Washington Township Public Schools
COURSE OF STUDY – CURRICULUM GUIDE

Course: Engineering Design (Capstone)

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Description: **Engineering Design** is a full year course designed to be a capstone for students preparing to enter engineering science curricula in a two or a four year college. Students explore the possible careers in the fields of Engineering and Architecture, their educational requirements, salaries, and working environments. Activities will include design experiences in the areas of mechanical, electrical and structural systems. Current real-world technological issues will serve as the source for many of the design problems. Documentation will be addressed through the development of student portfolios as well as student classroom presentations. Ethics in professional design will also be discussed.

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

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DEMONSTRABLE PROFICIENCIES

COURSE TITLE: Engineering Design (Capstone)

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 _12____ grade students who wish to be exposed to _engineering design_____. The course covers _Engineering design from product inception to prototype and presentation and the associated requisite skills. Students are exposed to the design and problem solving loop as well as engineering practices. Students use rapid prototyping equipment such as but not limited to, three dimensional printer, CNC router, and machine tool use.

B. SKILLS

1. Organization and self-motivation is required for problem application work.
2. Measurement -- both metric and imperial units
3. Sketching and Annotation
4. Computer file management
5. File formatting
6. Solid modeling software application
7. Extraction of working drawings from solid models
8. Scale, ratio and proportion
9. Spatial relationships
10. Mathematical and scientific computations and formulas related to design
11. Presentation of design solutions to a group of peers
12. Development of documentation of the design process
13. Research and investigation of pertinent design solution information Open and use solid modeling software
14. Output work to various media
15. Output design solutions to various scales as needed
16. Output design solutions to various formats as needed.
17. Work with solid bodies and derive solids as separate parts
18. Apply mathematical computation and formulas toward the solution of given design problems
19. Understand the components of the design loop
20. Present their ideas in front of a group
21. Convert fractional inch to decimal inch
22. Generate engineering drawings as required
23. Use basic and advanced modeling tools to create mock-ups and prototypes of their design solutions
24. Sketch and annotate preliminary designs
25. Visualize in 2D and 3D
26. Understand what design is
27. Understand what working drawings are
28. Be aware of several career paths in the area of design
29. Demonstrate software design skills
30. Develop basic technical literacy
31. Execute a variety of software commands
32. Execute Windows commands
33. Demonstrate file management

34. Gather information germane to design problem from a variety of sources
35. Defense of design rationale

C. APPRECIATION OF CONCEPTS

1. An appreciation for organization and orderliness of one's materials to enhance the expediency of performing a task.
2. An ability to analyze and reproduce select information.
3. The ability to adjust quickly to equipment, program, and procedure changes.
4. Appreciate how the initial calculation of inaccurate data affects several other areas of problem solving.
5. Appreciate the need for education for all areas of design
6. Appreciate the need to develop good documentation skills
7. Appreciate the need to develop an understanding of both 2-D and 3-D visualization skills
8. Appreciate the amount of effort required to be successful in the design field
9. Appreciate the benefits of using solid modeling software in the design process.

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: Engineering Design (Capstone)

I. **Design Facilities, Introduction to Course and Resources**
II. **Safety, tool and machine use**
III. **Career Awareness**
IV. **Designing for Society**
V. **Properties and Characteristics of Materials**
VI. **Documentation**
VII. **Modeling**
VIII. **Engineering Systems Integration**

UNIT OVERVIEW

Course Title: Engineering Design (Capstone)

Unit #: Unit 1 **Unit Title:** Design Facilities, Introduction to Course

Unit Description and Objectives:
Students are given a tour of the facilities with an emphasis on the resources at hand for the process of design. An overview of the course is presented with emphasis on learning activities and types of issues that will be explored. Students are also told what to do and where to go in the event of an emergency. Basic classroom expectations regarding behavior and work ethic are discussed.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. What is engineering?	1. Architecture is the systematic study of the built environment.	1 What is the difference between what an engineer does and what a structural engineer does?
2. Why is the ability to solid model a design on the computer important?	2. There are a variety of activities that we use from computer design to model building to convey engineering concepts.	2. What types of activities do we do in the class?
3. What educational requirements does an engineer need to become licensed?	3. Many engineering programs require four years of study.	3. Does an engineer have the ability to design structural systems?
4. Can you work as an engineer without being licensed?	4. Engineers can be licensed professionals or they can work under a licensed engineer.	4. Do you have to have a license to practice engineer?
5. Why is safety important in the lab?	5. It is important to conduct ourselves in a safe and prudent manner during all phases of the course.	5. Why should engineers be concerned with means of egress?

CURRICULUM UNIT PLAN

Course Title/Grade: Engineering Design (Capstone)

Unit Number/Title: I / Design Facilities, Introduction to Course, Resources, and Careers

