

# **Pascack Valley Regional High School District**

**Pascack Hills High School, Montvale, New Jersey  
Pascack Valley High School, Hillsdale, New Jersey**

**Course Name: Honors Engineering and Design II**

Born On: August, 2017  
Revised On: August, 2022  
Current Revision: August 2023  
Board Approved: 8/28/2023

## New Jersey Curricular Mandates for Technology Education

### Disabled & LGBT:

18A:35-4.35 - History of disabled and LGBT persons included in middle and high school curriculum. A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards.

### Diversity, Equity, and Inclusion (DEI):

C.18A:35-4.36a - Curriculum to include instruction on diversity and inclusion. 1. a. Beginning in the 2021-2022 school year, each school district shall incorporate instruction on diversity and inclusion in an appropriate place in the curriculum of students in grades kindergarten through 12 as part of the district's implementation of the New Jersey Student Learning Standards. b. The instruction shall: (1) highlight and promote diversity, including economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance; (2) examine the impact that unconscious bias and economic disparities have at both an individual level and on society as a whole; and (3) encourage safe, welcoming, and inclusive environments for all students regardless of race or ethnicity, sexual and gender identities, mental and physical disabilities, and religious beliefs. c. The Commissioner of Education shall provide school districts with sample learning activities and resources designed to promote diversity and inclusion.

### Amistad Law:

N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

### Climate Change:

2020 NJSL-Computer Science and Design Thinking: At the core of computer science and design thinking education, is the goal to prepare students with the essential knowledge and skills to make their local and global communities a better place to live. Learning experiences that enable students to apply content knowledge and employ computational thinking skills prepare students for the work of tomorrow by proposing solutions concerning the balancing of societal, environmental, and economic needs for a sustainable future. Further, leveraging topics such as computational sustainability and clean technology (Cleantech), technologies that either reduce or optimize the use of natural resources while reducing the negative effect that technology has on the planet and its ecosystems, is essential for developing a populace with the knowledge and skills necessary to mitigate the effects of climate change.

**HONOR ENGINEERING DESIGN II**

**Unit 1: Introduction to Curriculum Overview – Technology and Engineering Defined**

The study of Technology can be most plainly described as the study of our “Designed World”. By that we mean the things in our environment that have been created by people. These things allow humans to be more productive; extending ones capabilities and satisfying needs and wants. Things such as exercise equipment, surgical tools, electronic fuel injection, hydroponics gardening, new drugs and even *Gatorade*, are the result of the application of **The Design and Problem Solving Process**. This also requires the application of knowledge from other areas such as Math and Science. Courses in Technology Education afford students the opportunity to increase their level of technological literacy. Students will better understand how to live and work with current and future technologies and understand the careers available to them in an ever-changing workplace.

As a continuation of **Engineering Design I**, **Engineering Design II** students will have the opportunity to hone their technical and design abilities and apply them to more complex engineering problems. Taking on the role of engineer, students will identify problems, perform research, then conceive and design solutions in a variety of engineering disciplines including but not limited to: industrial, mechanical, civil, and electrical & computer engineering. Students will gain a more in-depth understanding of how to use a variety of software applications in the creation of design solutions.

**Time Allotted: Approximately 2-3 Weeks**

**New Jersey Student Learning Standards (NJSLS)**

- 8.2.2.ED.1: Communicate the function of a product or device.
- 8.2.2.ED.2: Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.
- 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
- 8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
- 9.3.12.AC.1 Use vocabulary, symbols and formulas common to engineering and technology.
- 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project.
- 9.3.12.AC.7 Describe career opportunities and means to achieve those opportunities in each of the Engineering Discipline Career Pathways.

| Essential Questions  | Student Learning Objectives  | Suggested Tasks/Activities  | Evidence of Learning (Assessment)   |
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| <ul style="list-style-type: none"> <li>• What is there a difference between Science and</li> </ul> | <ul style="list-style-type: none"> <li>• Define ‘Science’ and ‘Technology’.</li> </ul> | <ul style="list-style-type: none"> <li>• Create a digital presentation about the engineering achievement you identified.</li> </ul> | <ul style="list-style-type: none"> <li>• Assessment of gathering, evaluation, synthesis and communication of</li> </ul> |

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| <p>Technology?</p> <ul style="list-style-type: none"> <li>• What are the technological impacts, both desired and undesired?</li> <li>• Why do humans design and what is the 'Process?'</li> <li>• What are the greatest engineering achievements of the twentieth and twenty-first century?</li> <li>• Identify and explain what an ethical design dilemma</li> <li>• Trace the historical progression of technology through a period-of-time for a product or service</li> </ul> | <ul style="list-style-type: none"> <li>• Define 'Design' and the components to the 'Design Process.'</li> <li>• Identify a product or service in your life that is considered an engineering achievement and problem(s) it solved.</li> <li>• Identify the outcomes to a design solution</li> <li>• Predict the consequences of decisions made during the creation of your identified invention/iteration.</li> </ul>   | <p><i>What problem(s) did this structure solve, what problems did it create (if any), and what did we learn about this design?</i></p> <ul style="list-style-type: none"> <li>• Design a poster presentation about a famous engineer or designer and social impacts of designs</li> <li>• Create a presentation on Engineering Failures (i.e. The Kansas City Hyatt Regency Skyway Collapse, The Space Shuttle Tank Explosion, SUV Rollover, The Ford Pinto Gas Tank Explosion)) and discuss why it was a failure, what engineers learned from the failure, and its impact on history and society</li> </ul> | <p>information about Science vs. Technology in project research, submissions and presentation</p> <ul style="list-style-type: none"> <li>• Assessment of written and verbal mastery of unit-specific vocabulary, through conversation and writing samples.</li> <li>• Identify and evaluate one of the following for potential ethical dilemma: Transporting crude oil in tankers, Bio-engineered foods (GMO's), Burning fossil fuel, Recycling of plastic, Incineration of waste or a self- identified human created problem.</li> </ul> |
| <p><b>Resources/Materials</b></p>   | <ul style="list-style-type: none"> <li>• Internet, library, textbooks, periodicals, poster board, foam color, tri-fold display, color printer, large format printer</li> <li>• Competitions; STEM League, TSA, Delbarton Robotics, Panasonic Design Challenge, Cardboard Kayak, etc.</li> </ul>   |  |   |
| <p><b>Interdisciplinary Connections</b></p>   | <p>NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</p> |  |   |
| <p><b>Life Literacies &amp; Key Skills</b></p>  | <p>9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas</p> <p>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities</p> <p>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition</p>  |  |   |

