Summit Public Schools
Summit, New Jersey
Grade Level/Content Area: 9-12 Computer Graphics II - IV
Length of Course: 1 Semester

Curriculum

Course Description:
This one semester course is a continuation of the skills learned in the previous Computer Graphics course. This is a hands-on computer, art, and engineering course utilizing computer. It is designed to provide skills in both freehand and mechanical graphics methods, which are used commonly in the fine and graphic arts. This course includes specific training with intermediate and professional-level graphics applications. Student’s class work will include study in pre-press color theory/applications, digital photography, animation and audio/visual presentations. Students successfully completing this course will be able to integrate graphics, design and engineering into sophisticated presentations utilizing popular computer applications.

Unit 1: What is Technology?

Standard
8.2 Technology Education, Engineering, and Design All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.

Big Ideas: Course Objectives / Content Statement(s)
• Identify Technology as a Product, System, and Resources
• Document the creative process using the Design Loop
• Analyze the Influence of the Internet
• Identify risks and trade-offs of technology
• Participate in a Design Contest

Essential Questions
What provocative questions will foster inquiry, understanding, and transfer of learning?

• What is most commonly associated with the word “technology?”
• What products are most popular today? How about ten years ago?
• What technologies are most necessary for life?
• How does an engineer/designer plan the creation of their products?
• How has the Internet affected the world?
• What are the positives and negatives of the Internet?

Enduring Understandings
What will students understand about the big ideas?

Students will understand that…
• Technology is the process by which products are created to meet human needs or wants.
• Products of technology aid in the creation and design process.
• Technology is changing at an exponential rate.
• The design of a technology product or system can have positive and negative impacts.
• The Internet is a great technology,
| What role does design play in technology? | A. Nature of Technology: Creativity and Innovation. Technology products and systems impact every aspect of the world in which we live. Students will:

8.1.12.A.2 Produce and edit a multi-page document for a commercial or professional audience using desktop publishing and/or graphics software.

8.2.2.A.1 Describe how technology products, systems, and resources are useful at school, home, and work.

8.2.4.A.1 Investigate factors that influence the development and function of technology products and systems.

8.2.4.A.2 Using a digital format, compare and contrast how a technology product has changed over time due to economic, political, and/or cultural influences.

8.2.8.A.1 Explain the impact of globalization on the development of a technological system over time.

8.2.12.A.1 Design and create a technology product or system that improves the quality of life and identify trade-offs, risks, and benefits.

Areas of Focus: Proficiencies (Cumulative Progress Indicators) | Examples, Outcomes, Assessments |
--- | --- |
Instructional Focus: For this unit students will participate in a design challenge contest. For the project students will need to use the design loop to document their work. Students will participate in classroom discussions and breakout sessions.

Sample Assessments: Students will complete project documentation on their contest design. All students will complete formative assessments as an exit ticket in an online collaborative network.

Instructional Strategies:
Interdisciplinary Connections
Students will be assessed on their writing in their project evaluation as well as the formative online assessments.

Technology Integration
Students will become proficient in the use of the Adobe Suite as well as the class website and Portal.

Media Literacy Integration
Students will collaborate and discuss design and technology impact media.

Global Perspectives
Students will explore global trade-offs of the internet.

The following skills and themes listed to the right should be reflected in the design of units and lessons for this course or content area.

21st Century Skills:
Creativity and Innovation
Critical Thinking and Problem Solving
Media Literacy
Life and Career Skills

21st Century Themes (as applies to content)
Flexibility and Adaptability
Initiative and Self-Direction
### Unit 2: Engineering Technology

**Standard**

**8.2 Technology Education, Engineering, and Design** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.

**Big Ideas:** *Course Objectives / Content Statement(s)*

- Designing a product to improve the quality of life
- Analyzing the impacts of the product on society
- Identifying materials and designs that are sustainable
- Calculating the feasibility to mass produce a designed product
- Prototyping a solution to a real-world problem

