Washington Township Public Schools
COURSE OF STUDY – CURRICULUM GUIDE

Course: **Introduction to Engineering Technologies (#910)**

Written By: Simone Scafide

Under the Direction of: Steve Whalen

Description: This is the first course in the pre-engineering sequence. Students develop an understanding of the tools, techniques, and processes of technology using design principles, computers, problem solving and model making. Students learn to use *AutoDesk Inventor* to sketch solutions to problems, apply creative problem solving methods to create technical presentations, build models, and engineer designs. By the end of the course, students are prepared to take the Principles of Engineering and Technology Design class.

Jack McGee: *Interim Assistant Superintendent for Curriculum & Instruction*
Gretchen Gerber: *Director of Elementary Education*
Cleve Bryan: *Interim Director of Secondary Education*

Written: August, 2015
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DEMONSTRABLE PROFICIENCIES

COURSE TITLE: **Introduction to Engineering Technologies (#910)**

I. CLASSWORK REQUIREMENTS

A. Students must be attentive and effectively following directions
B. Students must exhibit responsibility by bringing the necessary materials to class
C. Student resource materials should be legible, well organized, and attention to detail must be noted
D. Homework is a regular requirement
E. Short-term problem applications will be assigned when appropriate
F. A culminating long-term business simulation will be assigned during the last marking period and is a major part of the graded work for the course
G. Quizzes and tests are teacher prepared instruments and usually administered after each chapter introduction of a unit

II. ATTITUDE & BEHAVIOR

A. Behavior and class attendance must conform to Board of Education policy.
B. Students must display a readiness to work.
C. Students must actively participate in class through the maintenance of a notebook and teacher directed patterning activities of concepts.
D. Students must adhere to scheduled deadlines.
E. Students must follow oral and written directions accurately.
F. Tolerate routine work without displaying frustration.

III. COURSE OBJECTIVES/OVERVIEW

A. **COURSE CONTENT**: This course is a full year course for 9th-12th grade students who wish to be exposed to engineering. The course covers:
   1. Measurement
   2. Solid modeling software
   3. Outputting work to various media
   4. Outputting design solutions to various scales as needed
   5. Applying basic mathematical computation and formulas toward the solution of given design problems

6. Understanding the components of the design loop
7. Presenting ideas in front of a group
8. Converting fractional inch to decimal inch
9. Generating engineering drawings as required
10. Using basic modeling tools to create mock-ups and prototypes of their design solutions
11. Sketching and annotating preliminary designs
12. Visualizing in 2D and 3D
13. Understanding what design is
14. Understanding what working drawings are
15. Being aware of several career paths in the area of design
16. Demonstrating software design skills
17. Developing basic technical literacy
18. Executing a variety of software commands
19. Executing basic Windows commands
20. Demonstrating file management
21. Gathering information germane to design problem from a variety of sources

A. SKILLS

a. Organization and self-motivation is required for problem application work.
b. Ability to work individually or in groups to solve problems
c. Practical application of math, science, and communication skills
d. Development of documentation of the design process
e. Increased manipulative skills in the utilization of tools, machines, and equipment

B. APPRECIATION OF CONCEPTS

a. An appreciation for organization and orderliness of one's materials to enhance the expediency of performing a task.
b. An ability to analyze and reproduce select information.
c. The ability to adjust quickly to equipment, program, and procedure changes.
d. Appreciate how the initial calculation of inaccurate data affects several other areas of problem solving.

IV. ATTENDANCE

Attendance: Refer to Board of Education Policy

V. GRADING PROCEDURES

A. Assessments- 30%

B. Assignments (Classwork/projects/homework) 60%

C. Conduct (Participation/Preparation) 10%

Semester 1 Grade (S1) is calculated: (50% of Y1) MP1=20%, MP2= 20%, Mid-term(X1) exam= 10%

Semester 2 Grade (S2) is calculated: (50% of Y1) MP3= 20%, MP4= 20%, Final (X2) exam = 10%

Final Grade (Y1) is calculated: S1 + S2 = Y1

MAJOR UNITS OF STUDY

Course Title: Introduction to Engineering Technologies (#910)

I. **Introduction to Engineering Technologies**
II. **The Resources of Technology and Safety**
III. **Measurement, Scale, Ratio, Proportion**
IV. **The Engineering Design Process**
V. **Documentation of Design**
VI. **Modeling and Prototyping**
VII. **Technology and Society**
VIII. **Careers in Design and Engineering Technologies**

UNIT OVERVIEW

Course Title: **Introduction to Engineering Technologies (#910)**

Unit #: Unit 1 **Unit Title:** Introduction to Engineering Technology

Unit Description and Objectives:
Students are introduced to the facilities, materials, and recourses that are available. Safety and behavioral requirements are introduced; course proficiency, methods of evaluation and the areas of study are reviewed. Students are also told what to do and where to go in the event of an emergency. By the end of the introductory unit, students will be able to safely respond to emergency situations. Students are asked "What is technology? What is engineering?" Students will be able to summarize what engineering and technology is.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. What do you do in case of an emergency?	1. There are different procedures for different emergency situations. 2. Around the room there is different equipment that can be used in case of emergency. 3. In the event of an emergency, students should following the appropriate protocol and remain calm.	1. Where do we go if there is a fire? 2. Where do we go if there is an active shooter? 3. What do we do if there are other school emergencies? 4. What should be done if an accident occurs?
2. What are the expectations for the Introduction to Engineering Technologies course?	1. Students will understand the acceptable behavior for students while in the technology education laboratories. 2. The attendance policy for the high school is set out by the board of education. 3. Evaluation of the student will be based on assessments, assignments, and conduct.	1. What are the behavior expectations for this course? 2. What is the attendance policy for this building? 3. How will the instructor evaluate the student? 4. Why is safety important in the technology education class?
3. What is technology? 4. What is engineering?	1. Technology is a process rather than a product. By definition, technology is the use of knowledge and other resources to solve problems and extend human capabilities. 2. Science is the creation of knowledge; technology is the application of knowledge.	1. What is technology? 2. Why do most people think of computers as technology? 3. How are technology and science different?