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|  | <p>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice</p> <p>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving</p>  |  |   |
| <p><b>Information and Media Literacy &amp; Technology Literacy</b></p>   | <p>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.</p> <p>9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources</p> <p>9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design</p> <p>9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience</p> <p>9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately</p> <p>9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity</p> <p>9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change</p> <p>9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations</p> <p>9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media</p> <p>9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task</p> <p>9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.</p> <p>9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.</p> <p>9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem</p> <p>9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.</p> <p>9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.</p> |  |   |
| <p><b>Career Readiness, Life Literacies &amp; Key Skills Practices</b></p>   | <p>Act as a responsible and contributing community member and employee</p> <p>Demonstrate creativity and innovation.</p> <p>Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>Model integrity, ethical leadership, and effective management.</p> <p>Use technology to enhance productivity, increase collaboration, and communicate effectively.</p> <p>Work productively in teams while using cultural/global competence.</p>   |  |   |
| <b>Modifications</b>   |  |  |   |
| <b>Multi-Lingual Learners</b>  | <b>Special Education</b>   | <b>At-Risk</b>   | <b>Gifted and Talented</b>  |
| <ul style="list-style-type: none"> <li>When possible, modify assignments so the ELL student writes less, has simpler questions to</li> </ul> | <ul style="list-style-type: none"> <li>Provide extended time for the creation of products.</li> <li>Scaffolded explanations for proper use of equipment.</li> </ul>  | <ul style="list-style-type: none"> <li>Incorporate student choice.</li> <li>Provide peer mentoring to improve techniques.</li> <li>Use effort and achievement</li> </ul> | <ul style="list-style-type: none"> <li>Offer choices, once finished with basic task, with personal interest being the key.</li> </ul> |

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| <p>answer, fewer spelling words, etc.</p> <ul style="list-style-type: none"> <li>● Provide models of completed homework assignments, projects, etc.</li> <li>● Assign a native language partner.</li> <li>● Use sentence/paragraph frames to assist with projects.</li> </ul> | <ul style="list-style-type: none"> <li>● Receive large project as smaller tasks with individual deadlines.</li> </ul> | <p>rubrics</p> <ul style="list-style-type: none"> <li>● Allow students many opportunities for practice and learning.</li> <li>● Use scaffolding for complex tasks.</li> <li>● Evaluate students on the basis of individual mastery.</li> </ul> | <ul style="list-style-type: none"> <li>● Pick 2 human designed products to compare and contrast the features that help solve human needs/wants.</li> </ul> |
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**HONORS ENGINEERING DESIGN II**

**Unit 2: Design and Problem Solving**

This unit guides students through an internalization of the engineering design process as they learn that the ‘Design Process’ is a systematic problem-solving strategy, with constraints and criteria considered and incorporated into ‘a’ solution. The observation and incorporation of constraints and criteria is required for divergent thinking where many solutions are possible for a given problem and the solution must help solve a human need or want. Problem solving is the process of understanding a problem (by asking questions to achieve understanding while also being empathetic of the issue(s), devising a plan, carrying out the plan (through rapid prototyping) and evaluating the effectiveness of the plan.

**Time Allotted: Approximately 6-7 Weeks**

**New Jersey Student Learning Standards (NJSLS)**

- 9.3.12.AC.3 Comply with regulations and applicable codes to establish and manage a legal and safe workplace.
- 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
- 8.2.2.ED.2: Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.
- 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).

| Essential Questions   | Student Learning Objectives   | Suggested Tasks/Activities   | Evidence of Learning (Assessment)   |
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| <ul style="list-style-type: none"> <li>● Why is it important to follow a structured design process?</li> <li>● How do we ‘Design’ for all?</li> <li>● What is the purpose of a prototype/modeling techniques and how are they are created?</li> <li>● How can we evaluate a prototype?</li> </ul> | <ul style="list-style-type: none"> <li>● Develop their own understanding of the engineering design process and its utility by drawing and labeling the steps of the engineering design process model</li> <li>● Maintain clear and concise documentation in their engineering notebooks.</li> <li>● Describe the role of engineers in addressing changing societal needs by developing an historical</li> </ul> | <ul style="list-style-type: none"> <li>● Engineering and construction techniques for a basic engineering project (i.e. Penny Bridge, Paper Tower) Challenge</li> <li>● Given examples, identify features and functions to a structure</li> <li>● Create a conceptual sketch</li> <li>● Create a 2-point perspective drawing</li> </ul> | <ul style="list-style-type: none"> <li>● Assessment of the Design Process skill by participating in the rapid design project, including journaling or other written responses, if required.</li> <li>● Assessment of mastery of unit-specific tools and techniques using a practical or performance.</li> <li>● Assessment of drawings with proper conventions</li> </ul> |

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| <ul style="list-style-type: none"> <li>How can a design be created as an orthographic projection using drafting tools?</li> </ul> | <p>timeline that demonstrates connections between imaging product evolution/innovation and the societal needs that prompted these changes (Unit Project).</p> <ul style="list-style-type: none"> <li>Demonstrate a variety of modeling techniques/rapid prototyping (LEGO's, K'nex, Laser cutter, Foam Board, Foam Core, Cardboard etc.)</li> </ul>   | <ul style="list-style-type: none"> <li>Practice drawing orthographic projections</li> <li>Practice drawing section views.</li> <li>Given a scale/creating a scale and general layout, practice drawing three different given objects, a star within two circles and an irregular polygon.</li> </ul> | <ul style="list-style-type: none"> <li>Assessment of modeling skills by drawing and labeling diagrams, making analogies, and/or making observational sketches.</li> <li>Assess the final drawing portfolio</li> </ul> |
| <p><b>Resources/Materials</b></p>   | <ul style="list-style-type: none"> <li>Copier Paper (tabloid size), Mechanical Pencil, White Poster Board, Cardboard, Chipboard, Index Cards, Manila Folder, Markers, Colored Pencils, Tape, String, Rubber Bands, Scissors, X-Acto Knife, Cutting Mat, Ruler, Compass, Color Printer, Wide Format Printer, Architect/Engineer Scale, T-Square, Triangles, Drafting Board, Eraser, Drafting Tape, Vellum Paper, Sharpie Marker, LEGO's, K'nex</li> <li><a href="https://www.teachengineering.org/k12engineering/designprocess">https://www.teachengineering.org/k12engineering/designprocess</a></li> <li><a href="https://tryengineering.org/teacher/laser-creations/">https://tryengineering.org/teacher/laser-creations/</a></li> <li>Competitions; STEM League, TSA, Delbarton Robotics, Panasonic Design Challenge, Cardboard Kayak, Steam Tank, Sea Perch etc.</li> </ul> |  |   |
| <p><b>Interdisciplinary Connections</b></p>   | <p>NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.</p> <p>NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.</p> <p>NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>  |  |   |
| <p><b>Life Literacies &amp; Key Skills</b></p>  | <p>9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas</p> <p>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities</p> <p>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition</p> <p>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice</p> <p>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving</p>  |  |   |



