

Cedar Grove School District

Cedar Grove, NJ

2017 | Grade 9-12

Advanced Building and Engineering



Revised 2017

Approved by the Cedar Grove Board of Education

Superintendent of Schools
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Advanced Building and Engineering

Course Description

In this full year course, project requirements are of a more advanced and complex nature than those completed in *Technology I & II*. Students will be introduced to renewable energy sources, the WEST POINT BRIDGE DESIGN program, and PRO/E engineering software, which is a computer assisted technology drafting program.

Prerequisites: *Building and Engineering*

**This curriculum was written in accordance with the
2014 NEW JERSEY STUDENT LEARNING STANDARDS FOR
VISUAL AND PERFORMANING ARTS,
the 2014 NEW JERSEY STUDENT LEARNING STANDARDS
FOR 21ST CENTURY LIFE AND CAREERS,
and the
2014 NEW JERSEY STUDENT LEARNING STANDARDS FOR
TECHNOLOGY**

Building and Engineering

Unit 1 – Applying Engineering and Design

Course Objective(s)	Student Objectives
Analyze and compare structural building materials.	<ul style="list-style-type: none"> Recognize, identify, and explain their uses for cement, various types of lumber, composite decking, cinder blocks, sheetrock, paint, etc.
Research, discuss and present on a specific building material	<ul style="list-style-type: none"> Research and write a paper on one of the following building materials: <ul style="list-style-type: none"> Cement Types of lumber Composite decking, cinder blocks Sheetrock Paint Deliver a 15 minute oral presentation to the class
Design, construct, and test a model structure	<ul style="list-style-type: none"> Research, design and construct a bridge made out of balsa wood which will be able to hold a load of 15 pounds; span of each end tower must be independent of the other Test the stability of the towers by simulating an earthquake
Utilize a computer simulation program to examine the forces that act upon a bridge	<ul style="list-style-type: none"> Expand knowledge of forces using the West Point Bridge Design computer program which will introduce students to various types of bridge structures Build and then test a bridge designed on the computer under a live load simulation

2014 New Jersey Student Learning Standards for Visual and Performing Arts

1.3.12.D.4 Analyze the syntax and compositional and stylistic principles of two- and three-dimensional artworks in multiple art media (including computer-assisted artwork), and interpret themes and symbols suggested by the artworks.

2014 New Jersey Student Learning Standards for 21st Century Life and Careers: Architecture & Construction Career Cluster

9.3.12.AC-DES.1 Justify design solutions through the use of research documentation and analysis of data.

9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.

9.3.12.AC-DES.7 Employ appropriate representational media to communicate concepts and project design.

2014 New Jersey Student Learning Standards for 21st Century Life and Careers: Arts, A/V technology & Communications Career Cluster

9.3.12.AR-VIS.2 Analyze how the application of visual arts elements and principles of design communicate and express ideas.

2014 New Jersey Student Learning Standards for 21st Century Life and Careers: Science, Technology, Engineering & Mathematics Career Cluster

9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.

9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.

2014 New Jersey Student Learning Standards for Technology

8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

8.1.12.E.1 Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.

8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

8.2.12.B.4 Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants.

Building and Engineering

Unit 2 – Aviation Engineering and Design

Course Objective(s)	Student Objectives
Differentiate and identify the forces that act upon an airplane	<ul style="list-style-type: none"> • Explain how each of the following forces act upon an airplane: <ul style="list-style-type: none"> ▪ Gravity ▪ Drag ▪ Thrust ▪ Lift ▪ Wind resistance ▪ Friction
Research how aviation had helped shape our society	<ul style="list-style-type: none"> • Research and discuss aviation’s impact on: <ul style="list-style-type: none"> ▪ History ▪ Business ▪ Careers
Demonstrate comprehension of design, modeling, propulsion, and forces on an airplane	Illustrate, design, build, and test an airplane.
2014 New Jersey Student Learning Standards for Visual and Performing Arts	
9.3.12.D.4 Analyze the syntax and compositional and stylistic principles of two- and three-dimensional artworks in multiple art media (including computer-assisted artwork), and interpret themes and symbols suggested by the artworks.	
2014 New Jersey Student Learning Standards for 21st Century Life and Careers: Architecture & Construction Career Cluster	
9.3.12.AC-DES.1 Justify design solutions through the use of research documentation and analysis of data.	
9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.	
9.3.12.AC-DES.7 Employ appropriate representational media to communicate concepts and project design.	
2014 New Jersey Student Learning Standards for 21st Century Life and Careers: Arts, A/V technology & Communications Career Cluster	
9.3.12.AR-VIS.2 Analyze how the application of visual arts elements and principles of design communicate and express ideas.	
2014 New Jersey Student Learning Standards for 21st Century Life and Careers: Science, Technology, Engineering & Mathematics Career Cluster	
9.3.ST.1 Apply engineering skills in a project that requires project management, process control and quality assurance.	
9.3.ST-SM.4 Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.	
2014 New Jersey Student Learning Standards for Technology	
8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.	
8.1.12.E.1 Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.	

Building and Engineering

Unit 3 – Computer Drafting

Course Objective(s)	Student Objectives
Demonstrate knowledge on mechanical drafting using the computer to design and build objects	Using the Pro-E Engineering Software, illustrate the ability to draw objects from a flat washer to a series of cylinders representing an orbiting space station.
2014 New Jersey Student Learning Standards for Visual and Performing Arts	
1.3.12.D.4 Analyze the syntax and compositional and stylistic principles of two- and three-dimensional artworks in multiple art media (including computer-assisted artwork), and interpret themes and symbols suggested by the artworks.	
2014 New Jersey Student Learning Standards for 21st Century Life and Careers: Architecture & Construction Career Cluster	
9.3.12.AC-DES.1 Justify design solutions through the use of research documentation and analysis of data.	
9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.	
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2014 New Jersey Student Learning Standards for 21st Century Life and Careers: Arts, A/V technology & Communications Career Cluster	
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2014 New Jersey Student Learning Standards for Technology	
8.1.12.C.1 Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.	
8.1.12.E.1 Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.	

Suggested Resources

Textbook:

- *Technology*, R. Thomas Wright, McGraw Hill, 2008
- *Technology & Engineering*, McGraw Hill, 2008
- *Technology Interpretations*, McGraw Hill, 2008
- *Introduction to Technology*, McGraw Hill, 2007

Supplementary Materials:

- Videos/DVDs
- *Wilbur & Orville Wright: Dreams of Flying*, A & E Videos, 2001.
- *Wind Generators*
- *Super Bridges*, ova, 2008
- *How a Car is Made*, Media Presentations, 2000
- *The Story of Henry Ford*, Questar, 2005

Websites:

- <http://www.historychannel.com>
- <http://www.discoverychannel.com>

Computer Work Stations

- Software
- Pro-E Engineering
- West Point Bridge Design

Equipment

- Drills
- Sanders
- Dremel
- Band saw
- Sanders