<table>
<thead>
<tr>
<th>Essential Questions</th>
<th>Enduring Understandings</th>
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<tbody>
<tr>
<td>What provocative questions will foster inquiry, understanding, and transfer of learning?</td>
<td>What will students understand about the big ideas?</td>
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<tr>
<td>• What products and technologies do human use most? What other technologies are they dependent on?</td>
<td>Students will understand that…</td>
</tr>
<tr>
<td>• What external factors foster a products design?</td>
<td>• Technology is the process by which products are created to meet human needs or wants.</td>
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<tr>
<td>• What planning is needed to produce a successful technology?</td>
<td>• Humans rely on many type of technologies including transportation, construction, manufacturing, medical, and electrical.</td>
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<tr>
<td>• What is a prototype?</td>
<td>• Natural factors influence design and must be taken into consideration.</td>
</tr>
<tr>
<td>• What happens if an engineering prototype fails?</td>
<td>• Prototypes are working models of a product and if failure occurs the design process repeats.</td>
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</table>

**Areas of Focus: Proficiencies (Cumulative Progress Indicators)**

**B. Design: Critical Thinking, Problem Solving, and Decision-Making.** The design process is a systematic approach to solving problems.

Students will:

*8.2.12.B.1* Design and create a product that maximizes conservation and sustainability of a scarce resource, using the design process

**Examples, Outcomes, Assessments**

Instructional Focus: For this project students will have to research, plan, prototype, and redesign a specific product. Graphics II will complete a vehicle design. Graphics III will design a bridge. Graphics IV will design a web site. Each class will be required to complete proper documentation.
<table>
<thead>
<tr>
<th>and entrepreneurial skills throughout the design process.</th>
<th>Sample Assessments: Students will use engineering design loop to make documentation and a short presentation illustrating materials chosen and explaining their design.</th>
</tr>
</thead>
</table>
| 8.2.8.B.2 Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation. | Instructional Strategies:  
Interdisciplinary Connections  
Students will learn the economics behind design. They will also learn materials science while selecting materials for their prototype.  
Technology Integration  
Students will become proficient in the use of the Adobe Suite as well as the class website. All work will be completed on the computer and through the use of text.  
Media Literacy Integration  
Students will utilize textbooks, the internet and science text to select material.  
Global Perspectives  
Students will explore and report on the impact of their technological product on the environment. |
| 8.2.4.B.3 Explain the positive and negative effect of products and systems on humans, other species, and the environment. |  
| 8.2.12.B.2 Design and create a prototype for solving a global problem, documenting how the proposed design features affect the feasibility of the prototype through the use of engineering, drawing, and other technical methods of illustration. |  
| 8.2.8.B.1 Design and create a product that addresses a real-world problem using the design process and working with specific criteria and constraints. |  
| 9.4.12.O.(1).2 Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems. |  
| The following skills and themes listed to the right should be reflected in the design of units and lessons for this course or content area. |  
| 21st Century Skills:  
Creativity and Innovation  
Critical Thinking and Problem Solving  
Media Literacy  
Life and Career Skills |  
| 21st Century Themes (as applies to content)  
Flexibility and Adaptability  
Initiative and Self-Direction  
Productivity and Accountability  
ICT Literacy |  

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### Unit 3: System/Product Design

**Standard**

**8.2 Technology Education, Engineering, and Design** All students will develop an understanding of the nature and impact of technology, engineering, technological design,
and the designed world, as they relate to the individual, global society, and the environment.

**Big Ideas: Course Objectives / Content Statement(s)**

- Explore the patent process
- Research and present on a global designer and the impact of their designs
- Analyze the negative impact of technology and redesign the product
- Create possible products and implement a business plan.
- Evaluate the ethics of system and product design.