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| <p><b>Information and Media Literacy &amp; Technology Literacy</b></p>  | <p>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.<br/>                 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources<br/>                 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design<br/>                 9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience<br/>                 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately<br/>                 9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity<br/>                 9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change<br/>                 9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations<br/>                 9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media<br/>                 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task<br/>                 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.<br/>                 9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.<br/>                 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem<br/>                 9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.<br/>                 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.</p> |  |  |
| <p><b>Career Readiness, Life Literacies &amp; Key Skills Practices</b></p>  | <p>Act as a responsible and contributing community member and employee<br/>                 Demonstrate creativity and innovation.<br/>                 Utilize critical thinking to make sense of problems and persevere in solving them.<br/>                 Model integrity, ethical leadership, and effective management.<br/>                 Use technology to enhance productivity, increase collaboration, and communicate effectively.<br/>                 Work productively in teams while using cultural/global competence.</p>   |  |  |
| <p><b>Modifications</b></p>   |  |  |  |
| <p><b>Multi-Lingual Learners</b></p> <ul style="list-style-type: none"> <li>● Add written labels to equipment.</li> <li>● Assign a native language partner.</li> <li>● Provide extended time for written responses and</li> </ul> | <p><b>Special Education</b></p> <ul style="list-style-type: none"> <li>● Provide an outline of lessons.</li> <li>● Receive large project as smaller tasks with individual deadlines.</li> <li>● Work or take a test in a different setting, such as a quiet room with few distractions.</li> </ul>   | <p><b>At-Risk</b></p> <ul style="list-style-type: none"> <li>● Allow students many opportunities for practice and learning.</li> <li>● Use scaffolding for complex tasks.</li> </ul> | <p><b>Gifted and Talented</b></p> <ul style="list-style-type: none"> <li>● Offer choices, once finished with basic task, with personal interest being the key.</li> <li>● Compare and contrast two different problem-solving models</li> </ul> |

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| <b>HONORS ENGINEERING DESIGN II</b>  |   |  |  |
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| <b>Unit 3: Computer Aided Design &amp; Drafting (CADD)</b>   |   |  |  |
| <p>The term Computer Aided Design and Drafting (CADD) refers to design with the use of a computer (desktop computers with AutoDesk AutoCAD, OnShape, TinkerCAD software). With the widespread computer availability engineers have been able to design using 2-D (meaning width and height) and 3-D (meaning length, width AND height) design applications/software.</p>   |   |  |  |
| <b>Time Allotted: Approximately 6-7 Weeks</b>  |   |  |  |
| <b>New Jersey Student Learning Standards (NJSLS)</b>   |   |  |  |
| <p>8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.<br/>                     8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modifications to increase optimization based on feedback.<br/>                     8.2.12.ED.6: Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).<br/>                     8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints.<br/>                     8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation.<br/>                     9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.<br/>                     9.3.12.AC.2 Use architecture and construction skills to create and manage a project.<br/>                     9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project.</p> |   |  |  |
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| <b>Essential Questions</b>   | <b>Student Learning Objectives</b>  | <b>Suggested Tasks/Activities</b>  | <b>Evidence of Learning (Assessment)</b>   |
| <ul style="list-style-type: none"> <li>● How do computer drawing programs help engineers to design?</li> <li>● What are the differences between 2-D and 3-D in engineering design?</li> <li>● How can a design (rough sketch) be created as an</li> </ul>  | <ul style="list-style-type: none"> <li>● Maintain clear and concise documentation in their engineering notebooks.</li> <li>● Describe the role of engineers in addressing changing societal needs by developing an historical timeline that demonstrates connections between</li> </ul> | <ul style="list-style-type: none"> <li>● Use a scale to sketch a few simple as well as more complex objects.</li> <li>● Practice with tools and techniques for drawing multiple views</li> <li>● Practice sketching ideas, given a variety of “problems” or “situations”</li> <li>● Practice drawing sectional views.</li> </ul> | <ul style="list-style-type: none"> <li>● Assessment of mastery of unit-specific tools (CADD applications/software) and techniques using a practical or performance.</li> <li>● Assessment of CADD drawings with proper conventions</li> <li>● Assessment of modeling skills by drawing and labeling diagrams, making analogies, and/or making observational sketches.</li> </ul> |

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| <p>orthographic projection using CADD?</p> <ul style="list-style-type: none"> <li>How can a design solution in 3-D be created (parametric modeling)?</li> </ul> | <p>imaging product evolution/innovation and the societal needs that prompted these changes (Unit Project).</p>   | <ul style="list-style-type: none"> <li>Given a scale and general layout, practice drawing individual views</li> <li>Create a detailed, scaled parts to a multi-part toy/multi-part object</li> <li>Critique CADD drawings similar to a gallery walk.</li> </ul> | <ul style="list-style-type: none"> <li>Digital Presentation</li> <li>Prototype Development</li> <li>Class Participation</li> <li>Research Documentation</li> <li>Extent To Which Prototype Satisfies 'The Design Brief'</li> </ul> |
| <p><b>Resources/Materials</b></p>   | <ul style="list-style-type: none"> <li>Computer with applications for CAD (2D); AutoDesk AutoCAD, TinkerCAD, OnShape, Color Printer, Wide Format Printer, Laser Cutter, 3D printer</li> <li>Competitions; STEM League, TSA, Delbarton Robotics, Panasonic Design Challenge, Cardboard Kayak, Steam Tank, Sea Perch etc.</li> </ul>   |   |  |
| <p><b>Interdisciplinary Connections</b></p>   | <p>NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.</p> <p>RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</p>   |   |  |
| <p><b>Life Literacies &amp; Key Skills</b></p>  | <p>9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas</p> <p>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities</p> <p>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition</p> <p>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice</p> <p>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving</p>   |   |  |
| <p><b>Information and Media Literacy &amp; Technology Literacy</b></p>  | <p>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.</p> <p>9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources</p> <p>9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design</p> <p>9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience</p> <p>9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately</p> <p>9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity</p> <p>9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change</p> |   |  |