Conceptual Lens: Course and lab introduction

Appropriate Time Allocation (# of Days): 2

Primary Content Standards referenced With Cumulative Progress Indicators

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. Classroom expectations 1. Behavior 2. Grading procedure 3. Attendance 4. Lateness 5. Housekeeping **B.** Egress/Evacuations 1. Fire Drill 2. Evacuation 3. Lock-down 4. Intruder **C.** Tools of the Lab 1. Computer 2. Measuring Tools 3. Paper cutting tools 4. Cabinets and Storage **D.** Lab **E.** Layout **F.** Introduction to Course	1. What the consequences of unexcused lateness are. 2. What the procedures are for making up work after being absent. 3. Where to go during a fire drill. 4. Where to go and what to do during any of the other emergencies. 5. Where the tools and storage cabinets are located. 6. The general layout of the lab as it	1. Explain what will happen on their third unexcused lateness of less than two minutes; of between 2 and 5 minutes; more than 5 minutes. 2. Locate the designated area(s) for all emergencies. 3. Locate tools and storage cabinets within the design lab. 4. Sit in their assigned seats. 5. Maintain their individual work area as well as the lab with regard to proper clean-up after each period as required.	1. Students go outside to observe the location of their designated area for a fire drill. 2. Students and teacher discuss the different emergencies and what to do and where to go under various circumstances. 3. Teacher demonstrates location of all storage areas and tool cabinets. 4. Teacher demonstrates clean-up procedures. 5. Teacher discusses grading and evaluative processes. 6. Teacher/student discussion of current and/or past issues and problems in the areas of architecture and engineering	1. Functioning network and internet connection 2. Inventor /Revit Software	P21 Framework 1. Communication And Collaboration 2. Information Literacy	**8.2.12.B.4** **8.2.12.C.5** **9.3.12.AC.4** **9.3.12.AC.5** **9.3.12.AC.7**	**Formative Assessments:** **1. Teacher questions students regarding egress directions and how they differ from emergency to emergency or drill.** **2. Teacher directs student discussion regarding differences in architecture and engineering.** **3. Students look up design-related careers on**

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 and Society 2. Design for ADA 3. Designing for the lab Designing for communities	relates to their assigned seat. 7. The procedures for maintaining a clean lab. 8. How activities are evaluated. 9. Some possible issues and problems that may be covered in the course.	6. State the various categories used in the grade breakdown. 7. Describe some possible issues and problems of interest to them.					**the OOH and turn in a written report on findings** **4. Students orally describe the concept of parametric design.** **5. Teacher observes students during lay out and construction of lab model.** **Summative Assessment(s)** 1. **Students show up at assigned egress locations according to drill/emergency** 2. **Students list educational requirements, salary, work conditions and employment opportunities**

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:**
							for selected careers. 3. **Students present oak tag model of lab.**

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: Engineering Design (Capstone)

Unit #: 2 **Unit Title:** Safety, tool and machine use

Unit Description and Objectives:
This unit covers the essential safety and operating procedures for the design lab. Students will be able to demonstrate safe and prudent use of all related tools and equipment.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. Why do different tools have different cutting surfaces?	1. The varying molecular makeup of materials requires different cutting tools to achieve material separation.	1. How do end mill cuts differ from how a circular saw blade cuts? 1.2. Is a file considered a cutting tool? Sand paper?
2. What is the most prevalent injury in the design lab throughout the state?	2. Lacerations are the leading injury in design labs throughout the state.	2. What tool is most responsible for lacerations in the design lab?
3. How does the grain direction influence the type of tool used to cut it?	3. Using the correct tool for material separation is contingent upon the material and its grain direction.	3.1. What power tools could be used for rip cuts? 3.2. What power tools could be used for cross cuts?
4. Can you use the milling machine to bore holes?	4. There are multiple tools used for boring operations depending on the tolerances required and the type of material being bored.	4. Can 6061 aluminum be bored on the drill press?
5. Why should the miter saw never be used in conjunction with the rip fence on the table saw?	5. Kickbacks are caused by the binding of the work piece between the moving blade and a stationary guiding surface.	5. What tool would be a better choice for repeating the same dimension cross-cut?
6. Cross-cutting is most efficiently accomplished with what machine?	6. The miter saw is best suited for cross-cutting.	6. What is another name for the power miter saw?

7. How do you prevent bit "drift" when drilling a hole in any material?	7. Use of a center punch is crucial when using the drill press to bore holes accurately.	7. Does a drill bit have a "point"?
8. How can you cut the power to all the lab's machines at once?	8. Emergency power shut-offs are located by each of the doorways in the lab.	8. What could you do to stop a machine that is putting the operator in a dangerous circumstance?
9. Why shouldn't you talk to anyone while they are operating a power tool?	9. Distractions are likely to cause the operator of a machine to be injured.	9. Is it ok to talk to someone while they are using a power tool?

CURRICULUM UNIT PLAN

Course Title/Grade: Engineering Design (Capstone)

Unit Number/Title: Unit 2- **Safety, tool and machine use**

Conceptual Lens: The safe use of tools is crucial in preventing injuries.

Appropriate Time Allocation (# of Days)**:** 5

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 CRP1-12	
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) Tools of the Design Lab a) Power Tools Miter saw Table saw Circular saw Band saw Drill press Mill Lathe Jointer Belt sander Disc sander b) Hand tools Cross-cut saw Rip saw Utility knife x-acto knife Screwdrivers c) Pneumatic tools Brad nailer Nailer Pin nailer d) Special tools CNC router 3-D printer	1. Safe operating procedures for the following: Miter saw Table saw Circular saw Band saw Drill press Mill Lathe Jointer Belt sander Disc sander Cross-cut saw Rip saw Utility knife x-acto knife Screwdrivers Brad nailer Nailer Pin nailer CNC router 3-D printer	1. Select and properly use the correct tool to cross-cut and rip a piece of lumber 2. Use the milling machine to bring a piece of material to the required dimensions within 0.005" 3. Use the lathe to bore and turn down aluminum and steel to design tolerances. 4. Select and safely use the correct hand or power tool for a given operation. 5. Use the design software to output files to the CNC router and 3-D printer.	1. This unit is designed to be applied throughout the year on a variety of projects/designs. There is no one activity that is identified as the delivery vehicle for these concepts. 2. Set up and mill a piece of material to a given dimension with a tolerance of 0.0025"+/- 3. Apply all other hand and power tools as required throughout the year to complete individual prototypes and models of design solutions.	1. Tools and machines of H-110 and H-111 2. Aluminum, steel, wood and various other structural materials as needed for individual design solutions. 3. Internet 4. Inventor and Revit Software	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)	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	**Formative Assessment:** 1. Safety Quiz **Summative Assessment** 1. Marking Period 1 Benchmark TEST 2. Midterm EXAM