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<td><strong>What will students understand about the big ideas?</strong></td>
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</table>
| - Who influenced the Industrial Revolution?  
- What products/systems influenced technological growth the most?  
- What are the biggest failures in engineering?  
- What are the greatest achievements in engineering?  
- How does a product become patented?  
- Why are some patents similar in function? | - Technology is the process by which products are created to meet human needs or wants.  
- Designers from around the globe influenced technology growth.  
- Engineering failures lead to scientific discoveries and better engineering.  
- Patenting is a legal process that protects a designers/inventors ideas/products.  
- Patented products with negative impacts can be redesigned and patented. |

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| **C. Technological Citizenship, Ethics, and Society.** Knowledge and understanding of human, cultural, and societal values are fundamental when designing technology systems and products in the global society. | Instructional Focus: Students will explore the patent process and the global impacts of technology. Graphics II students will generate a presentation on an important technological figure. Graphics III students will conduct a product evaluation and redesign. Graphics IV students will explore green design and create an art kit to be patented and sold. All classes will present their results.  
Sample Assessments: Students will be assessed based on their findings and presentation of information. All information will be documented and evaluated for a final grade. |
| Students will:  
8.2.4.C.2 Explain the purpose of trademarks and the impact of trademark infringement on businesses. | Instructional Strategies:  
Interdisciplinary Connections  
Students will explore iconic figures in the |  
8.2.4.C.3 Examine ethical considerations in the development and production of a product from its inception through production, marketing, use, maintenance, and eventual disposal by consumers. |  
8.2.8.C.1 Explain the need for patents and the process of registering one. |  
8.2.12.C.2 Evaluate ethical considerations regarding the sustainability of resources that are used for the design, creation, and maintenance of a chosen product. |
8.2.12.C.3 Evaluate the positive and negative impacts in a design by providing a digital overview of a chosen product and suggest potential modifications to address the negative impacts.

| History of design, manufacturing, and technology. |

Technology Integration
Students will explore how technology has evolved and utilize various programs to create a product.

Media Literacy Integration
Students will collaborate and discuss design and technology impact media.

Global Perspectives
Students will explore global figures in technology.

The following skills and themes listed to the right should be reflected in the design of units and lessons for this course or content area.

| 21st Century Skills: |
| Creativity and Innovation |
| Critical Thinking and Problem Solving |
| Media Literacy |
| Life and Career Skills |

21st Century Themes (as applies to content)

- Flexibility and Adaptability
- Initiative and Self-Direction
- Productivity and Accountability
- ICT Literacy

**Unit 4: Reverse Engineering**

**Standard**

8.2 Technology Education, Engineering, and Design All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.

**Big Ideas:** *Course Objectives / Content Statement(s)*

- Reverse engineer products and document how it works
- Identify mechanical systems
- Problem solving/Critical Thinking through discovery
- Explain relationships between technical fields/careers
- Engineers use reverse engineering to design new technologies

**Essential Questions**

*What provocative questions will foster inquiry, understanding, and transfer of learning?*

- Why are there multiple products that achieve the same goal?

**Enduring Understandings**

*What will students understand about the big ideas?*

- Students will understand that…
  - Technologies from one field can be
- How do engineers duplicate technologies from other countries?
- What is reverse engineering?
- How do gears work?
- What's a mechanical system?
- What careers are associated with product development?
- How do you properly document how a product is put together?

- Engineers buy and reverse engineer products so companies can compete.
- Reverse engineering allows for the creation of newer more effective technologies.
- Careers from the graphics, business, and literary fields are all associated to aid engineering.

### Areas of Focus: Proficiencies
(Cumulative Progress Indicators)

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<thead>
<tr>
<th>Instructional Focus:</th>
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<tr>
<td><strong>D. Research and Information Fluency.</strong> Information-literacy skills, research, data analysis, and prediction provide the basis for the effective design of technology systems. Students will:</td>
<td>Instructional Focus: Students will reverse engineer a product to understand how mechanisms function. Students will then document step by step how the product is constructed with a breakdown of how individual parts function as a system. Students in Graphics II and III will receive products with gears and mechanisms. Students in Graphics IV will focus on reverse engineering a publication and create a sustainable brochure/magazine.</td>
</tr>
<tr>
<td>8.2.12.D.1 Reverse-engineer a product to assist in designing a more eco-friendly version, using an analysis of trends and data about renewable and sustainable materials to guide your work.</td>
<td>Sample Assessments: Students will complete project documentation All students design more sustainable product.</td>
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<tr>
<td>8.2.8.G.2 Explain the interdependence of a subsystem that operates as part of a system.</td>
<td>Instructional Strategies:</td>
</tr>
<tr>
<td>8.2.8.D.1 Evaluate the role of ethics and bias on trend analysis and prediction in the development of a product that impacts communities in the United States and/or other countries.</td>
<td>Interdisciplinary Connections</td>
</tr>
<tr>
<td>9.4.12.O.(1).6 Explain relationships among specific scientific theories, principles, and laws that apply to technology and engineering.</td>
<td>Technology Integration</td>
</tr>
<tr>
<td>9.4.12.O.(1).12 Model technical competence by developing and applying processes and concepts in the design process.</td>
<td>Media Literacy Integration</td>
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</tbody>
</table>