CURRICULUM UNIT PLAN

Course Title/Grade: Introduction to Engineering Technologies (#910)
Unit Number/Title: Unit I- Introduction to Engineering Technologies
Conceptual Lens:
Appropriate Time Allocation (# of Days): 5 days

Primary Content Standards referenced With Cumulative Progress Indicators			
8.1.12.A3,4	8.1.12.F.12	9.2.12.C.3,6	
8.1.12.D.5	9.1.12.A.3	9.3.12FN-ACT.1-4	
8.1.12.E.1	9.1.12.A.6		

Topics/Concepts (Incl. time / # days per topic)	Critical Content (Students Will Know:)	Skill Objectives (Students Will Be Able To:)	Instructional/Learning Activities & Interdisciplinary Connections	Instructional Resources	Technology & 21st C Skills Integration (Specify)	NJSLS w/ CPI Reference	Evaluation/ Assessment:
A. Definition of (What is technology?) B. Definition of (What is engineering?) C. Course & Room Orientation 1. The tech lab 2. Safety letter 3. S eating chart D. Course Proficiency 1. Class requirements 2. Attitude / behavior 3. Course objectives 4. Attendance / makeup 5. Grading A. Specific Areas of Study 1. Measurement, Scale, Ratio, Proportion 2. Resources of Technology and Safety 3. The Engineering Design Process	1. Technology has changed throughout history, and will continue to develop. 2. The layout of the lab 3. That the course requires good behavior, attendance, and class work. 4. The 7 specific areas of study for the course 5. The definition of technology 6. The difference between science and technology	1. Demonstrate classroom policies and procedures through their attitude and behavior 2. Explain the course proficiencies 3. Show what to do in the event of an emergency or drill 4. Recognize what safety equipment is in the classroom 5. Identify the location of safety equipment in the classroom 6. Show how to operate any safety equipment that may be necessary to use in the event of an emergency 7. Identify the steps that should be followed in the event of an accident or medical emergency in the classroom.	When asked, “what is technology? What is engineering?” Students will write their individual definitions. Have students conduct group discussions of various definitions while listing them on the board. A group tour of the tech. lab and computer resource room. Discussion of safety, letter that students will have signed by their parents. Fill out emergency cards. Assign seating/workstations. Group discussion of course profanely, discipline, course content attendance/makeup work and grading. Group discussion of TLA’s – Technology learning activities Course outline Methods of evaluation	1. Class syllabus 2. Map of the classroom 3. Emergency Procedures book 4. Student handbook	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 Technology Foundation Standards for Students (NETS) 1 (1,2,3) 2 (1,2,3,4,5) 3 (1,4) 4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) 9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4 Environmental literacy	NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10 NJSLS N-Q.1-3 CS.5.3.12.C.1	**Formative Assessment:** 1. Class discussions **Summative Assessment** 2. Procedures Quiz 3. Classroom layout Quiz

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
4. Documentation of Design 5. Modeling and Prototyping 6. Technology and Society 7. Careers in Design and Engineering Technologies .					Critical Thinking and Problem Solving Communication Collaboration Flexibility & Adaptability Productivity & Accountability Leadership & Responsibility NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4		

Unit Modifications for Special Population Students:

Struggling Learners	Gifted and Talented Students (Challenge Activities)	English Language Learners	Learners with an IEP	Learners with a 504
• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Break assignments into small segments and assign only one segment at a time. • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability.	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students.	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class.	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

UNIT OVERVIEW

Course Title: **Introduction to Engineering Technologies (#910)**

Unit #: Unit 2 **Unit Title:** The Resources of Technology and Safety

Unit Description and Objectives:
This unit familiarizes the students with the necessary tools, machines and equipment for the design portion of the problem solving process used in the technology class. It promotes proper use, care and safety of all hand tools, machine tools, and equipment. The unit develops an awareness of general safety and proper procedures while in the technology lab. Students should use safe practices when using machines in the tech lab, while having an understanding of how different materials are processed using various machines. By the end of the unit on "The Resources of Technology and Safety", students will be able to identify safety features in the classroom such as fire extinguishers, emergency power switches, eye-wash stations, exits, etc. Students will also be able to identify and utilize different safety features on tools and machines. Students will be able to summarize the necessity of safety glasses, close-toed shoes, and removing ear buds while in the technology lab. Students will be able to safety operate tools, machines and equipment such as band saws, drill presses, power sanders, miter saws, x-acto knives, utility knives, etc.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations** **Students will understand that:**	**Guiding Questions**
1. Why is safety important?	1. Tools can be dangerous when operated incorrectly, and safety rules must always be followed. 2. Their knowledge of the safety rules apply to any unit or activities in the technology lab. 3. Keeping the technology lab clean and organized can help prevent accidents. 4. Safety glasses must be worn whenever material is being processed or projects are being tested.	1. Why must safety glasses be worn? 2. What is a potential consequence of not wearing safety glasses 3. What are rules specific for each tool? 4. What are generic rules for all or most tools? 5. What is the proper way to clean-up after working? 6. What are potential consequences for not cleaning-up after working in the technology lab? 7. What are common safety accidents and how can they be prevented?
1. What can be done to decrease the chance of accidents?	1. Selecting the right tools and right machine for the job will help decrease the chance of accidents occurring. 2. Selecting the right tools and right machines is part of the engineering design loop.	1. What are design tools? 2. What are hand tools? 3. What is the proper care and use of all tools? 4. What are different types of materials we have available? 5. How do you choose a material? 6. What properties about materials are important to consider?

CURRICULUM UNIT PLAN

Course Title/Grade: **Introduction to Engineering Technologies (#910)**
Unit Number/Title: **Unit 2-** The Resources of Technology and Safety
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 15 days

Primary Content Standards referenced With Cumulative Progress Indicators			
8.1.12.A3,4	8.1.12.F.12	9.2.12.C.3,6	
8.1.12.D.5	9.1.12.A.3	9.3.12FN-ACT.1-4	
8.1.12.E.1	9.1.12.A.6		

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
A. General Lab Safety a. Safety glasses b. Lab Procedures c. Machine Care B. Tools for Design C. Methods of design D. Hand tools a. Layout b. Cutting E. Use, Care, and Safety a. sawing b. drilling c. sanding d. jointing e. buffing/ grinding F. Properties of Materials a. Acoustical b. Chemical c. Electrical d. Magnetic e. Manufacturing f. Mechanical g. Thermal	1. That all safety rules must be followed at all times. 2. Proper care and safety for tools and machines 3. Safety classes must be worn at all times in the lab 4. All machines are to be turned off after use 5. All work areas, tools and machines must be cleaned-up and put away after use 6. How to operate different tools and machines 7. Properties of different materials	1. Develop an awareness of general safety and proper procedures while in the technology lab. 2. Use all tools and machines with proper safety and care. 3. List 5 properties of materials that can influence the decision to use a material. 4. Comprehend the relationships that exist among the different types of machines	Discuss, define and demonstrate. 1. Assign glasses, cleanup jobs, and work stations Discuss, define, and demonstrate. 1. Use care safety 2. Different uses on materials (wood, plastic, metal, cardboard) 3. Student use 4. Quiz 5. Test 6. Construction of mock-up 7. Construction of prototype	Whiteboard Handout Displays Material Samples • hardwoods • softwoods • plastics • metals • etc. Tools Machines Computer with internet access	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 Technology Foundation Standards for Students (NETS) 1 (1,2,3) 2 (1,2,3,4,5) 3 (1,4) 4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) 9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4 NGSS HS-ETS1-1	NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10 NJSLS N-Q.1-3 CS.5.1.12.A.1-3 CS.5.1.12.B.1-4 CS.5.2.12.A.5-6	**Formative Assessment:** 1. Safety Quiz 2. Safety Test 3. Daily work/clean-up log **Summative Assessment** 4. Midterm EXAM

Topics/Concepts (Incl. time / # days per topic)	**Critical Content** (Students Will Know:)	**Skill Objectives** (Students Will Be Able To:)	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
					HS-ETS1-2 HS-ETS1-3 HS-ETS1-4 Global awareness Environmental literacy Creativity and Innovation Critical Thinking and Problem Solving Communication Collaboration Flexibility & Adaptability Productivity & Accountability Leadership & Responsibility		