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	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

			learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	

UNIT OVERVIEW

Course Title: Engineering Design (Capstone)

Unit #: Unit 3 **Unit Title:** Career Awareness

Unit Description and Objectives:

This unit has students explore some of the career paths associated with the fields of architecture and engineering. Careers in architecture and engineering are highlighted. Sub categories within engineering such as civil, mechanical, electrical and environmental are discussed along with some of the various architectural specialties. Emphasis is placed on educational requirements, salaries and working conditions as well as future job demand. Correlation between business, industry and the economy are also discussed.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. What are the educational requirements of an architect? 2. What are four types of engineers?	1. There are several occupational pathways associated within the area of architecture. 2. Engineering is a broad field that includes numerous sub sets.	1. What area post-secondary schools offer degrees in architecture, engineering or design? 2. What are the main engineering degrees offered?
3. What is the job outlook over the next ten years for an environmental engineer?	3. The Occupational Outlook Handbook is a valuable resource from which to gather information regarding a wide range of careers.	3. What does OOH stand for?
4. What does a landscape architect do?	4. Architecture and Landscape Architect have different goals	4. Can a landscape architect do an architect's job?
5. What is the median income for a civil engineer?	5. There are a wide range of salaries within specific engineering fields.	5. What engineering occupation has the highest median salary?
6. What companies do you see as being successful in 10 years? Why?	6. Most companies depend upon a designer of some sort to create products and designs.	7. How many household products can you list that didn't use a designer/engineer?

CURRICULUM UNIT PLAN

Course Title/Grade: Engineering Design (Capstone)
Unit Number/Title: **Unit 3- Career Awareness**
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 15

Primary Content Standards referenced With Cumulative Progress Indicators			

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. Career Paths in the Field of Design 1. Architect 2. Engineers a. Chemical b. Civil c. Structural d. Computer e. Environmental 3. Landscape architect B. Educational requirements 1. four year degree 2. two year degree 3. technical school 4. apprenticeship 5. post graduate degree C. Earnings potential D. Job Outlook	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 engineering related occupations over the next ten years.	1. List three careers in architecture and engineering. 2. Recall the job outlook for at least three architecture and engineering related occupations over the next ten years. 3. Distinguish between median, starting and top incomes. Understand the relationship between the architecture and engineering fields and many businesses and industries	1. Students read the want ads of a local newspaper to see what jobs are in demand. 2. Students research brainstorm 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. Students go online to access stock quotes for selected design related industries and invest $15.000 in two different companies.	1. Newspaper 2. Internet connection 3. Computers	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)	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	**Formative Assessment:** 1. Students demonstrate knowledge of OOH by accessing site and recording information about selected careers. **Summative Assessment** 1. Students present career information to class and field questions on educational requirements, salary and working conditions as well as employment outlooks for the future.

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:**
Business and Industry connection	5. The relationship between the design field and many businesses and industries. Basic stock market investment techniques.						

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: Engineering Design (Capstone)

Unit #: Unit 4 **Unit Title:** Designing for Society

Unit Description and Objectives:
This unit deals with The Americans with Disabilities Act and its impact on the designed world. Students are introduced to the concept of accessibility and its role in public and residential buildings. Codes' impacts are discussed along with their influence on student designs.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. What is the maximum slope an accessible ramp can have? 2.	1. The ADA governs many aspects of our designed world.	1. What is the ADA?
3. Why is there a maximum run for a ramp?	2. Accessibility includes visual standards as well as spatial standards.	2. How steep is too steep for a wheelchair to go up or down?
4. Why is there a maximum distance for protruding objects from a wall?	3. There is a need to be aware of the clearances required for safe passage of all people.	3. How far can a railing protrude before it's considered an obstacle?
4. Why should the long dimension of grating be placed perpendicular to traffic?	4. Designing for traffic requires consideration for all types of vehicles.	4. Can a bicycle's tire get stuck in a storm grate?
5. What codes govern a school's construction?	5. A building's use governs codes that guide its design and building	5. Should there be different codes that govern the build and design of a private structure versus a public building?
6. What codes do you think would be relevant to the design of an underwater living space?	6. Designing for alien environments is a unique and challenging design	6. What environmental circumstances would require deviation from traditional codes?
7. Are there any local regulations or codes that could super cede federal ones?	7. Local codes and regulations govern our design as well as state and federal regulations.	7. What circumstance could result in a federal code not being followed?