- Students will assess on their writing in their project evaluation as well as their use of measurement.
- Students will reverse engineer technology giving them a greater appreciation and understanding of its function.
- Students will collaborate and discuss their products and create media to illustrate their respective product of technology.
- Students will explore different manufacturers products from around the globe.

- Global Perspectives
The following skills and themes listed to the right should be reflected in the design of units and lessons for this course or content area.

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### Unit 5: Communication, Collaboration and Global Issues

#### Standard

**8.2 Technology Education, Engineering, and Design** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.

#### Big Ideas: *Course Objectives / Content Statement(s)*

- Collaborating as a team to devise the best solution.
- Talking to experts to gather information.
- Identifying trade-offs for the proposed solution
- Solving a Global Issue using math and science concepts
- Design a system that requires multiple working parts

#### Essential Questions

<table>
<thead>
<tr>
<th>What provocative questions will foster inquiry, understanding, and transfer of learning?</th>
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<tbody>
<tr>
<td>- What are the proposed solutions to your global issue?</td>
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<tr>
<td>- Who can you talk to about your global issue?</td>
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<tr>
<td>- What Math and science concepts can help you achieve your goal?</td>
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<tr>
<td>- How can you chart your progress over a period of time?</td>
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<tr>
<td>- Why is the input of others important when designing?</td>
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</table>

#### Enduring Understandings

<table>
<thead>
<tr>
<th>What will students understand about the big ideas?</th>
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</thead>
<tbody>
<tr>
<td>Students will understand that…</td>
</tr>
<tr>
<td>- Collaboration and communication is imperative when solving a global issue to improve the quality of life.</td>
</tr>
<tr>
<td>- Professionals should be contacted directly to obtain accurate information.</td>
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<tr>
<td>- Graphs and material sciences should be used when designing a sustainable product.</td>
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<tr>
<td>- Solutions to a global issue may only be successful for a particular region based on climate and cultural beliefs.</td>
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</tbody>
</table>

#### Areas of Focus: Proficiencies (Cumulative Progress Indicators)

<table>
<thead>
<tr>
<th>Examples, Outcomes, Assessments</th>
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<tbody>
<tr>
<td>E. Communication and Collaboration. Digital tools facilitate local and global</td>
</tr>
<tr>
<td>Instructional Focus: Students will follow a project plans provided by Steven’s Institute.</td>
</tr>
</tbody>
</table>
communication and collaboration in designing products and systems.

Students will:

| 8.2.12.E.1 | Use the design process to devise a technological product or system that addresses a global issue, and provide documentation through drawings, data, and materials, taking the relevant cultural perspectives into account throughout the design and development process. |
| 8.2.4.E.1 | Work in collaboration with peers to produce and publish a report that explains how technology is or was successfully or unsuccessfully used to address a local or global problem. |
| 8.2.8.E.1 | Work in collaboration with peers and experts in the field to develop a product using the design process, data analysis, and trends, and maintain a digital log with annotated sketches to record the development cycle. |

| 9.4.12.O.(1).7 | Use mathematics, science, and technology concepts and processes to solve problems in projects involving design and/or production (e.g., medical, agricultural, biotechnological, energy and power, information and communication, transportation, manufacturing, and construction). |

These projects address global issues and provide a web quest and resources for investigation. The program allows students to collaborate with other schools on a message board to aid communication and collaborations. Students in Graphic II will complete a unit on Biodynamic Farming. Students in Graphics III will complete a unit on shelter for the homeless. Students in Graphics IV will complete a unit on water purification.