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|  | <p>9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations</p> <p>9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media</p> <p>9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task</p> <p>9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.</p> <p>9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.</p> <p>9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem</p> <p>9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.</p> <p>9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.</p> |   |  |
| <p><b>Career Readiness, Life Literacies &amp; Key Skills Practices</b></p>   | <p>Act as a responsible and contributing community member and employee</p> <p>Demonstrate creativity and innovation.</p> <p>Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>Model integrity, ethical leadership, and effective management.</p> <p>Use technology to enhance productivity, increase collaboration, and communicate effectively.</p> <p>Work productively in teams while using cultural/global competence.</p>  |   |  |
| <p><b>Modifications</b></p>  |   |   |  |
| <p><b>Multi-Lingual Learners</b></p>   | <p><b>Special Education</b></p>   | <p><b>At-Risk</b></p>   | <p><b>Gifted and Talented</b></p>  |
| <ul style="list-style-type: none"> <li>● When possible, modify assignments so the ELL student writes less, has simpler questions to answer, fewer spelling words, etc.</li> <li>● Provide models of completed homework assignments, projects, etc.</li> <li>● Assign a native language partner.</li> </ul> | <ul style="list-style-type: none"> <li>● Provide an outline of lessons.</li> <li>● Get a written list of instructions.</li> <li>● Receive large projects as smaller tasks with individual deadlines.</li> </ul>   | <ul style="list-style-type: none"> <li>● Incorporate student choice.</li> <li>● Encourage and ensure students that they can be successful.</li> <li>● Allow students multiple opportunities for practice and learning.</li> </ul> | <ul style="list-style-type: none"> <li>● Offer choices, once finished with basic tasks, with personal interest being the key.</li> <li>● Assess individual choice of object(s) to draw using accepted conventions</li> </ul> |

**HONORS ENGINEERING DESIGN II**

**Unit 4: Industrial Engineering**

This unit combines CADD techniques and strategies with design in teams of two students. This unit strives to seek the correct balance of CADD skills learned in the design suite coupled with hands-on-design in the fabrication suite. Students can design; (moving ‘pull’ toy, LEGO toy or any other toy with multiple parts/pieces) using inspiration-ideation-imagination-iteration-implementation. The primary focus of the unit is on product design, generating and communicating design ideas, and learning to use effective tools for design (including CADD). The toy design provides a scaffold for you to learn the design process holistically. The course will concentrate on CAD on the one hand and design thinking techniques in the lectures/tutorials. For computer-aided design & drafting we will use (AutoDesk AutoCad & Inventor, OnShape, TinkerCAD) in the design suite.

**Time Allotted: Approximately 6-7 Weeks**

**New Jersey Student Learning Standards (NJSLS)**

- 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
- 8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
- 8.2.12.ED.3: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.
- 8.2.12.ED.6: Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
- 8.2.12.NT.2: Redesign an existing product to improve form or function.
- 9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.
- 9.3.12.AC.2 Use engineering and construction skills to create and manage a project.
- 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project.

| Essential Questions   | Student Learning Objectives   | Suggested Tasks/Activities   | Evidence of Learning (Assessment)   |
|---|---|--|---|
| <ul style="list-style-type: none"> <li>● How do engineers design different objects using CADD?</li> <li>● How do engineers use assemblies to create the toy?</li> <li>● What techniques do engineers use to organize and</li> </ul> | <ul style="list-style-type: none"> <li>● Students conduct a Design of Experiments with more than two factors.</li> <li>● Students learn to acquire and represent data, and to analyze these data to inform engineering decisions.</li> <li>● Students explore, investigate, and present about a field of</li> </ul> | <ul style="list-style-type: none"> <li>● Gain advanced knowledge of, and experience with, CADD for designing mechanical systems via AutoDesk AutoCAD, OnShape, TinkerCAD</li> <li>● Hands-on demonstrations and tutorials</li> </ul> | <ul style="list-style-type: none"> <li>● Physical Device / Artifact</li> <li>● Digital Presentation</li> <li>● Prototype Development</li> <li>● Class Participation</li> <li>● Research Documentation</li> <li>● Extent To Which Prototype Satisfies ‘The Design Brief’</li> <li>● Quizzes</li> </ul> |

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| <p>represent data for decision-making and communication purposes?</p> <ul style="list-style-type: none"> <li>Understand the role of 'Human Factors' engineering in product design/production.</li> </ul> | <p>chemical engineering and how it impacts society.</p> <ul style="list-style-type: none"> <li>Students model liquid extraction over time mathematically.</li> <li>Gain experience with rapid prototyping</li> </ul>   | <ul style="list-style-type: none"> <li>Design and build team project (action toy/structure)</li> <li>Integrate CADD knowledge into the product design process</li> <li>Create a product via mass production</li> </ul> |  |
| <p><b>Resources/Materials</b></p>  | <ul style="list-style-type: none"> <li>AutoDesk Auto CAD, Inventor, OnShape, TinkerCAD, Color Printer, Hand Tools, Power Tools, Wood, elastic string, Wooden beads, Dowels, Wood Glue, Hot Glue Gun, Latex Paint, Paint Brushes, Polyurethane, Sandpaper, Steel wool, Tack Cloth, Clear Plastic sheets, Nylon String, Spray Primer Paint, Spray Paint, Foam core, Cardboard, 3D Printer, ABS Support Material, ABS Plastic, Laser cutter, Baltic Birch Plywood, Acrylic, Painters Tape, Masking Tape, Metal</li> <li>Competitions; STEM League, TSA, Delbarton Robotics, Panasonic Design Challenge, Cardboard Kayak, Steam Tank, Sea Perch etc.</li> </ul>  |  |  |
| <p><b>Interdisciplinary Connections</b></p>  | <p>NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p> |  |  |
| <p><b>Life Literacies &amp; Key Skills</b></p>   | <p>9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas</p> <p>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities</p> <p>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition</p> <p>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice</p> <p>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving</p>   |  |  |
| <p><b>Information and Media Literacy &amp; Technology Literacy</b></p>   | <p>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.</p> <p>9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources</p> <p>9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design</p>   |  |  |