CURRICULUM UNIT PLAN

Course Title/Grade: Engineering Design (Capstone)

Unit Number/Title: **Unit 4-** Designing for Society

Conceptual Lens: Designing for society requires knowledge of human dimension and federal, state and local codes

Appropriate Time Allocation (# of Days)**:** 20

Primary Content Standards referenced With Cumulative Progress Indicators					
8.2.12.A.1	8.2.12.B.2	8.2.12.B.3	8.2.12.C.3	8.2.12.D.1	8.2.12.E.1
8.2.12.F.3	8.2.12.B.2		8.2.12.C.3		8.2.12.E.1
8.2.12.B.1	8.2.12.B.3		8.2.12.D.1		8.2.12.B.1

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. Designing for the Americans with Disabilities Act I. Minimum Requirements II. Space Allowance and Reach Ranges III. Accessible Route IV. Protruding Objects V. Ground and Floor Surfaces VI. Parking and Passenger Loading Zones VII. Curb Ramps VIII. Ramps IX. Stairs X. Elevators XI. Windows XII. Doors XIII. Entrances XIV. Bathrooms/Lavatories	1. Designing any space requires reference of the Americans with Disabilities Act (ADA). 2. The ADA Standards for Accessible Design 28 CFR part 36 can be found on-line. 3. Each area for which a design is to be produced has its own unique set of design requirements. 4. Local codes play a role in	1. Locate and use the ADA Standards for Accessible Design 28 CFR part 36. 2. Apply all appropriate sections of the ADA Standards for Accessible Design 28 CFR part 36 3. Access all relevant local and state codes for any given project. 4. Choose an appropriate project for at least one of the topics listed in the Topics/Con-tent section.	1. Design a community swim club with completely accessible snack bar, club house and locker rooms. 2. Redesign one of the school cafeterias and bring it up to all applicable current codes. Design a community for an alien venue such as for deep sea exploration or deep space travel.	Resources: The ADA Standards for Accessible Design 28 CFR part 36	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 P21Framework 1. Creativity And Innovation 2. Critical Thinking And Problem Solving 3. Communication And Collaboration 4. Information Literacy 5. Ict (Information, Communications And Technology) Literacy 6. Initiative And Self-Direction	8.2.12.A.1 8.2.12.B.1 8.2.12.B.2 8.2.12.B.3 8.2.12.C.3 8.2.12.D.1 8.2.12.E.1 8.2.12.F.3 9.3.12.AC.1 9.3.12.AC.2 9.3.12.AC.6 9.3.12.AC-DES.1 9.3.12.AC-DES.2 NJSLS.MATH.CONTENT.HSG.SRT.C.6 NJSLS.MATH.CONTENT.HSG.SRT.C.7	**Formative Assessment:** 1. Students present weekly updates on design work and go through peer review while defending their design decisions. **Summative Assessment** 1. Students turn in designs using Inventor/Revit as needed. Designs will contain all applicable ADA design criteria and be judged on accessibility. 2. 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:
XV. Restaurants and Cafeterias XVI. Medical Care Facilities XVII. Transportation Facilities XVIII. Libraries XIX. Business and Mercantile B. Designing for the Lab I. Furniture II. Tools III. Equipment IV. Facility V. Unique Projects VI. Pathways and Circulation C. Designing for the school I. Pathways and Circulation II. Building and Grounds III. Facility Layout D. Designing for a community 1. Local Codes 2. Design for Community Security 3. Design for global Communities 4. Design for Alien Communities	the design process. Designing for alien communities may require design parameters with unique challenges.	Work as part of a team designing one aspect of a larger project.			7. Productivity And Accountability ISTE Standards 1. Creativity and innovation 2. Communication and collaboration 3. Research and information fluency 4. Critical thinking, problem solving, and decision making 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)	NJSLS.MATH.CONTENT.HSG.SRT.C.8 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	

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	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

			learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	

UNIT OVERVIEW

Course Title: Engineering Design (Capstone)

Unit #: Unit 5 **Unit Title:** **Properties and Characteristics of Materials**

Unit Description and Objectives:
In this unit the student will learn the history, physical properties and appropriate use of various materials. Modeling techniques will also be covered

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
What role s have different materials played in the development of technology?	Materials are necessary to produce models of design solutions.	What material technologies were needed to allow the development of nuclear power generation?
How have certain technologies been held back because of the lack of proper materials?	Material selection depends on material properties.	What material technologies needed to be in place to allow the development of the semi-conductor?
What are the nine material properties?	Materials have properties that influence their selection for desired results	What material properties are important for a tool that needs to work in a marine environment?
What are the material classifications?	Material classifications include metals, ceramics, polymeric, and composites	What material classification would carbon fiber be?
5. What are the different types of models?	There are a variety of model types depending on the desired use.	What type of model would be needed to demonstrate the appearance of a design without the functionality?

CURRICULUM UNIT PLAN

Course Title/Grade: Engineering Design (Capstone)
Unit Number/Title: **Unit 5- Properties and Characteristics of Materials**
Conceptual Lens:
Appropriate Time Allocation (# of Days)**:** 23

Primary Content Standards referenced With Cumulative Progress Indicators			
8.2.12.A.1	8.2.12.C.3	8.2.12.B.31	
8.2.12.D.1	8.2.12.F.1		
8.2.12.B.3	8.2.12.E	8.2.12.C.3	