Unit Modifications for Special Population Students:

Struggling Learners	Gifted and Talented Students (Challenge Activities)	English Language Learners	Learners with an IEP	Learners with a 504
• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Break assignments into small segments and assign only one segment at a time. • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability.	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students.	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class.	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

UNIT OVERVIEW

Course Title: **Introduction to Engineering Technologies (#910)**

Unit #: Unit 3 **Unit Title:** Measurement, Scale, Ratio, Proportion

Unit Description and Objectives:
Students learn more in-depth about different ways to measure using different tools, units including English and Metric as well as the fact there are measurements of angle, mass, speed, light, temperature and sound to name a few. The use of rulers, calipers, tape measures, architect and engineer's scales as well as other measuring tools will be demonstrated and used by the students. The relationship between scale and ratio will be explored. Additional discussion of professional standards will also be discussed. The ability to maintain proportional relationships between various design elements will be emphasized. Concepts within this unit will be applied throughout the course in all aspects of student design work. By the end of the unit on Measurement, Scale, Ratio and Proportion, students will be able to identify different measurement tools, and use the tools to generate accurate measurements. Students will understand different units of measurement, and perform conversions. Students will be able to properly perform mathematical functions to find and solve ratios and proportions.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations** **Students will understand that:**	**Guiding Questions**
1. What is the distance from "point a" to "point b"?	1. Measurement units were based on specific distances and have evolved as the need to accuracy increased. 2. A measurement device is only has accurate as its smallest increment of unit division. 3. We can use any type of uniform unit of measure-even one we create, as long as it is agreed upon by all parties concerned.	1. What is a unit? 2. What makes a unit of measurement effective? 3. Why are there different units? 4. Why have certain units become standardized? 5. Why is it important to standardized units? 6. How can units affect the design processes? 7. What kinds of tools do we have to take measurements? 8. Why does the United States use the English system of measurement?
1. What is a scale?	1. A scale can have unlike terms whereas a ratio must use like terms for comparison. 2. Scales are used to maintain proportional relationships between design elements.	1. What is an Architectural scale? 2. What are some features of an architectural scale? 3. What does proportional mean?
1. What is the proper way to measure?	1. Different tools can be used to measure different relationships. 2. Using the right measurement tool is essential in getting accurate measurements	1. What tools can be used to measure angles? 2. What tools can be used to measure distance? 3. How can we measure mass? Weight? 4. What tools can be used to measure diameter? Oddly shaped objects?

CURRICULUM UNIT PLAN

Course Title/Grade: **Introduction to Engineering Technologies (#910)**
Unit Number/Title: **Unit 3-** Measurement, Scale, Ratio, Proportion
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 10 days

Primary Content Standards referenced With Cumulative Progress Indicators			
8.1.12.A3,4	8.1.12.F.12	9.2.12.C.3,6	
8.1.12.D.5	9.1.12.A.3	9.3.12FN-ACT.1-4	
8.1.12.E.1	9.1.12.A.6		

Topics/Concepts (Incl. time / # days per topic)	Critical Content (Students Will Know:)	Skill Objectives (Students Will Be Able To:)	Instructional/Learning Activities & Interdisciplinary Connections	Instructional Resources	Technology & 21st C Skills Integration (Specify)	NJSLS w/ CPI Reference	Evaluation/ Assessment:
A. Types of Common Measurements 1. Linear 2. Angular 3. Speed 4. Mass 5. Volume B. Scales 1. Architect 2. Civil Engineer 3. Mechanical Engineer C. Reading scales and rulers 1. English 2. Metric 3. Fractions 4. Fractional and decimal inches 5. Conversion of fractional inches to decimal inches	1. The different types of phenomena that can be measured and the types of tools used to measure them. 2. The difference between a scale and a ratio. 3. The difference between architect, mechanical engineer and civil engineer scales. 4. How to convert fractional inches to decimal inches. 5. How to use scale to maintain proportional relationships between design elements. 6. Measurement is an agreed upon standard. 7. The importance of establishing standards.	1. Measure to within 1/16th of an inch. 2. Measure to the nearest millimeter. 3. Create a linear measuring tool. 4. Use their measuring device to determine the relationship of an object's dimensions. 5. Express an object's dimensions as a percent of its height or width. 6. Use sketching and proportional skills to create an enlargement of a given picture part. 7. State the ratio that a given picture is enlarged based on given dimensions of the original. 8. Use shading and other sketching skills to render a portion of a given picture.	1. Students measure various objects in the design lab to hone scale and ruler reading skills. 1. Students use construction paper to create a ruler based on their unit of measure. 2. Students use their ruler to measure various objects in the design lab. 3. Students develop proportional relationships between individual object's dimensions. 4. Students represent an object's dimensions as a percent of its height or width. 5. Students solve teacher created ratio and proportion problems. 6. Students are given 1/16th of a drawing and must enlarge it 16 times so that it may be assembled with their classmates' sketches to form an enlarged picture of the original. 7. Students create an accurate representation of their piece of the larger picture.	Rulers Calipers Scales Paper Pencils Erasers Handouts Whiteboard Pictures Calculators	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 Technology Foundation Standards for Students (NETS) 1 (1,2,3) 2 (1,2,3,4,5) 3 (1,4) 4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) 9.3.ST.1-6 9. 9.3.ST-EN.1-6 NGSS HS-ETS1-1	NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10 NJSLS N-Q.1-3 CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 NJSLS F.BF.1 NJSLS F.LE.1 NJSLS A.SSE.3	**Formative Assessment:** 4. Measurement handouts 5. Measurement Quiz **Summative Assessment** 5. Midterm EXAM 6. Sketching Projects

Topics/Concepts (Incl. time / # days per topic)	**Critical Content** (Students Will Know:)	**Skill Objectives** (Students Will Be Able To:)	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
					HS-ETS1-2 HS-ETS1-3 HS-ETS1-4 Environmental literacy Creativity and Innovation Critical Thinking and Problem Solving Communication Collaboration Flexibility & Adaptability Productivity & Accountability Leadership & Responsibility		

Unit Modifications for Special Population Students:

Struggling Learners	Gifted and Talented Students (Challenge Activities)	English Language Learners	Learners with an IEP	Learners with a 504
• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Break assignments into small segments and assign only one segment at a time. • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability.	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students.	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class.	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