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|  | <p>9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience</p> <p>9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately</p> <p>9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity</p> <p>9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change</p> <p>9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations</p> <p>9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media</p> <p>9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task</p> <p>9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.</p> <p>9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.</p> <p>9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem</p> <p>9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.</p> <p>9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.</p> |   |  |
| <p><b>Career Readiness, Life Literacies &amp; Key Skills Practices</b></p>   | <p>Act as a responsible and contributing community member and employee</p> <p>Demonstrate creativity and innovation.</p> <p>Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>Model integrity, ethical leadership, and effective management.</p> <p>Use technology to enhance productivity, increase collaboration, and communicate effectively.</p> <p>Work productively in teams while using cultural/global competence.</p>  |   |  |
| <p><b>Modifications</b></p>  |   |   |  |
| <p><b>Multi-Lingual Learners</b></p>   | <p><b>Special Education</b></p>   | <p><b>At-Risk</b></p>   | <p><b>Gifted and Talented</b></p>  |
| <ul style="list-style-type: none"> <li>● Provide a variety of texts and resources on curriculum topics at a range of reading levels.</li> <li>● Provide models of completed homework assignments, projects, etc.</li> <li>● Provide extended time</li> </ul> | <ul style="list-style-type: none"> <li>● Receive large project as smaller tasks with individual deadlines</li> <li>● Use an alarm to help with time management.</li> <li>● Work with a partner</li> </ul>   | <ul style="list-style-type: none"> <li>● Incorporate student choice</li> <li>● Provide peer mentoring.</li> <li>● Use scaffolding for complex tasks.</li> </ul> | <ul style="list-style-type: none"> <li>● Offer choices, once finished with basic tasks, with personal interest being the key.</li> </ul> |

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| for written responses and reports. |  |  |  |
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| <b>HONORS ENGINEERING DESIGN II</b>  |  |  |   |
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| <b>Unit 5: Civil Engineering – Statics</b>   |  |  |   |
| <p>This unit demonstrates the importance of acquiring and analyzing data to inform design decisions. Students will be introduced to the basic theory of structural design (forces, materials, properties, etc.) and learn the various types/styles of bridges that are used in the world. A video of the Tacoma Narrows Bridge collapse will be viewed and the engineering failures of this design will be discussed. Students will then be able to create the designs described in the introduction and then make their own bridges to compete for the cheapest, working bridge.</p>  |  |  |   |
| <p><b>Time Allotted: Approximately 6-7 Weeks</b></p>   |  |  |   |
| <p><b>New Jersey Student Learning Standards (NJSLS)</b></p>  |  |  |   |
| <p>8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.<br/>                     8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modifications to increase optimization based on feedback.<br/>                     8.2.12.ED.6: Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).<br/>                     8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.<br/>                     9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.<br/>                     9.3.12.AC.2 Use architecture and construction skills to create and manage a project.<br/>                     9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project.</p> |  |  |   |
| <b>Essential Questions</b>   | <b>Student Learning Objectives</b>   | <b>Suggested Tasks/Activities</b>  | <b>Evidence of Learning (Assessment)</b>  |
| <ul style="list-style-type: none"> <li>● What test equipment do engineers use to analyze a problem and how is this equipment used?</li> <li>● How do engineers analyze the data of the information</li> </ul>  | <ul style="list-style-type: none"> <li>● Students will Design, Build and Test Model Bridges/Structure(s), Cardboard Kayak etc.</li> <li>● Students to use authentic engineering design process to develop their designs</li> <li>● Student to apply math, science, and computer technology as problem-solving tools</li> </ul> | <ul style="list-style-type: none"> <li>● Document the design criteria/constraints, your chosen design process, construction procedure, testing analysis and improvement(s) for a redesign</li> <li>● Create component parts</li> </ul> | <ul style="list-style-type: none"> <li>● Physical Device / Artifact</li> <li>● Digital Presentation</li> <li>● Prototype Development</li> <li>● Class Participation</li> <li>● Research Documentation</li> <li>● Extent To Which Prototype Satisfies ‘The Design Brief’</li> <li>● Quizzes</li> </ul> |



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| <p>gathered from these tests?</p> <ul style="list-style-type: none"> <li>How do engineers make informed decisions?</li> </ul> | <ul style="list-style-type: none"> <li>Students to learn how 'real' structures are designed and built</li> <li>Students to learn how 'real' structures work</li> </ul>   | <p>and perform a strength of test</p> |  |
| <p><b>Resources/Materials</b></p>   | <ul style="list-style-type: none"> <li>Desktop Computer, Computer with CAD 2D, Adobe Illustrator, Laser Cutter, 3D Printer, Large Format Printer, Cereal Boxes, Foam Core, Mass Scale, Manila Folder, Wood Glue, T-Pins, Painter's Tape, Waxed Paper, Mini Back Saw, Miter Block, X-Acto Knife, Utility Knife, Cutting Mat, Drafting Tape, Torpedo Levels, Cardboard, Spray Adhesive, Acrylic Caulk, Packaging Tape, Plastic Drop Cloth</li> <li>West Point Bridge Design software</li> <li>OSHA Safety Guidelines: <a href="https://www.osap.org/page/GuideOSHAh">https://www.osap.org/page/GuideOSHAh</a></li> <li>Competitions; STEM League, TSA, Delbarton Robotics, Panasonic Design Challenge, Cardboard Kayak, Steam Tank, Sea Perch etc.</li> </ul>  |                                       |  |
| <p><b>Interdisciplinary Connections</b></p>   | <p>NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>NJSLSA.SL3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.</p>  |                                       |  |
| <p><b>Life Literacies &amp; Key Skills</b></p>  | <p>9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas</p> <p>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities</p> <p>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition</p> <p>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice</p> <p>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving</p>   |                                       |  |
| <p><b>Information and Media Literacy &amp; Technology Literacy</b></p>  | <p>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.</p> <p>9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources</p> <p>9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design</p> <p>9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience</p> <p>9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately</p> <p>9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity</p> <p>9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change</p> <p>9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations</p> <p>9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media</p> |                                       |  |