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. Material Selection 2. Physical Properties 3. Material Classification 4. Types of Paper Products 5. Metals a. Ferrous b. Nonferrous 6. Ceramics 7. Polymers 8. Composites 9. Wood 10. Adhesives 11. Coatings 12. Graphics	1. The importance of materials and their impact on history. 2. The factors involved in material selection. 3. The nine properties of material. 4. Ten material classifications. 5. The affects of proper fit and finish on a model	1. Identify five consumer products and make a list of all the materials used to produce those products. 2. Develop a materials matrix listing a materials characteristics and give probable justifications for its selection. 3. List three examples of a particular product made from at least three different materials. 4. Develop an appearance model for a product he has designed 5. Develop a prototype model for a product they have designed.	1. Students select a product and analyze it for its material use, fit and finish, appearance, functionality and aesthetics. 2. Students make suggestions for improvements they would make for the above selected product.	1. Sample materials 2. Consumer products of the students' choice 3. Computer 4. Network 5. Inventor software	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 1. P21Framework 2. Creativity And Innovation 3. Critical Thinking And Problem Solving 4. Communication And Collaboration 5. Information Literacy 6. Ict (Information, Communications And Technology) Literacy 7. Initiative And Self-Direction 8. Productivity And Accountability 9. ISTE Standards 10. Creativity and innovation	8.2.12.A.1 8.2.12.B.3 8.2.12.C.3 8.2.12.D.1 8.2.12.E.1 8.2.12.F.1 NJSLS.ELA-LITERACY.RST.11-12.1 NJSLS.ELA-LITERACY.RST.11-12.2 NJSLS.ELA-LITERACY.RST.11-12.3 NJSLS.ELA-LITERACY.RST.11-12.4 NJSLS.ELA-LITERACY.RST.11-12.5 NJSLS.MATH.CONTENT.HSF.TF.B.7 NJSLS.MATH.CONTENT.HSG.GMD.B.4 NJSLS: Gr.11-12, RST 1	**Formative Assessment:** 1. Students present weekly updates on design work and go through peer review while defending their design decisions. **Summative Assessment** 1. Inventor based redesign of selected product that lists: Material classifications Finishes Changes that would be made 2. Engineering drawing of redesigned product

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:**
					11. Communication and collaboration 12. Research and information fluency 13. Critical thinking, problem solving, and decision making 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)	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	

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: Engineering Design (Capstone)

Unit #: Unit 6 **Unit Title:** **Documentation**

Unit Description and Objectives:
This unit covers the topic of communicating design intent. The documentation of a design is the interface between concept and implementation.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. Why is it important to generate clear and concise drawings?	1. Information is of little value if it can't be understood. 2. Standards play a vital role in the way information is documented	1. Is there any information or views that would not add to a drawing's meaning? 2. What governs how should views be arranged on a sheet?
2. What role does an engineering drawing play in the presentation of ideas?	2. It is critical to have a logical arrangement of ideas in order for your design to be fully understood.	3. What would be the best way to present a design idea so as to give it the best chance of being selected for manufacture?
3. Who would most likely benefit from the information contained on an engineering drawing?	3. Fabricators and other technical and trades people rely on accurately executed documents to carry out the engineer's intent.	4. Why would another engineer need to be able to efficiently discern information about a given design?
5. When is an exploded view used?	4. Exploded views are important to show part relationships.	5. What type of design representation would be most able to show part relationships within the assembly?
6. Why is it important to document your work?	6. Sometimes designers are pulled from one project to another and good documentation allows more efficiency in moving from one project to another.	6. How would you retain information on a project that you haven't worked on in two months?
7. What output devices are available for your documents?	7. There are multiple output devices including laser printers, plotters, 3-D printers and CNC devices.	7. What would be the best way to print a size "D" drawing?

8. Why is it important to generate clear and concise drawings?	8. Design intents are reliant on the ability to produce clear and uncluttered documentation.	8. How would misinformation be costly to a company manufacturing a product?
9. What does it mean if something is said to be ergonomically designed?	9. Ergonomics is the application of human dimensions to design a product for efficient human interaction	9. How is your family car's instrument panel arranged across the dashboard?
10. What is anthropometrics?	10. Human dimensions and their study is called anthropometrics	10. Why are automobile front seats adjustable?

CURRICULUM UNIT PLAN

Course Title/Grade: Engineering Design (Capstone)

Unit Number/Title: Unit 6- **Documentation**

Conceptual Lens: Good designs need equally good documentation to concisely and clearly communicate design intents.

Appropriate Time Allocation (# of Days)**:** 25

Primary Content Standards referenced With Cumulative Progress Indicators			
8.2.12.A.1	8.2.12.B.1	8.2.12.B.2	
8.2.12.E.1	8.2.12.F.1	8.2.12.F.2	
8.2.12.G.1			

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. Portfolio Pages I. Logo II. Binding III. Content IV. Layout V. Output a. Printer b. Plotter B. Sketches I. Preliminary II. Annotated III. Developmental C. Computer Generated Files I. Inventor Parts II. Inventor Assemblies III. Inventor Engineering Drawings	1. How the layout and assembly of the portfolio impact peoples' perception of their design. 2. Why it's important to include all documentation work in their portfolio. 3. The role each type of document plays in the portfolio. 4. How to generate the various documents	Create a cover page that includes at least one graphic germane to their design problem as well as class information. Document information gathered from sources such as published works, people and charts. Incorporate computer generated documents/designs into the solutions section of their portfolio. Incorporate at least one type of information graphic into their portfolio.	It should be noted that this unit is used in varying degrees throughout the year. Once students have developed solid modeling skills, all design work will yield a portfolio which includes the contents and concepts from this unit. The first design problem which will have the students use all information in this unit to develop a full blown design portfolio will be a chair design. Students will use data collected in class as well as information gathered from published sources,	• Functional internet connection for research of anthropometric data • Inventor/Revit software	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 8.2.12.A.1 8.2.12.B.1 8.2.12.B.2 8.2.12.D.1 8.2.12.E.1 8.2.12.F.1 8.2.12.F.2 8.2.12.F.3 8.2.12.G.1 9.3.12.AC.1 9.3.12.AC.2 9.3.12.AC.6 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)	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.ELA-LITERACY.RST.11-12.1 NJSLS.ELA-LITERACY.RST.11-12.2 NJSLS.ELA-LITERACY.RST.11-12.3 NJSLS.ELA-LITERACY.RST.11-12.4	**Formative Assessment:** 1. Presentation of anthropometric data 2. Demonstration of anthropometric data applications in ergonomically designed solutions. **Summative Assessment** 1. Test of final design with accompanying solid models in Inventor software. 2. Output of design solution documents to appropriate device such as the plotter or laser printer.