UNIT OVERVIEW

Course Title: **Introduction to Engineering Technologies (#910)**

Unit #: Unit 4 **Unit Title:** The Engineering Design Process

Unit Description and Objectives:
This unit introduces students to the basics of the engineering design process. In any design there are intended and unintended, positive and negative results. Documentation and note taking is an important aspect of creating a product. The engineering design process involves testing and redesigning. It should be noted that this unit's concepts, as well as many of the ensuing concepts, are used throughout the course and the other courses in the engineering sequence while being applied to each design problem. By the end of the Engineering Design Process unit, students will be able to apply the engineering design loop process to different problems. Students will identify a problem, brainstorm possible solutions, perform research, sketch solutions, create a prototype, analyze the results, and then revisit the results for possible modifications or improvements improve before final testing.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations** **Students will understand that:**	**Guiding Questions**
1. What is the engineering design process/loop?	1. Problem solving is a process that involves many steps. 2. The engineering design loop can be used for any problem. 3. Following the steps to the engineering design loop will lead to more effective solutions and designs.	1. What is the difference between identifying a problem and building a solution? 2. What are the purposes of the design brief? 3. What are some examples of resources for research? 4. What is brainstorming? What does brainstorming look like? 5. What part of the design process is most important? Why?
2. What makes a bad design?	1. Many factors need to be considered before completing a problem. 2. A failure can occur due to ignorance or negligence.	1. What are some examples of good and bad designs? 2. How can ignorance make a bad design? 3. How can negligence make a bad design? 4. What can be done to prevent bad designs? 5. How can you tell a design is bad?
3. Why is documentation important?	1. Documentation helps the designer keep track of the design process. 2. Good documentation can effectively communicate ideas.	1. How can we document our work? 2. What pieces of information are important to include when creating documentation? 3. What information is not necessary to include when creating documentation?

CURRICULUM UNIT PLAN

Course Title/Grade: **Introduction to Engineering Technologies (#910)**
Unit Number/Title: **Unit 4-** The Engineering Design Process
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 36 days

Primary Content Standards referenced With Cumulative Progress Indicators			
8.1.12.A3,4	8.1.12.F.12	9.2.12.C.3,6	
8.1.12.D.5	9.1.12.A.3	9.3.12FN-ACT.1-4	
8.1.12.E.1	9.1.12.A.6		

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
The Design Process A. Design Loop 1. Identifying the problem 2. Framing a design Brief 3. Investigation and Research 4. Generating Alternative Solutions 5. Choosing a solution 6. Developmental Work 7. Modeling and Prototyping 8. Testing and Evaluating a. Results/impacts 1. anticipated positive 2. anticipated negative 3. unanticipated positive 4. unanticipated negative 9. Redesigning and Improving B. Standards 1. ANSI 2. DIN 3. JIS C. Invention vs. Innovation	1. The difference between a problem and a solution. 2. Some methods for generating ideas. 3. How to select the best solution 4. How to transform ideas from paper to model and prototype. 5. How to evaluate designs and redesign as needed. 6. The need for standards and the role standards play in our designed world. 7. The difference between invention and innovation.	1. Identify the steps in the design loop. 2. Understand the difference between a problem and a solution. 3. Distinguish the difference between invention and innovation. 4. Define the term ergonomics. 5. Explain what anthropometrics are. 6. Understand the importance of human dimension application in the designed world. 7. State the role standards and standardized parts play in design.	1. Students use measuring tools to collect anthropometric data of classmates and compare it to charts using the mean, 5th and 95th percentiles for male and female. 2. Students write a sentence that describes the problem identified. 3. Students write a preliminary design brief for given problem statements. 4. The teacher discusses examples of innovations and invention such as the bicycle and some of the innovations made to the bicycle such as gearing and suspension, frame materials, etc. 5. Students identify and discuss mobility problems associated with being in a wheel chair and some possible design problem statements along with the design briefs and	• Computers with internet • Measurement tools • AutoDesk Inventor Design Software • Whiteboard • Anthropometric data	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 Technology Foundation Standards for Students (NETS) 1 (1,2,3) 2 (1,2,3,4,5) 3 (1,4) 4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) 9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4 NGSS HS-ETS1-1	NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10 NJSLS N-Q.1-3 CS.5.1.12.A.1-3 CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 CS.5.1.12.D.1-3 CS5.2.12.E.1-4 NJSLS S.IS.9	**Formative Assessment:** 1. Students answer questions when called upon during discussion of problem statements, design briefs and specification writing. 2. Students record and turn in one set of anthropometric data to be compiled with the rest of their classmates' data. 3. Students calculate mean, 95th and 5th percentiles of class data. 4. Students compare a hybrid bicycle to a road bicycle (example) and answer questions

Topics/Concepts (Incl. time / # days per topic)	Critical Content (Students Will Know:)	Skill Objectives (Students Will Be Able To:)	Instructional/Learning Activities & Interdisciplinary Connections	Instructional Resources	Technology & 21st C Skills Integration (Specify)	NJSLS w/ CPI Reference	Evaluation/ Assessment:
D. Ergonomics 1. Anthropometric data 2. Application of human dimensions to designs			specifications needed for each statement.		HS-ETS1-2 HS-ETS1-3 HS-ETS1-4 Global awareness Environmental literacy Creativity and Innovation Critical Thinking and Problem Solving Communication Collaboration Flexibility & Adaptability Productivity & Accountability Leadership & Responsibility		regarding each of the inventions vs. innovations for each. (or two other generic objects) 5. Students list five innovations each of the above bicycles shares with each other. (or two other generic objects) 6. Students list three innovations that are specific to the respective bicycles (or two other generic objects) **Summative Assessment** 7. Midterm EXAM 8. Ergonomics Design Project

Unit Modifications for Special Population Students:

Struggling Learners	Gifted and Talented Students (Challenge Activities)	English Language Learners	Learners with an IEP	Learners with a 504
• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Break assignments into small segments and assign only one segment at a time. • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability.	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students.	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class.	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

UNIT OVERVIEW

Course Title: **Introduction to Engineering Technologies (#910)**

Unit #: Unit 5 **Unit Title:** Documentation of the Design

Unit Description and Objectives:
Strategies and methods for documenting all work associated with a design problem are discussed and demonstrated. Emphasis on aesthetics of the portfolio page and engineering graphics are stressed as well as what should and should not be included in the design documentation. Students will be introduced to the AutoDesk Inventor software, and Computer Aided Drafting/Design (CADD) basics. Students will utilize different commands to accurately and efficiently create three dimensional CAD files. By the end of the Documentation of the Design unit, students will be able to produce a working CAD drawing file with accurate dimensions and all the necessary annotations.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. Why is the ability to generate drawings or sketches an important skill to develop?	1. Information is of little value if it cannot be understood. 2. The ability to create drawing files is an important step in the design process and allows ideas to go from concepts to graphic representations.	1. What are the basics of creating effective sketches? 2. What are the different file types in Inventor? 3. How do you read drawing files? 4. What is a tittle block? 5. What are the aspects of a drawing file?
2. How can we make documentation of a design?	1. There are standards and conventions that dictate the way lines are drawn as well as their meaning. 2. Most objects are projected onto imaginary planes.	1. What are the differences between an isometric drawing and a multi-view drawing? 2. What are planes of projection? 3. Why are there lines that are drawn with different meanings? 4. How do we annotate and add dimensions to our drawings?
3. How do we use the Inventor Software?	1. It is necessary to understand the coordinate system and its related axis. 2. The Cartesian coordinate system uses three axis. 3. The origin is the intersection of the axis. 4. Coordinates are written in xyz order. 5. There are three main planes from which to start a sketch. 6. There is a grid system used to help locate points in space. 7. You must create sketches in order to execute features. 8. You must apply features in order to generate the solid geometry of parts.	5. What is the Cartesian coordinate system and why is it important to understand? 6. Why use computer aided design? 7. What is a sketch as defined by the software? 8. Where does a sketch reside? 9. What can you use to design spatial and geometric relationships between sketch elements? 10. How do you start a project? 11. Why is file management important?