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|  | <p>9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task</p> <p>9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.</p> <p>9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.</p> <p>9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem</p> <p>9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.</p> <p>9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.</p> |   |  |
| <p><b>Career Readiness, Life Literacies &amp; Key Skills Practices</b></p>   | <p>Act as a responsible and contributing community member and employee</p> <p>Demonstrate creativity and innovation.</p> <p>Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>Model integrity, ethical leadership, and effective management.</p> <p>Use technology to enhance productivity, increase collaboration, and communicate effectively.</p> <p>Work productively in teams while using cultural/global competence.</p>  |   |  |
| <p><b>Modifications</b></p>  |   |   |  |
| <p><b>Multi-Lingual Learners</b></p>   | <p><b>Special Education</b></p>   | <p><b>At-Risk</b></p>   | <p><b>Gifted and Talented</b></p>  |
| <ul style="list-style-type: none"> <li>● Provide a variety of texts and resources on curriculum topics at a range of reading levels.</li> <li>● Provide models of completed homework assignments, projects, etc.</li> <li>● Assign a native language partner.</li> </ul> | <ul style="list-style-type: none"> <li>● Receive large projects as smaller tasks with individual deadlines.</li> <li>● Only create one 8-story building, instead of a building with more floors AND a second building</li> </ul>  | <ul style="list-style-type: none"> <li>● Use scaffolding for complex tasks.</li> <li>● Allow students many opportunities for practice and learning</li> </ul> | <ul style="list-style-type: none"> <li>● Offer choices, once finished with basic tasks, with personal interest being the key.</li> </ul> |

**HONORS ENGINEERING DESIGN II****Unit 6: Electrical/Computer Engineering**

With the advancement of technology, engineers find themselves designing, inventing, and creating increasingly complex products. Often dividing a large task into smaller, more manageable objectives is not only helpful, but necessary.

This introductory Electrical Engineering unit provides the student with a broad overview of electrical basics. Topics include the electric circuit, solving circuits, measuring electricity, and electricity standards. Specific laws and theorems are introduced such as Ohm's Law.

**Time Allotted: Approximately 6-7 weeks**

**New Jersey Student Learning Standards (NJSLs)**

- 8.1.12.CS.1: Describe ways in which integrated systems hide underlying implementation details to simplify user experiences.
- 8.1.12.CS.2: Model interactions between application software, system software, and hardware.
- 8.1.12.CS.3: Compare the functions of application software, system software, and hardware.
- 8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
- 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
- 8.1.12.IC.2: Test and refine computational artifacts to reduce bias and equity deficits.
- 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
- 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena
- 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
- 8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
- 8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables.
- 8.1.12.AP.3: Select and combine control structures for a specific application based upon performance and readability, and identify trade-offs to justify the choice.
- 8.1.12.AP.4: Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue
- 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
- 8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
- 8.1.12.AP.7: Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users.
- 8.1.12.AP.8: Evaluate and refine computational artifacts to make them more usable and accessible.
- 8.1.12.AP.9: Collaboratively document and present design decisions in the development of complex programs.
- 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
- 9.3.12.AC.3 Comply with regulations and applicable codes to establish and manage a legal and safe workplace.

| Essential Questions   | Student Learning Objectives   | Suggested Tasks/Activities   | Evidence of Learning (Assessment)   |
|---|---|--|---|
| <ul style="list-style-type: none"> <li>Why is electricity important to modern-day life?</li> <li>How is electricity produced and transported?</li> <li>How are electric circuits described and analyzed?</li> </ul> | <ul style="list-style-type: none"> <li>Describe the basic properties of electric current</li> <li>Solve problems related current, charge, and time</li> <li>Differentiate between direct current and alternating current</li> <li>Write code and upload to an Arduino to move an object</li> </ul>  | <ul style="list-style-type: none"> <li>Model and create basic DC circuits</li> <li>Combine circuits to perform specific tasks</li> <li>Write programming to control a mechanical device</li> </ul> | <ul style="list-style-type: none"> <li>Physical Device / Artifact</li> <li>Digital Presentation</li> <li>Prototype Development</li> <li>Class Participation</li> <li>Research Documentation</li> <li>Extent To Which Prototype Satisfies The Design Brief</li> <li>Quizzes</li> </ul> |
| <b>Resources/Materials</b>  | <ul style="list-style-type: none"> <li>Computer, Motors, Switches, Wires, Power Supply, Electronic Tools, Sandpaper, White Poster Board, Cardboard, Chipboard, Plastic, Fabric, Cylindrical Tubes, Index Cards, Manila Folder, Markers, Colored Pencils, Tape, String, Paint, Pop sickle sticks / Tongue Depressors, Rubber Bands, Scissors, X-Acto Knife, Ruler, Arduino, USB Cable, Breadboard, Piezo Buzzer/Speaker, Compass, 9Volt Battery, 9Volt Battery Holder, BMP180 SPI barometric pressure &amp; altitude sensor OR Altimeter, Carabiner / Spring snap, HC-SR04 ultrasonic/sonar distance sensor module OR Range-finder sensor, microSD card (16GB or 32GB) with adaptor for microSD to SD, Various Color LED's, 10K Ohm Resistor, 330 Ohm Resistor, Capacitor, 470 uF, through-hole, Servomotor, 4.8-6V, 180 degrees, Bluetooth Sensor/Receiver, Small digital camera (SQ11), Drone Release ++, Release supplies (depends on launch method) ++, Safety glasses, work gloves, Spools of String that Wind on a Core, Digital Multi Meter</li> <li>Internet access, Resource Texts</li> <li>Machinery: Drill Press, Band Saw, Power Sander, Lathe, Laser Cutter, 3D Printer, Handheld Power Tools</li> <li>Competitions; STEM League, TSA, Delbarton Robotics, Panasonic Design Challenge, Cardboard Kayak, Steam Tank, Sea Perch etc.\</li> <li>OSHA Safety Guidelines: <a href="https://www.osap.org/page/GuideOSHAh">https://www.osap.org/page/GuideOSHAh</a></li> </ul> |  |   |
| <b>Interdisciplinary Connections</b>  | <p>NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p>   |  |   |

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|   | <p>NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.</p> <p>NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.</p> <p>NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>   |
| <b>Life Literacies &amp; Key Skills</b>                             | <p>9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas</p> <p>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities</p> <p>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition</p> <p>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice</p> <p>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving</p>   |
| <b>Information and Media Literacy &amp; Technology Literacy</b>     | <p>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.</p> <p>9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources</p> <p>9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design</p> <p>9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience</p> <p>9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately</p> <p>9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity</p> <p>9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change</p> <p>9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations</p> <p>9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media</p> <p>9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task</p> <p>9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.</p> <p>9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.</p> <p>9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem</p> <p>9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.</p> <p>9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.</p> |
| <b>Career Readiness, Life Literacies &amp; Key Skills Practices</b> | <p>Act as a responsible and contributing community member and employee</p> <p>Demonstrate creativity and innovation.</p> <p>Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>Model integrity, ethical leadership, and effective management.</p>   |

