: Engineering Design and Development, published by Project Lead the Way.