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:**
IV. Inventor Exploded Views D. Information Graphics I. Graphs II. Charts III. Schematics IV. Sequence Diagrams E. Research and Investigation I. Investigation Strategies a. Asking the right questions b. Open ended questions II. Collecting Published Information a. Key words b. Encyclopedia c. Using Library Resources III. Collecting Information form People IV. Human Factors Engineering a. Myth of Average Person	for portfolio assembly. 5. How to create a chart, graph, schematic and sequence diagram to more clearly illustrate their design solution. 6. How to pose open ended questions. 7. How to collect published information. 8. How to collect information from people. How to gather and interpret basic anthropometric data.	Generate open ended questions to direct their research. Define anthropometrics. Describe ergonomic design. Apply anthropometric data to a given design problem.	people and the internet to create an ergonomically designed chair for use outdoors. Appropriate consideration is to be given to human dimensions from between the 5th and 95th percentiles as well as the types of materials appropriate for outdoor use. The activity will culminate with the students developing a mock-up and Power Point presentation for the class to view and critique.		4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) **ISTE Standards** 1. Creativity and innovation 2. Communication and collaboration 3. Research and information fluency Critical thinking, problem solving, and decision making	NJSLS.ELA-LITERACY.RST.11-12.5 NJSLS.MATH.CONTENT.HSF.TF.B.7 NJSLS.MATH.CONTENT.HSG.GMD.B.4	3. Output of collected data into spreadsheet along with the generation of graphs. 4. Presentation of final design

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:**
b. Human Scale 1. Anthropometrics 2. Ergonomics Standard Deviation							

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: Engineering Design (Capstone)

Unit #: Unit 7 **Unit Title:** **Engineering Systems Integration**

Unit Description and Objectives:
This unit deals with the concept of the interrelation of the various engineering disciplines. The idea that it is rare for one discipline to work in the total absence of another is emphasized.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. What are the advantages of each engineering system?	1. Basic principles of design apply to all engineering fields.	How are structural and technological systems similar?
2. What kinds of tasks a best suited for each system?	2. Many tasks can be performed by multiple systems.	What systems are contained in an automobile?
3. What factors determine the selection of one system over another?	3. Systems are chosen for their strengths and eliminated for their weaknesses	How do we know if a system is not well suited for a particular task?
4. How do multiple systems operate together?	4. Design engineering is seldom done in a vacuum.	What systems can be identified on the international space station?
5. What is programming?	5. Programming is a set of instructions that can be carried out autonomously.	How are inputs, processes and outputs controlled?
6. What is the purpose of the interface?	6. Interfaces allow different systems to communicate to each other	How do the systems in your family's automobile work together?

CURRICULUM UNIT PLAN

Course Title/Grade: Engineering Design (Capstone)

Unit Number/Title: Unit 7- **Engineering Systems Integration**

Conceptual Lens:

Appropriate Time Allocation (# of Days)**:** 80

Primary Content Standards referenced With Cumulative Progress Indicators			
8.2.12.A.1	8.2.12.B.1	8.2.12.B.2	8.2.12.D.1
8.2.12.E.1	8.2.12.F.1	8.2.12.F.2	8.2.12.F.3
8.2.12.G.1			

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. Structural Systems II. Technological Systems III. Forces on Structures IV. Structural Components V. Calculating Loads on a Structure. VI. Kinematics Linear motion Reciprocal motion Rotary motion Oscillating motion VII. Levers and Linkages	How forces act on a structure. The differences between a shape and a structure. The type of external forces. The differences between the scientific approach and the technological approach. What equilibrium is? The difference between	Discuss how forces act on a structure. Differentiate between a shape and a structure. Calculate a safety factor. Discuss the difference between the scientific approach and the technological approach to solving a problem. Explain equilibrium. Differentiate between stress and strain.	This unit contains the major activity for this course. The students will be divided into teams and given a major project to specify, design, construct, test and evaluate. This project would incorporate all of the engineering disciplines and require the integration of all systems. It is hoped that each year the instructor would bring a new challenge to that year's students. As an example this project will be for the students to design an operational railroad. This railroad must be able to do the following:	1. Functioning internet connection 2. Inventor software 3. Electronic materials as needed 4. Programming software as needed 5. Android pcb and accompanying hardware	NJSLS 8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 8.2.12.A.1 8.2.12.B.1 8.2.12.B.2 8.2.12.D.1 8.2.12.E.1 8.2.12.F.1 8.2.12.F.2 8.2.12.F.3 8.2.12.G.1 9.3.12.AC.1 9.3.12.AC.2 9.3.12.AC.6 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)	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.ELA-LITERACY.RST.11-12.1 NJSLS.ELA-LITERACY.RST.11-12.2 NJSLS.ELA-LITERACY.RST.11-12.3 NJSLS.ELA-LITERACY.RST.11-12.4	**Formative Assessment:** 3. Students present weekly progress with peer and teacher review. **Summative Assessment** 5. Students turn in portfolio that includes the following: a. Statement of problem b. Compilation of all research, investigation, and information gathered toward the solution of the given problem.