	9. There are a variety of drawing tools to accomplish the creation of sketch geometry 10. Constraints are used to keep geometric relationships between sketch elements. 11. Dimensions are used to maintain spatial relationships between sketch elements. 12. There are a variety of document and application options used to aid your designing ability. 13. You can create individual parts. 14. You can use individual parts to create assemblies. 15. You can generate engineering drawings from a part or an assembly. 16. You can create exploded views in the presentation application. 17. You can access data that defines the mass properties of the solid model. 18. You can define the material from which the part is constructed. 19. You can render the part for photo-realistic effects. 20. You can create templates for assemblies, drawings, parts, presentations, sheet metal parts and weldments.	12. What is the difference between sketching tools and features? 13. How do you access the features in order to create a solid model? 14. How do you edit a sketch? 15. How do you edit a feature? 16. What is an assembly? 17. How do you define spatial relationships between parts in an assembly? 18. How is an engineering drawing created? 19. How is a presentation created? 20. How do you make an engineering drawing fit onto a given size paper? 21. How can you set your document up the way you want for a specific exercise?

CURRICULUM UNIT PLAN

Course Title/Grade: **Introduction to Engineering Technologies (#910)**
Unit Number/Title: **Unit 5-** Documentation of the Design
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 70 days

Primary Content Standards referenced With Cumulative Progress Indicators			
8.1.12.A3,4	8.1.12.F.12	9.2.12.C.3,6	
8.1.12.D.5	9.1.12.A.3	9.3.12FN-ACT.1-4	
8.1.12.E.1	9.1.12.A.6		

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
A. Line Types 1. Hidden 2. Object 3. Center 4. Dimension 5. Extension B. Orthographic Projection 1. Visualization and views of objects 2. Planes of projection 3. Alignment of views C. Isometric Sketching 1. Isometric axes 2. Circles and arcs in isometric 3. Inclined/oblique lines in isometric D. Coordinate System I. Axes a. X axis b. Y axis c. Z axis d. Origin e. Reading coordinates II. Grid System a. Snap Grid b. Reference grid	1. The different planes of projection. 2. The difference between isometric and multi-view drawing. 3. The meanings of the various line types and how they are used to communicate attributes of a sketched object. 4. How to open, save and mange files within the solid modeling program and Windows environments. 5. What coordinate system is used and how to set up user preferences for that system. 6. How to create a part using sketching and	1. Identify the line types and when they should be used. 2. Identify the planes used in orthographic projection. 3. Properly read aligned views in a multi-view drawing. 4. Represent design concepts using the CAD software. 4. Open, save and mange files within the solid modeling program and Windows environments 5. Set up user preferences for the document including the coordinate system and units of measure. 6. Create a part using sketching and sketch patterning tools. 7. Specify spatial relationships through dimensioning tools.	1. Students read teacher prepared handout defining line types and their meanings. 2. Teacher demonstrates planes of projection and explains the different views represented by each. 3. Students are given oak tag and tape and five days to design, sketch and construct one part of a class made Rube Goldberg type device to convey a marble from the top of a stairwell to the bottom while passing through each student's design. 4. Students use preliminary sketching techniques to get initial design ideas onto paper. 5. Students use isometric paper to sketch an isometric representation of their design. 6. Students add annotations to preliminary sketch to increase the level of detail of their design.	1. Computers 2. AutoDesk Inventor Software 3. Printer 4. Plotter 5. Paper of varied sizes (A, B, C, D and E) 6. NetOp Software 7. Plastic models 8. Calipers, rulers and other measurement tools 9. Oak Tag 10. Masking Tape 11. Marbles	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 Technology Foundation Standards for Students (NETS) 1 (1,2,3) 2 (1,2,3,4,5) 3 (1,4) 4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) 9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10 NJSLS N-Q.1-3 CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 CS.5.1.12.D.1-3 NJSLS CO.1-12 NJSLS G.MP.4 NJSLS G.MG.1 NJSLS G.C.1-5 CS1.1.12.D.1	**Formative Assessment:** 1. Sketches and Drawing files with accurate line types, dimensions, annotations 2. Student Notebooks/Portfolios **Summative Assessment** 1. Midterm EXAM 2. Rube Goldberg Device Project

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
c. Setting preferences E. Creating a Part I. Sketches a. Planes b. Sketch Tools 1. line 2. circle 3. arc 4. rectangle 5. fillet 6. hole 7. center 8. polygon c. Sketch patterning tools 1. mirror 2. rectangular pattern 3. circular pattern d. Dimensioning tools 1. General dimensioning 2. Auto dimensioning 3. Editing dimensions e. Editing tools 1. Extend 2. Trim 3. Move 4. Rotate f. Constraints 1. Perpendicular 2. Parallel 3. Tangent	sketch patterning tools. 7. How to specify spatial relationships through dimensioning tools. 8. How to set up geometric relationships through the use of constraints. 9. How to modify sketches through the use of editing tools. 10. How to generate a solid model through the use of sketches by applying features to selected profiles. 11. How to pattern selected features through the use of feature patterning tools. 12. How to create an assembly from selected or created parts. 13. How to orient assembly parts by using assembly constraints.	8. Set up geometric relationships through the use of constraints. 9. Modify sketches through the use of editing tools. 10. Generate a solid model through the use of sketches by applying features to selected profiles. 11. Pattern selected features through the use of feature patterning tools. 12. Create an assembly from selected or created parts. 13. Orient assembly parts by using assembly constraints. 14. Create and edit an engineering drawing. 15. Dimension an engineering drawing. 16. Add text to an engineering drawing. 17. Create auxiliary, section, detail and broken views in an engineering drawing. 18. Set up a title block in an engineering drawing. 19. Generate Inventor, oral and Power Point presentations.	7. Students further refine design ideas by creating developmental sketches of their design. 8. Students read teacher produced drawing files and recreate the object in inventor. 9. Students gather measurements and create the object as a part in inventor.		NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4 Global awareness Environmental literacy Creativity and Innovation Critical Thinking and Problem Solving Communication Collaboration Flexibility & Adaptability Productivity & Accountability Leadership & Responsibility		

Topics/Concepts (Incl. time / # days per topic)	Critical Content (Students Will Know:)	Skill Objectives (Students Will Be Able To:)	Instructional/Learning Activities & Interdisciplinary Connections	Instructional Resources	Technology & 21st C Skills Integration (Specify)	NJSLS w/ CPI Reference	Evaluation/ Assessment:
4. Concentric 5. Horizontal 6. Equal 7. Fix 8. Symmetric 9. Vertical 10. Collinear 11. Coincident II. Features a. Extrude b. Revolve c. Hole d. Shell e. Rib f. Loft g. Sweep h. Coil i. Thread j. Fillet k. Split l. Replace m. Thicken n. Offset o. Emboss p. Decal III. Feature Patterns a. Rectangular b. Circular c. Mirror F. Creating an Assembly I. Placing a Component II. Mirroring a Component III. Patterning a Component IV. Component Constraints	14. How to create and edit an engineering drawing. 15. How to dimension an engineering drawing. 16. How to add text to an engineering drawing. 17. How to create auxiliary, section, detail and broken views in an engineering drawing. 18. How to set up a title block in an engineering drawing. 19. How to generate Inventor, oral and Power Point presentations.						