Sample Assessments: Students will complete project documentation and complete a log of their work. Students will also complete a closure assessment rating evaluating their group and peers work.

Instructional Strategies:

Interdisciplinary Connections

Students will be required to generate graphs and research science principals to complete each task.

Technology Integration

Students will participate in an online collaboration group to foster inquiry.

Media Literacy Integration

Students will gain literacy in evaluating scientific journals and online media.

Global Perspectives

Students will explore global issues such as water purification, homelessness farming of various regions of the world.

The following skills and themes listed to the right should be reflected in the design of units and lessons for this course or content area.

21st Century Skills:
- Creativity and Innovation
- Critical Thinking and Problem Solving
- Media Literacy
- Life and Career Skills

21st Century Themes (as applies to content)
- Flexibility and Adaptability
- Initiative and Self-Direction
# Unit 6: Green Resource Selection

## Standard

**8.2 Technology Education, Engineering, and Design** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.

## Big Ideas: Course Objectives / Content Statement(s)

- Selecting materials that are Green and eco-friendly.
- Analyzing which materials can be repurposed most effectively.
- Identifying which resources have the largest impact on the earth and society.
- Creating a product that is both renewable and solves a human need or want.
- Analyzing the interaction between technologies.

## Essential Questions

**What provocative questions will foster inquiry, understanding, and transfer of learning?**

- What products and materials negatively impact the environment?
- What alternative uses for these products? Why can they not be recycled?
- Why are materials produced if they cannot be disposed?
- What products can be made out of existing materials?

## Enduring Understandings

**What will students understand about the big ideas?**

- Non-renewable materials are now being repurposed to become Green materials.
- Green Materials are less harmful for the environment but are usually more expensive.
- Creating a green product requires knowledge about its scientific makeup.
- Technology products and systems impact every aspect of the world in which we live.

## Areas of Focus: Proficiencies (Cumulative Progress Indicators)

**F. Resources for a Technological World.** Technological products and systems are created through the application and appropriate use of technological resources.

**Students will:**

8.2.8.F.1 Explain the impact of resource selection and processing in the development of a common technological product or system.

8.2.8.F.2 Explain how the resources and processes used in the production of a current technological product can be modified to

## Examples, Outcomes, Assessments

Instructional Focus: For this unit students create Green products through material research. Prototypes will be constructed of each. Graphics II students will create recycled clothing out of juice containers or another desired materials. The Graphics III class will design and select materials for a Green living space. The Graphics IV class will collaborate on the design, development, and creation of a technological product or system.
<table>
<thead>
<tr>
<th>Number</th>
<th>Standard</th>
<th>Description</th>
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<tbody>
<tr>
<td>8.2.12.F.2</td>
<td>Explain how material science impacts the quality of products.</td>
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<tr>
<td>8.2.12.F.1</td>
<td>Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.</td>
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<tr>
<td>8.2.12.G.1</td>
<td>Analyze the interactions among various technologies and collaborate to create a product or system demonstrating their interactivity.</td>
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</table>

Sample Assessments: Students will be assessed on their documentation of their design process. Adequate research, Planning, Drawings, Testing, Creating and Evaluating must be present.

Instructional Strategies:
- **Interdisciplinary Connections**
  Students must use Science, Technology, Engineering, and Math (STEM) to complete the final class project.

  - **Technology Integration**
    Students will become proficient in the use of the Adobe Suite, Microsoft Office as well as the class website and Portal.

  - **Media Literacy Integration**
    Students will collaborate and discuss design and technology and the impact media has on society.

  - **Global Perspectives**
    Students will explore global issues associated with Going Green.

The following skills and themes listed to the right should be reflected in the design of units and lessons for this course or content area.

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<th>21st Century Themes (as applies to content)</th>
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<tbody>
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<td>Economics</td>
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