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:**
VIII. Mechanical Advantage IX. Velocity Ratio X. Inputs. Sensors Switches XI. Process XII. Signal Conditioning XIII. Logic XIV. Outputs Displays Actuators XV. Principals of Pneumatics XVI. Principals of Hydraulics XVII. Characteristics of fluids XVIII. Pascal's Law XIX. Compressed Air XX. System Components Cylinders Valves	stress and strain. The five common forces. How to calculate loads. The six simple machines. The six machine elements. What kinematics is. How different motions work. The differences between inputs, outputs, and processes. The functions of sensors The functions of transducers, actuators, and displays.	Give examples of the five common forces. List the six simple machines. List the six machine elements. Discuss Kinematics. Give examples of linear motion Give examples of reciprocal motion Give examples of rotary motion Give examples of oscillating motion Explain the difference between inputs, outputs, and processes. Apply various sensors to accomplish a task.	Operate automatically and unassisted. Cause the trains to go forward, reverse, and stop at specified locations. Switch onto various tracks according to a program. Identify and sort railroad cars to build trains. Students will have to design and build all automatic equipment as well as write program instructions.		4 (2,4) 5 (3,4) 6 (4) 7 (1,2,5,6) 8 (4,5) 9 (2,5,6) 10 (3,5) **P21Framework** 1. Creativity And Innovation 2. Critical Thinking And Problem Solving 3. Communication And Collaboration 4. Information Literacy 5. Ict (Information, Communications And Technology) Literacy 6. Initiative And Self-Direction 7. Productivity And Accountability **ISTE Standards** 4. Creativity and innovation 5. Communication and collaboration	NJSLS.ELA-LITERACY.RST.11-12.5 NJSLS.MATH.CONTENT.HSF.TF.B.7 NJSLS.MATH.CONTENT.HSG.GMD.B.4	c. Alternate solutions generated d. Rationale for selecting one of the solutions over others e. Demonstration of final solution f. Recommendations for improvements and things that would be changed in the next iteration of the design.

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:**
Regulators Flow Controls XXI. Solenoids	The purposes of insulators and conductors in a circuit. The relationship of voltage, current, and resistance in a circuit. How to calculate circuit values using ohms law. There are different types of control valves.	Apply various output devices to accomplish a task. Solve a simple problem by applying an electronic circuit. Build simple AC and Dc circuits on a breadboard. Calculate circuit values. Measure circuit values. Discuss the differences and similarities of different types of fluid systems. Design a simple pneumatic circuit using appropriate compressors, valves, and actuators.			6. Research and information fluency 7. Critical thinking, problem solving, and decision making		

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	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

			learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	

UNIT OVERVIEW

Course Title: Engineering Design (Capstone)

Unit #: Unit 8 **Unit Title:** **Modeling**

Unit Description and Objectives:
Students are exposed to a broad range of modeling techniques and tools. The main objective of this unit is to have students develop the knowledge sufficient to allow proper material choices commensurate with the type of model they are building.

Essential Questions and Enduring Understandings:

Essential Questions:	**Enduring Understandings/Generalizations Students will understand that:**	**Guiding Questions**
1. What safety equipment is needed when using a cutting tool such as a utility or x-acto knife?	1. Safety is critical when using any modeling tools within the design lab and the use of safety equipment is essential.	2. What is a safety edge used for?
3. What tool is responsible for the most frequent injury in New Jersey public schools?	2. There are many everyday items that may be used for construction of models and prototypes that are responsible for injuries.	What tool causes the most lacerations?
4. Is balsa wood a good material to use when strength is required?	3. There is a difference between a model and a prototype and balsa wood is a relatively weak material.	What material would you select if strength were important?
5. What are some of the tools used for assembly?	4. Selection of tools is dependent upon the design requirements of the solution.	Is glue acceptable to use for assembly of a model?
6. What is foam core made from?	5. Foam core is a good material to use for appearance models	How can a model that is intended for appearance be made efficiently?
7. Why is scale important to understand when building a model?	6. Precision is more important as the scale of the model decreases.	If you were constructing a model of a cable stayed bridge would you use a small or large scale?

CURRICULUM UNIT PLAN

Course Title/Grade: Engineering Design (Capstone)

Unit Number/Title: **Unit 8- Modeling**

Conceptual Lens: Modeling is an important step toward design solution.

Appropriate Time Allocation (# of Days)**:** 10

Primary Content Standards referenced With Cumulative Progress Indicators			
8.2.12.A.1	8.2.12.B.1	8.2.12.B.2	
8.2.12.E.1	8.2.12.F.1	8.2.12.F.2	
8.2.12.G.1			