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
a. mate b. Angle c. Tangent d. Insert G. Engineering Drawing I. Views a. Base b. Projected c. Auxiliary d. Section e. Detail f. Broken II. Annotations a. General Dimension b. Baseline Dimension c. Ordinate Dimension d. Hole/thread notes e. Centerlines f. Text g. Leaders h. Parts List i. Balloons H. Presentations I. Inventor Presentations II. Oral Presentations III. Power Point Presentations							

Unit Modifications for Special Population Students:

Struggling Learners	Gifted and Talented Students (Challenge Activities)	English Language Learners	Learners with an IEP	Learners with a 504
• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Break assignments into small segments and assign only one segment at a time. • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability.	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students.	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class.	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

UNIT OVERVIEW

Course Title: **Introduction to Engineering Technologies (#910)**

Unit #: Unit 6 **Unit Title:** Modeling and Prototyping

Unit Description and Objectives:
This unit covers the techniques and safety needed for the successful modeling of selected design solutions. Modeling and Prototyping builds on all the other units, especially the Resources of Technology and Engineering Design unit. This unit focuses on modeling and building prototypes in the design lab, and how it affects the design process. Students should focus on the redesign and testing aspect of the engineering design loop. Emphasis will be placed on modeling tools and the safety instruction for their use. By the end of the unit on Modeling and Prototyping, students will be able to safely operate tools and machines in order to fabricate models and prototypes. Students will revisit the engineering design loop, and analyze how designs could have been improved to make the fabrication process more efficient.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. What is a prototype? 2. What is a model?	1. There is a difference between a prototype and a model. 2. Design documentation is essential to follow when creating a successful prototype.	1. What is the difference between a prototype and a model? 2. When would we build a prototype? 3. When would we build a model? 4. How do we know what to build? 5. How do we following documentation? 6. How can we use feedback to improve the design?
1. How do we create prototypes or models?	1. Safety is critical when using any of the tools within the design lab 2. There are many everyday objects that can be used for construction of models and prototypes 3. Selection of the materials is dependent upon the design requirements of the solution 4. Precision is more important as the scale of the model decreases	7. What considerations should be made when using tools for prototypes or models? 8. What materials are appropriate to use when building a prototype or model? 9. What materials properties from pervious units are important when creating a model? 10. What material properties are important to consider when creating a prototype? 11. How precise does the model have to be?

CURRICULUM UNIT PLAN

Course Title/Grade: **Introduction to Engineering Technologies (#910)**
Unit Number/Title: **Unit 6-** Modeling and Prototyping
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 70 days

Primary Content Standards referenced With Cumulative Progress Indicators			
8.1.12.A3,4	8.1.12.F.12	9.2.12.C.3,6	
8.1.12.D.5	9.1.12.A.3	9.3.12FN-ACT.1-4	
8.1.12.E.1	9.1.12.A.6		

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
A. Modeling is not functional B. Prototype is fully functional C. Tools I. X-acto knives II. Utility knives III. Scales IV. Abrasives V. Saws VI. Balsa cutters VII. Drills D. Materials I. Balsa II. Poplar III. White Pine E. Presentation Boards/Sheets i. Foam core ii. Cardboard iii. Mat board iv. Paper F. Assembly Materials I. Clamps II. Jigs/fixtures III. Glues IV. Mechanical fasteners V. Tapes G. Specialty Materials I. Landscaping II. Figures/people	1. A model is not necessarily functional, and is relatively cheap to manufacture. 2. Only the outside of a model is necessary to represent the designed image. 3. A prototype is fully functional, but may have some flaws that will need to be addressed in the final design. 4. A prototype should have interior working parts. 5. Safety is of the utmost importance whenever using any of the modeling tools. 6. You should never use a tool for a use that is	1. Follow the appropriate safety procedures at all times while using cutting tools. 2. Select and use the appropriate tool for the job at hand. 3. Use clamps to hold material in place for checking fit, gluing and tool processes. 4. Select the appropriate material for modeling their design solution. 5. Employ proper measuring techniques and accuracy for all modeling activities. 6. Apply appropriate scale for modeling purposes. 7. Use a set of engineering drawings for dimensional and other information related to their model construction.	This unit will be applied throughout the year for all modeling activities. The following is a sample activity representative of the techniques to be used in all activities. 1. Chair design activity. For this activity students employ concepts of research and investigation to gather anthropometric data from classmates as well as the text “Human Dimension and Interior Space”. 2. After gathering information and creating a solid model on the computer, students output designs to appropriate medium to a scale specified by the instructor. 3. When plans are available, students use recycled cardboard and modeling techniques listed under topic and concepts, to create a chair made to	Modeling tools listed under topics Modeling materials listed under topics Documentation of designs provided by teacher Student driven documents of designs Textbook “Human Dimensions and Interior Space	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 Technology Foundation Standards for Students (NETS) 1 (1,2,3) 2 (1,2,3,4,5) 3 (1,4) 4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) 9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10 NJSLS N-Q.1-3 CS.5.1.12.A.1-3 CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 CS.5.1.12.D.1-3 CS5.2.12.D.1-5 CS5.2.12.E.1-4 NJSLS G.SRT.6-8 NJSLS A.REI.3 CS1.1.12.D.1	**Formative Assessment:** 3. Notebooks/portfolios **Summative Assessment** 3. Final exam 4. Finished prototypes or projects

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
III. Vehicles IV. Miscellaneous H. Safety a. Cutting b. Sanding c. Drilling d. Gluing	unintended for that tool. 7. Utility knives are most responsible for lacerations in the public schools of New Jersey. 8. Clamps are used for holding materials in place for a tool operation. 9. Clamps are also used to hold material together while checking for fit. 10. Clamps are used to hold materials together when gluing. 11. Selection of materials is important for appearance as well as strength of the model.		the appropriate anthropometric dimensions.		NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4 Global awareness Environmental literacy Creativity and Innovation Critical Thinking and Problem Solving Communication Collaboration Flexibility & Adaptability Productivity & Accountability Leadership & Responsibility		

Unit Modifications for Special Population Students:

Struggling Learners	Gifted and Talented Students (Challenge Activities)	English Language Learners	Learners with an IEP	Learners with a 504
• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Break assignments into small segments and assign only one segment at a time. • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability.	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students.	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class.	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