|   |   |  |   | Use technology to enhance productivity, increase collaboration, and communicate effectively.<br>Work productively in teams while using cultural/global competence. |
|---|---|--|---|--|
| Modifications   |   |  |   |  |
| Multi-Lingual Learners  | Special Education   | At-Risk  | Gifted and Talented   |  |
| <ul style="list-style-type: none"> <li>● Add written labels to equipment and explain the purpose of each component.</li> <li>● Assign a native language partner.</li> <li>● Provide extended time for written responses and reports.</li> </ul> | <ul style="list-style-type: none"> <li>● Provide an outline of lessons.</li> <li>● Receive large projects as smaller tasks with individual deadlines.</li> <li>● Work or take a test in a different setting, such as a quiet room with few distractions.</li> </ul> | <ul style="list-style-type: none"> <li>● Allow students many opportunities for practice and learning.</li> <li>● Use scaffolding for complex tasks.</li> </ul> | <ul style="list-style-type: none"> <li>● Offer choices, once finished with basic tasks, with personal interest being the key.</li> <li>● Investigate how an electronic component works</li> <li>● Investigate the components used in an electronic device and explain their function</li> </ul> |  |

| <b>HONORS ENGINEERING DESIGN II</b>  |
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| <b>Unit 7: Mechanical Engineering</b>  |
| <p>This introductory Mechanical Engineering unit offers students an opportunity to learn in a hands-on design suite culminating with an industry-level capstone design experience. Topics include: Forces and Vectors, Buoyancy, Mass, Volume, Density, Drag, Gears, Gear Ratios, Stability, Mathematics used in Engineering, Mechanical Elements, Loads, Inertia and Axes, Beams, and Cables. This course also includes career exploration in the Mechanical Engineering field.</p>   |
| <p><b>Time Allotted: Approximately 6-7 weeks</b></p>   |
| <p><b>New Jersey Student Learning Standards (NJSLs)</b></p> <p>8.1.12.CS.1: Describe ways in which integrated systems hide underlying implementation details to simplify user experiences.</p> <p>8.1.12.CS.2: Model interactions between application software, system software, and hardware.</p> <p>8.1.12.CS.3: Compare the functions of application software, system software, and hardware.</p> <p>8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.</p> <p>8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.</p> <p>8.1.12.IC.2: Test and refine computational artifacts to reduce bias and equity deficits.</p> <p>8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.</p> |

8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.  
 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena  
 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.  
 8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.  
 8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables.  
 8.1.12.AP.3: Select and combine control structures for a specific application based upon performance and readability, and identify trade-offs to justify the choice.  
 8.1.12.AP.4: Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue  
 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.  
 8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.  
 8.1.12.AP.7: Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users.  
 8.1.12.AP.8: Evaluate and refine computational artifacts to make them more usable and accessible.  
 8.1.12.AP.9: Collaboratively document and present design decisions in the development of complex programs.  
 9.3.12.AC.3 Comply with regulations and applicable codes to establish and manage a legal and safe workplace.  
 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).

| Essential Questions   | Student Learning Objectives   | Suggested Tasks/Activities  | Evidence of Learning (Assessment)   |
|---|---|---|---|
| <ul style="list-style-type: none"> <li>● Why is iterative design so important to engineers?</li> <li>● Why is testing and redesign so critical to product development?</li> </ul> | <ul style="list-style-type: none"> <li>● Solve complex engineering problems by applying principles of engineering, science, and mathematics</li> <li>● Students will design a mechanical system and produce creative solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors</li> <li>● Design a mechanical system to produce a desired output.</li> </ul> | <ul style="list-style-type: none"> <li>● Design a mechanical system to move</li> <li>● Design a mechanical system to pick up an object</li> <li>● Design a system to place an object in a goal/container</li> </ul> | <ul style="list-style-type: none"> <li>● Physical Device / Artifact</li> <li>● Digital Presentation</li> <li>● Prototype Development</li> <li>● Class Participation</li> <li>● Research Documentation</li> <li>● Extent To Which Prototype Satisfies 'The Design Brief'</li> <li>● Quizzes</li> </ul> |

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| <p><b>Resources/Materials</b></p>                                      | <ul style="list-style-type: none"> <li>● Computer, Motors, Switches, Wires, Power Supply, Electronic Tools, Sandpaper, White Poster Board, Cardboard, Chipboard, Plastic, Fabric, Cylindrical Tubes, Index Cards, Manila Folder, Markers, Colored Pencils, Tape, String, Paint, Pop sickle sticks / Tongue Depressors, Rubber Bands, Scissors, X-Acto Knife, Ruler, Arduino, USB Cable, Breadboard, Piezo Buzzer/Speaker, Compass, 9Volt Battery, 9Volt Battery Holder, Digital Multi Meter, LEGO Mindstorm Kit, NXT Brick, AAA Batteries, Plastic Water-Proof Containers, Toilet Bowl Ring Wax, Camera Film Canister, Wire Stripers, Heat Shrink, Water-Proof Tape, Power Supply, Water Trough, Magnetic Pool Toys, Window Screen Material, Zip Ties, Pool Noodles, Propellers, Lock Washers, Washers, Ny-Lock Washers</li> <li>● Internet access, Resource Texts</li> <li>● Machinery: Drill Press, Band Saw, Power Sander, Lathe, Laser Cutter, 3D Printer, Handheld Power Tools</li> <li>● Competitions; STEM League, TSA, Delbarton Robotics, Panasonic Design Challenge, Cardboard Kayak, Steam Tank, Sea Perch etc.</li> <li>● OSHA Safety Guidelines: <a href="https://www.osap.org/page/GuideOSHAh">https://www.osap.org/page/GuideOSHAh</a></li> </ul> |  |  |
| <p><b>Interdisciplinary Connections</b></p>                            | <p>NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others’ ideas and expressing their own clearly and persuasively.</p> <p>NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.</p> <p>NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.</p> <p>NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>   |  |  |
| <p><b>Life Literacies &amp; Key Skills</b></p>                         | <p>9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas</p> <p>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities</p> <p>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition</p> <p>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice</p> <p>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving</p>   |  |  |
| <p><b>Information and Media Literacy &amp; Technology Literacy</b></p> | <p>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.</p> <p>9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources</p> <p>9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design</p> <p>9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience</p> <p>9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately</p>  |  |  |