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:
Tools I. X-acto knives II. Utility knives III. Scales IV. Abrasives V. Saws VI. Balsa cutters VII. Drills Materials Balsa . Poplar I. White Pine Presentation Boards/Sheets I. Foam core II. Cardboard III. Mat board IV. Paper Assembly Materials I. Clamps II. Jigs/fixtures III. Glues IV. Mechanical fasteners	That safety is of the utmost importance whenever using any of the modeling tools. You should never use a tool for a use that is unintended for that tool. Utility knives are most responsible for lacerations in the public schools of New Jersey. Clamps are used for holding materials in place for a tool operation. Clamps are also used to hold material together	Follow the appropriate safety procedures at all times while using cutting tools. Select and use the appropriate tool for the job at hand. Use clamps to hold material in place for checking fit, gluing and tool processes. Select the appropriate material for modeling their design solution. Employ proper measuring techniques and accuracy for all modeling activities. Apply appropriate scale for modeling purposes.	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	1. Modeling tools listed under topics 2. Modeling materials listed under topics 3. Inventor software 4. Functioning intranet	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) **P21Framework** 8. Creativity And Innovation	8.2.12.A.1 8.2.12.B.1 8.2.12.B.2 8.2.12.D.1 8.2.12.E.1 8.2.12.F.1 8.2.12.F.2 8.2.12.F.3 8.2.12.G.1 9.3.12.AC.1 9.3.12.AC.2 9.3.12.AC.6 NJSLS.ELA-LITERACY.RST.11-12.1 NJSLS.ELA-LITERACY.RST.11-12.2 NJSLS.ELA-LITERACY.RST.11-12.3 NJSLS.ELA-LITERACY.RST.11-12.4 NJSLS.ELA-LITERACY.RST.11-12.5	**Formative Assessment:** 4. Students discuss selection of modeling materials for their selected design's model 5. Students are observed applying modeling concepts while they build their design models **Summative Assessment** 6. Students present model of design to class and field peer generated questions regarding rationale

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:**
V. Tapes Specialty Materials I. Landscaping II. Figures/people III. Vehicles IV. Miscellaneous Safety I. Cutting II. Sanding III. Drilling IV. Gluing	while checking for fit. Clamps are used to hold materials together when gluing. Selection of materials is important for appearance as well as strength of the model.	Use a set of engineering drawings for dimensional and other information related to their model construction.	medium to a scale specified by the instructor. When plans are available, students use recycled cardboard and modeling techniques listed under topic and concepts, to create a chair made to the appropriate anthropometric dimensions. Modeling tools listed under topics Modeling materials listed under topics		9. Critical Thinking And Problem Solving 10. Communication And Collaboration 11. Information Literacy 12. Ict (Information, Communications And Technology) Literacy 13. Initiative And Self-Direction 14. Productivity And Accountability **ISTE Standards** 8. Creativity and innovation 9. Communication and collaboration 10. Research and information fluency 11. Critical thinking, problem solving, and decision making	NJSLS.MATH.CONTENT.HSF.TF.B.7 NJSLS.MATH.CONTENT.HSG.GMD.B.4	for material selection 7. Students model demonstrates quality craftsmanship and attention to scale and detail.

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
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			learning opportunities. The framework can be viewed here www.udlguidelines.cast.org	

CROSS-CONTENT STANDARDS ANALYSIS

Course Title: Engineering Design (Capstone) **Grade:** 11-12

Unit Title:	Visual and Performing Arts	Comp. Health & Physical Ed.	English Language Arts	Mathematics	Science	Social Studies	World Languages	Technology	21st Century Life & Careers
			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				8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1 8.1.12.F.12 8.2.12.B.4 8.2.12.C.5 9.1.12.A.3 9.1.12.A.6 9.2.12.C.3,6 9.3.12FN-ACT.1-4 CRP1-12 9.3.12.AC.4 9.3.12.AC.5 9.3.12.AC.7	
			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				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	
			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	HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			8.1.12.A3,4 8.1.12.D.5 8.1.12.E.1	

			NJSLS: Gr.11-12, RST 10 NJSLS: Gr.11-12, WHST 6 NJSLS: Gr.11-12, WHST 10					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	
			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	HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			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	P21Framework 1. Creativity And Innovation 2. Critical Thinking And Problem Solving 3. Communication And Collaboration 4. Information Literacy 5. Ict (Information, Communications And Technology) Literacy 6. Initiative And Self-Direction 7. Productivity And Accountability 8. ISTE Standards 9. Creativity and innovation 10. Communication and collaboration 11. Research and information fluency 12. Critical thinking, problem solving, and decision making
			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	HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			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	P21Framework 1. Creativity And Innovation 2. Critical Thinking And Problem Solving 3. Communication And Collaboration 4. Information Literacy

									5. Ict (Information, Communications And Technology) Literacy 6. Initiative And Self-Direction 7. Productivity And Accountability 8. ISTE Standards 9. Creativity and innovation 10. Communication and collaboration 11. Research and information fluency 12. Critical thinking, problem solving, and decision making
			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	HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			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	P21Framework 1. Creativity And Innovation 2. Critical Thinking And Problem Solving 3. Communication And Collaboration 4. Information Literacy 5. Ict (Information, Communications And Technology) Literacy 6. Initiative And Self-Direction 7. Productivity And Accountability 8. ISTE Standards 9. Creativity and innovation 10. Communication and collaboration 11. Research and information fluency 12. Critical thinking, problem solving, and decision making

			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	HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			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	P21Framework 1. Creativity And Innovation 2. Critical Thinking And Problem Solving 3. Communication And Collaboration 4. Information Literacy 5. Ict (Information, Communications And Technology) Literacy 6. Initiative And Self-Direction 7. Productivity And Accountability 8. ISTE Standards 9. Creativity and innovation 10. Communication and collaboration 11. Research and information fluency 12. Critical thinking, problem solving, and decision making
			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	HS-ETS1-1 HS-ETS1-2 HS-ETS1-3 HS-ETS1-4			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	P21Framework 1. Creativity And Innovation 2. Critical Thinking And Problem Solving 3. Communication And Collaboration 4. Information Literacy 5. Ict (Information, Communications And Technology) Literacy 6. Initiative And Self-Direction 7. Productivity And Accountability 8. ISTE Standards

									9. Creativity and innovation 10. Communication and collaboration 11. Research and information fluency 12. Critical thinking, problem solving, and decision making

***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.

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- 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.

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