UNIT OVERVIEW

Course Title: **Introduction to Engineering Technologies (#910)**

Unit #: Unit 7 **Unit Title:** Technology and Society

Unit Description and Objectives:
This unit introduces students to the effects that technology has on society, and vice versa. Students will explore the history of technology, and the rapid rate of changing technologies. This unit also familiarizes the student with the adverse effects of technology on the environment, and the need to develop synthetic materials to replace depleting natural resources. It develops an awareness of the characteristics of different materials used to solve various problems. By the end of the unit on Technology and Society, students will be able to identify both positive and adverse effects of technology on society. Students will be able to analyze society's role in the development of technologies.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations** **Students will understand that:**	**Guiding Questions**
1. How has the evolution of technology impacted society?	1. Technology has evolved rapidly since the Industrial Revolution. 2. Technology has changed how humans interact with each other. 3. Technology has dramatically impacted the standards of living for many individuals.	1. What was the Industrial Revolution? 2. What were some of the new technology of the 20th century? 3. What were some of the new technology of the 21st century? 4. What were the "101 Inventions that Changed the World"? 5. How has technology changed human interaction? 6. How has technology changed the standard of living?
1. How does society drive the evolution of technology?	1. Society can also drive the changes in technology. 2. Technology increases the need for more technology 3. Technologies are now created as a "want" instead of a "need"	1. What is an example of a technology that has been developed as a result of how society is changing? 2. How can current events (like the Arab Spring or Ferguson, MO) change technology? 3. What do we do when technology breaks? 4. Why do we use most of the technology available today? 5. Why was most technology used prior to the 21st century?
1. How does technology impact the environment?	1. Technology has had both positive and negative impacts on the environment. 2. Technology is evolving so rapidly that it is critical to keep up on the impacts it has on the environment. 3. There are ethical considerations to consider when creating technology.	1. What are some negative impacts technologies has had on the environment? 2. How has technology positively impacted the environment? 3. How much coal was consumed in the entire 18th century? 19th? 20th?

CURRICULUM UNIT PLAN

Course Title/Grade: **Introduction to Engineering Technologies (#910)**
Unit Number/Title: **Unit 7-** Technology and Society
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 10 days

Primary Content Standards referenced With Cumulative Progress Indicators			
8.1.12.A3,4	8.1.12.F.12	9.2.12.C.3,6	
8.1.12.D.5	9.1.12.A.3	9.3.12FN-ACT.1-4	
8.1.12.E.1	9.1.12.A.6		

Topics/Concepts (Incl. time / # days per topic)	Critical Content (Students Will Know:)	Skill Objectives (Students Will Be Able To:)	Instructional/Learning Activities & Interdisciplinary Connections	Instructional Resources	Technology & 21st C Skills Integration (Specify)	NJSLS w/ CPI Reference	Evaluation/ Assessment:
1. Technology on Society a. Industrial Revolution b. Steam Engine c. Cotton Gin d. Telephone e. Electricity f. "101 Inventions that changed the world" g. Current Events 2. Society on Technology a. Higher standard of living b. People "need" more sophisticated technology c. Medical Technology d. Replacing vs. fixing technology e. Tech for entertainment	1. The Industrial Revolution changed the way people lived and traveled. 2. New technologies change the way people live 3. More of the "101 Inventions that Changed the World" were invented in the last 200 years then in the entire human existence. 4. People have a higher standard of living now. 5. Cell phones have changed the lives of people in remote African villages 6. Technology has both positive and negative	1. Identify specific examples of technologies that have revolutionized the world. 2. Use the internet to research a specific technology's impact on society. 3. Debate the positive and negative effects of technology on the environment. 4. Identify specific examples of how technology has impacted current events	1. Have class discussions about what the students are learning in history class, and how technology has impacted historical events. 2. Have class discussions about current events and how technologies like cell phones and computers have changed the way humans interact. 3. Students will debate the effects of technology on the environment. Debates can focus on a specific topic like global warming, over-developing, or source of energy. 4. Students can research different inventions, and how they have impacted society. Have students hypothesize how things would be different without the technology.	5. Internet 6. Whiteboard, 7. History text books	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 Technology Foundation Standards for Students (NETS) 1 (1,2,3) 2 (1,2,3,4,5) 3 (1,4) 4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) 9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10 NJSLS N-Q.1-3 CS.6.1.12.A.5.a-c CS.6.1.12.B.5.a-b CS.6.1.12.C.5.a-c CS.6.1.12.D.5.a-d CS.6.1.12.C.12.a CS.6.1.12.B.C CS.6.1.12.D.12.C-E CS.6.1.12.A.16.A-C CS.6.1.12.B.16.A CS.6.1.12.C.16.A-C CS.6.1.12.D.16.A-C CS.6.2.12.A.6.A-D CS.5.1.12.A.1-3 CS.5.1.12.B.1-4	**Formative Assessment:** 4. Class discussions 5. Notebooks/portfolios **Summative Assessment** 5. Research Presentation 6. Debate

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
3. Technology and the Environment a. Oil spills b. Over developing c. Global warming d. Water filtration e. Agriculture f. Energy sources	impacts on the environment				NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4 Global awareness Environmental literacy Creativity and Innovation Critical Thinking and Problem Solving Communication Collaboration Flexibility & Adaptability Productivity & Accountability Leadership & Responsibility	CS.5.1.12.C.1-3 CS.5.1.12.D.1-3 CS.5.3.12.C.2 NJSLS S.CP.1-9 NJSLS S.MD.6-7 NJSLS S.ID.1	

Unit Modifications for Special Population Students:

Struggling Learners	Gifted and Talented Students (Challenge Activities)	English Language Learners	Learners with an IEP	Learners with a 504
• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Break assignments into small segments and assign only one segment at a time. • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability.	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students.	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class.	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

UNIT OVERVIEW

Course Title: **Introduction to Engineering Technologies (#910)**

Unit #: Unit 8 **Unit Title:** Careers in Design and Engineering Technologies

Unit Description and Objectives:
This unit has students explore some of the career paths associated with the field of engineering and engineering technologies. Areas such as civil engineering, mechanical engineering, chemical engineering, electrical engineering, as well as mechanical engineering technology and civil engineering technology are highlighted. Emphasis is placed on educational requirements, salaries and working conditions as well as future job outlook and growth. Correlation between business, industry and the economy are also discussed. By the end of the Careers in Design and Engineering Technologies unit, students will be able to summarize different careers in engineering technologies, and also identify requirements necessary to be successful in the field.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. What opportunities are available in the field of engineering and design?	1. There are many occupational pathways associated with the area of design. 2. They can access employment information at the government's Occupational Outlook Handout website. 3. Engineering is a broad field that includes numerous sub sets.	1. What are the four types of engineers? 2. What is the job outlook for different branches of engineering? 3. What does a landscape architect do? 4. What does an architect do? 5. What is the median income for different branches of engineering? 6. What companies do you see as being successful in 10 years? Why?
1. What requirements are standard for individuals wishing to pursue a career in engineering and design?	1. Many times education is an important facet of the design career pathways 2. For most design occupations, learning is a lifelong endeavor	3. What are the educational requirements of engineering? 4. What are the educational requirements of an architect? 5. What programs are available for engineering or architecture?