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|   | <p>9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity</p> <p>9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change</p> <p>9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations</p> <p>9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media</p> <p>9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task</p> <p>9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.</p> <p>9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.</p> <p>9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem</p> <p>9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.</p> <p>9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.</p> |  |   |
| <p><b>Career Readiness, Life Literacies &amp; Key Skills Practices</b></p>  | <p>Act as a responsible and contributing community member and employee</p> <p>Demonstrate creativity and innovation.</p> <p>Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>Model integrity, ethical leadership, and effective management.</p> <p>Use technology to enhance productivity, increase collaboration, and communicate effectively.</p> <p>Work productively in teams while using cultural/global competence.</p>   |  |   |
| <p><b>Modifications</b></p>   |  |  |   |
| <p><b>Multi-Lingual Learners</b></p>  | <p><b>Special Education</b></p>  | <p><b>At-Risk</b></p>  | <p><b>Gifted and Talented</b></p>   |
| <ul style="list-style-type: none"> <li>● Add written labels to equipment and explain the purpose of each component.</li> <li>● Assign a native language partner.</li> <li>● Provide extended time for written responses and reports.</li> </ul> | <ul style="list-style-type: none"> <li>● Provide an outline of lessons.</li> <li>● Receive large projects as smaller tasks with individual deadlines.</li> <li>● Work or take a test in a different setting, such as a quiet room with few distractions.</li> </ul>  | <ul style="list-style-type: none"> <li>● Allow students many opportunities for practice and learning.</li> <li>● Use scaffolding for complex tasks.</li> </ul> | <ul style="list-style-type: none"> <li>● Offer choices, once finished with basic tasks, with personal interest being the key.</li> <li>● Investigate how an electronic component works</li> <li>● Investigate the components used in an electronic device and explain their function</li> </ul> |

**HONORS ENGINEERING DESIGN II**

**Unit 8: Ethics in Engineering**

Almost all types of engineers use programming in the course of their work. This exploration teaches standard computer programming skills in two different development environments as students work in teams to build

**Time Allotted: Approximately 2-3 Weeks**

**New Jersey Student Learning Standards (NJSLs)**

- 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
- 8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback.
- 8.2.12.ED.3: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.
- 9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.
- 9.3.12.AC.2 Use architecture and construction skills to create and manage a project.
- 9.3.12.AC.3 Comply with regulations and applicable codes to establish and manage a legal and safe workplace.
- 9.3.12.AC.4 Evaluate the nature and scope of the Architecture & Construction Career Cluster and the role of architecture and construction in society and the economy.
- 9.3.12.AC.5 Describe the roles, responsibilities, and relationships found in the architecture and construction trades and professions, including labor/management relationships.
- 9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project.
- 9.3.12.AC.7 Describe career opportunities and means to achieve those opportunities in each of the Architecture & Construction Career Pathways.

| Essential Questions   | Student Learning Objectives  | Suggested Tasks/Activities  | Evidence of Learning (Assessment)   |
|---|--|---|---|
| <ul style="list-style-type: none"> <li>● What are the fundamental canons of engineering?</li> <li>● What are the professional obligations of an engineer?</li> <li>● Why is ethics important in engineering?</li> </ul> | <ul style="list-style-type: none"> <li>● Be able to compare the positive and negative impacts of a significant technological/engineering advancement while focusing on the role that an engineer played</li> </ul> | <ul style="list-style-type: none"> <li>● Create a research project of your choice that represents the four technological outcomes to any decision.</li> <li>● Show a product or service’s iterations</li> <li>● Describe the problem that was solved</li> </ul> | <ul style="list-style-type: none"> <li>● Digital Presentation</li> <li>● Prototype Development</li> <li>● Class Participation</li> <li>● Research Documentation</li> <li>● Quizzes</li> </ul> |

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|   |   |  |  |
| <b>Resources/Materials</b>                                      | <ul style="list-style-type: none"> <li>• Desktop and/or Laptop Computer, Library, Source Documents, Physical Device Chosen, Large Format Printer, Color Printer, Poster Board, Foam Core, Tri-fold Display Board, Prezi, PowerPoint</li> <li>• Competitions; STEM League, TSA, Delbarton Robotics, Panasonic Design Challenge, Cardboard Kayak, Steam Tank, Sea Perch etc.</li> </ul>   |  |  |
| <b>Interdisciplinary Connections</b>                            | <p>NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others’ ideas and expressing their own clearly and persuasively.</p> <p>NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>NJSLSA.SL3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric.</p>   |  |  |
| <b>Life Literacies &amp; Key Skills</b>                         | <p>9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas</p> <p>9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities</p> <p>9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition</p> <p>9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice</p> <p>9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving</p>  |  |  |
| <b>Information and Media Literacy &amp; Technology Literacy</b> | <p>9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.</p> <p>9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources</p> <p>9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design</p> <p>9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience</p> <p>9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately</p> <p>9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity</p> <p>9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change</p> <p>9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations</p> <p>9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media</p> <p>9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task</p> <p>9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.</p> <p>9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.</p> <p>9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem</p> <p>9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.</p> <p>9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests)</p> |  |  |

|  | used by employers in various industry sectors.   |   |  |
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| <b>Career Readiness, Life Literacies &amp; Key Skills Practices</b>  | <p>Act as a responsible and contributing community member and employee</p> <p>Demonstrate creativity and innovation.</p> <p>Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>Model integrity, ethical leadership, and effective management.</p> <p>Use technology to enhance productivity, increase collaboration, and communicate effectively.</p> <p>Work productively in teams while using cultural/global competence.</p> |   |  |
| <b>Modifications</b>   |  |   |  |
| <b>Multi-Lingual Learners</b>  | <b>Special Education</b>   | <b>At-Risk</b>  | <b>Gifted and Talented</b>   |
| <ul style="list-style-type: none"> <li>● When possible, modify the project so ELL students have simpler questions to answer, fewer spelling words, etc.</li> <li>● Provide a variety of texts and resources on curriculum topics at a range of reading levels.</li> <li>● Provide models of completed homework assignments, projects, etc.</li> <li>● Assign a native language partner.</li> </ul> | <ul style="list-style-type: none"> <li>● Receive large projects as smaller tasks with individual deadlines.</li> <li>● Work with a partner.</li> <li>● Only do one portion, instead of the entire model home.</li> </ul>   | <ul style="list-style-type: none"> <li>● Incorporate student choice.</li> <li>● Provide peer mentoring.</li> <li>● Allow students multiple opportunities for practice and learning</li> <li>● Use scaffolding for complex tasks.</li> </ul> | <ul style="list-style-type: none"> <li>● Offer choices, once finished with basic tasks, with personal interest being the key.</li> </ul> |