CURRICULUM UNIT PLAN

Course Title/Grade: **Introduction to Engineering Technologies (#910)**
Unit Number/Title: **Unit 8-** Careers in Design and Engineering Technologies
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 15 days

Primary Content Standards referenced With Cumulative Progress Indicators			
8.1.12.A3,4	8.1.12.F.12	9.2.12.C.3,6	
8.1.12.D.5	9.1.12.A.3	9.3.12FN-ACT.1-4	
8.1.12.E.1	9.1.12.A.6		

Topics/Concepts (Incl. time / # days per topic)	**Critical Content (Students Will Know:)**	**Skill Objectives (Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
I . Career Paths in the Field of Design 1. Architect 2. Engineers a. Chemical b. Civil c. Mechanical d. Electrical e. Environmental 3. Industrial designer 4. Landscape architect A. Educational requirements 1. four year degree 2. two year degree 3. technical school 4. apprenticeship 5. post graduate degree B. Earnings potential C. Job Outlook D. Business and Industry connection	1. The relationship between education and earnings potential. 2. Engineering is a broad field encompassing many specialty areas. 3. The difference between median, starting, and top incomes. 4. The job outlook for at least three design related occupations over the next ten years. 5. The relationship between the design field and many businesses and industries. 6. Basic stock market investment techniques.	1. List three design careers. 2. Recall the job outlook for at least three design related occupations over the next ten years. 3. Distinguish between median, starting and top incomes. 4. Understand the relationship between the design field and many businesses and industries. 5. Follow their stock market investments.	1. Students will find job listings and the requirements for different jobs. 2. Students research how much income is required for independent living. 3. Students use classroom computers and an internet connection to access the federal government's Occupational Outlook Handbook. 4. Students go online to access stock quotes for selected design related industries and invest $10,000 in two different companies.	Computers Internet Occupational Outlook Handout Excel	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 Technology Foundation Standards for Students (NETS) 1 (1,2,3) 2 (1,2,3,4,5) 3 (1,4) 4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) 9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4 9.2.12.C.1, 9.2.12.C.2, 9.2.12.C.3, 9.2.12.C.4,	NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10 NJSLS N-Q.1-3 CS.6.1.12.D CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 CS.5.3.12.C.2	**Formative Assessment:** 6. Stock Portfolio **Summative Assessment** 7. Career Presentation

Topics/Concepts **(Incl. time / # days per topic)**	**Critical Content** **(Students Will Know:)**	**Skill Objectives** **(Students Will Be Able To:)**	**Instructional/Learning Activities & Interdisciplinary Connections**	**Instructional Resources**	**Technology & 21st C Skills Integration (Specify)**	**NJSLS w/ CPI Reference**	**Evaluation/ Assessment:**
					9.2.12.C.5, 9.2.12.C.6, 9.2.12.C.7, 9.2.12.C.8, 9.2.12.C.9 NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4 Global awareness Environmental literacy Creativity and Innovation Critical Thinking and Problem Solving Communication Collaboration Flexibility & Adaptability Productivity & Accountability Leadership & Responsibility		

Unit Modifications for Special Population Students:

Struggling Learners	Gifted and Talented Students (Challenge Activities)	English Language Learners	Learners with an IEP	Learners with a 504
• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Break assignments into small segments and assign only one segment at a time. • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability.	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students.	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class.	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

			framework can be viewed here www.udlguidelines.cast.org	

CROSS-CONTENT STANDARDS ANALYSIS

Course Title: Introduction to Engineering Technologies (#910) **Grade:** 9-12

Unit Title:	Visual and Performing Arts	Comp. Health & Physical Ed.	English Language Arts	Mathematics	Science	Social Studies	World Languages	Technology	21st Century Life & Careers
Introduction to Engineering Technologies			NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10	NJSLS N-Q.1-3	CS.5.3.12.C.1 NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4				
The Resources of Technology and Safety			NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10	NJSLS N-Q.1-3	CS.5.1.12.A.1-3 CS.5.1.12.B.1-4 CS.5.2.12.A.5-6 NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	
Measurement, Scale, Ratio, Proportion			NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10	NJSLS N-Q.1-3 NJSLS F.BF.1 NJSLS F.LE.1 NJSLS A.SSE.3	CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	
The Engineering Design Process			NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4	NJSLS N-Q.1-3 NJSLS S.IS.9	CS.5.1.12.A.1-3 CS.5.1.12.B.1-4 CS.5.1.12.C.1-3			9.3.ST.1-6 9. 9.3.ST-EN.1-6	

			NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 1.a NJSLS: Gr.11-12, WHST 1.c NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10		CS.5.1.12.D.1-3 CS5.2.12.E.1-4 NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			9.3.AT-SM.1-4	
Documentation of Design	CS1.1.12.D.1		NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10	NJSLS N-Q.1-3 NJSLS CO.1-12 NJSLS G.MP.4 NJSLS G.MG.1 NJSLS G.C.1-5	CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 CS.5.1.12.D.1-3 NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	
Modeling and Prototyping	CS1.1.12.D.1		NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 1.a NJSLS: Gr.11-12, WHST 1.c NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10	NJSLS N-Q.1-3 NJSLS G.SRT.6-8 NJSLS A.REI.3	CS.5.1.12.A.1-3 CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 CS.5.1.12.D.1-3 CS5.2.12.D.1-5 CS5.2.12.E.1-4 NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	
Technology and Society			NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8 NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10	NJSLS N-Q.1-3 NJSLS S.CP.1-9 NJSLS S.MD.6-7 NJSLS S.ID.1	CS.5.1.12.A.1-3 CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 CS.5.1.12.D.1-3 CS.5.3.12.C.2 NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4	CS.6.1.12.A.5.a-c CS.6.1.12.B.5.a-b CS.6.1.12.C.5.a-c CS.6.1.12.D.5.a-d CS.6.1.12.C.12.a CS.6.1.12.B.C CS.6.1.12.D.12.C-E CS.6.1.12.A.16.A-C CS.6.1.12.B.16.A CS.6.1.12.C.16.A-C CS.6.1.12.D.16.A-C CS.6.2.12.A.6.A-D		9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	
Careers in Design and			NJSLS: Gr.11-12, RST 1 NJSLS: Gr.11-12, RST 3 NJSLS: Gr.11-12, RST 4 NJSLS: Gr.11-12, RST 8	NJSLS N-Q.1-3	CS.5.1.12.B.1-4 CS.5.1.12.C.1-3 CS.5.3.12.C.2	CS.6.1.12.D		9.3.ST.1-6 9. 9.3.ST-EN.1-6 9.3.AT-SM.1-4	9.2.12.C.1, 9.2.12.C.2, 9.2.12.C.3, 9.2.12.C.4, 9.2.12.C.5, 9.2.12.C.6,

Engineering Technologies			NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10		NGSS HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4				9.2.12.C.7, 9.2.12.C.8, 9.2.12.C.9

***All content areas may not be applicable in a particular course.**

Washington Township Public Schools
Department of Student Personnel Services

CURRICULUM MODIFICATION

The regular curriculum is modified for Special Education students enrolled in both self-contained and resource center classes.

Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include:

- Variation of time: adapting the time allotted for learning, task completion, or testing
- Variation of input: adapting the way instruction is delivered
- Variation of output: adapting how a student can respond to instruction
- Variation of size: adapting the number of items the student is expected to complete
- Modifying the content, process or product

Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here.

Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org