PUBLIC SCHOOLS OF EDISON TOWNSHIP
DIVISION OF CURRICULUM AND INSTRUCTION

Engineering Graphics

Length of Course: Full Year

Elective/Required: Required

Schools: High School (Edison High only)

Eligibility: Grade 10

Credit Value: 5 Credits

Date Approved: September 22, 2014

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STATEMENT OF PURPOSE

The Edison Public School District is committed to improving instruction and providing the most challenging academic opportunities for our students. It is important that the curricula across grade levels are connected and students are able to build upon a strong educational foundation, which is developed through a consistent curriculum map.

The Engineering Graphics course within the Science and Engineering Academy is designed to create a broad-based foundation for students who desire a career pathway in a variety of engineering fields. The Engineering Graphics course will utilize PTC/ Creo. PTC/ Creo is a scalable, interoperable suite of product design software that delivers fast time to value. It helps teams to create, analyze, view product designs and leverage this information downstream.

Stakeholders will use engineering driven designs in conjunction with Computer Aided Machining (CAM) and 3-dimensional prototyping. Components of this course will give students a hands-on engineering laboratory and prototyping experience while exposing them to different concepts in Engineering. The contents and methods of this course will provide a foundation for future engineering pathways and prerequisites for additional Science and Engineering Academy courses.

The curriculum guide was created by: Kevin Kerins, Edison High School

Edison High School
Engineering Graphics - Curriculum Guide
2014 - 2015

Month	Essential/ Supporting Questions	Content		Assessment	Standards
MP 1 Module 1	What is the Engineering Design Process? How best to implement the Engineering Design Process? What is best and most current platform for communicating design? What is the evolution of the Engineering Design Process?	**History Engineering Design and Processes** <u>**Instructional Strategies:**</u> Paperless class format -PowerPoint -Template Design -Laboratory safety Laboratory learning experiences -Web Portfolio -Blog Postings -Student reflections -Class discussions		<u>**Summative Assessment:**</u> -Web Portfolio - Unit Project- *Design Template* -Unit Reflection via Blog <u>**Formative Assessment:**</u> - Lab Safety Observations -Class discussions - Web Site Discussion Boards -Instructor Question and Answer Session - Laboratory Session Participation	NJ CCS 8.1 NJ CCS 8.2 8.1.2.A.2 8.1.2.A.3 8.1.2.A.4 8.4.8.C.1 8.1.8.D.1 8.1.8.D.2 8.1.8.D.3 8.1.12.A.1 8.1.12.A.2 8.1.12.A.3 8.1.12.A.4 8.2.12.A.1 8.2.12.B.1 8.2.12.B.2 8.2.12.B.3 8.2.12.C.1 8.2.12.C.2 8.2.12.C.3 8.2.12.D.1 8.2.12.E.1 8.2.12.E.2

| MP 1 Module 2 | What is a perspective drawing?

What is a 2-point perspective drawing?

What are Engineering Drawings?

Why is ability to sketch important in engineering?

How do you shadow an object with predetermined light source?

How do you texture objects?

How do you shade Objects?

What is rendering | **Communicating Engineering Drawings and Design**

Instructional Strategies:

Paperless class format
-PowerPoint
-Perspective Drawings
-Texture, shadow, shade

-Laboratory safety
Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project-
Engineering Drawing Assignment.

Texture, shadow, shade assignment

-Unit Reflection via Blog

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.C.3
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8.2.12.E.1
8.2.12.E.2 |

| MP1 Module 3 | What is CAD?

What is CAM?

What is PTC?

What is PTC / CREO

How is PTC/Creo Parametric Interfaced?

What outputs are possible via Creo?

What is Makerbot?

What is Replicator 2.0.

What is prototyping?

How is Prototyping utilized in Engineering Design? | **CAD/CAM Introduction**

Instructional Strategies:

Paperless class format
-PowerPoint
- Video tutorials
- PTC Set up
PTC Creo

-Laboratory safety
Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

PTC Unit and Measurement setup

-Unit Reflection via Blog

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.E.2 |

| MP1 Module 4 | How are geometric features and models edited and created?

What is the function of each PTC/ CREO tool?

What is the PTC/CREO Basic modeling Process?

What are the PTC/CREO parametric concepts?

What are extrusions?

What are layers and how labeled? | **PTC CREO Parametric Basic Modeling Process**

Instructional Strategies:

-Paperless class format PowerPoint
-Video tutorials
- PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

PTC Extrusions and rendering options Labeling

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

- Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Complete extrusions and rendering options

Complete labeling assignment

Formative Assessment:
-
-Web Portfolio

Unit Project-

-Unit Reflection via Blog | NJ CCS 8.1
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8.2.12.E.1
8.2.12.F.1
8.2.12.F.2
8.2.12.F.3 |

| MP1 Module 5 | What are the solid modeling concepts?

What are feature based concepts?

What are Parametric Concepts?

What are associative concepts?

What are Model-Centric Concepts?

What are file extensions?

How are file extensions used? | **Understanding Creo Parametric Concepts**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Organizational assignment
Extensions assignment

-Laboratory safety
Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Extensions assignment

Organizational charting assignment

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.E.1
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8.2.12.F.3
8.2.12.G.1 |

| MP1 Module 6 | What are the key components of the main interface?

What is a folder browser?

What are the key elements of the web browser?

How does the working directory facilitate opening and savings of files?

How does ribbon interface work?

How are files managed in Creo?

What are Datum Display options?

How do you analyze basic 3-D orientation?

How do you set up new part models?

How do you create states using the view manager? | **Using the Creo Parametric Interface**

Instructional Strategies:

-Paperless class format
-PowerPoint
- Video Tutorials
- PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Athletic field creation and layout assignment

-Laboratory safety
Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

Athletic field creation and layout assignment

-Unit Reflection via Blog

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.D.1
8.2.12.F.1
8.2.12.F.2
8.2.12.F.3
8.2.12.G.1 |

MP1 Module 7	What are Creo parametric basic controls? How are dimension draggers utilized? What are "hot keys"? What are the elements of the model tree? How are model tree filters used? How are basic model tree columns built How is direct selection utilized? How is a query selection used?	**Selecting Geometry, Features and Models** Instructional Strategies: -Paperless class format -PowerPoint - PTC CREO Software - Makerbot Replicator 2.0 3D Design Printer *Dimensioning and layering of objects assignment* -Laboratory safety Laboratory learning experiences -Web Portfolio -Blog Postings -Student reflections -Class discussions		**Summative Assessment:** -Web Portfolio - Unit Project- Web Portfolio -Unit Reflection via Blog *Dimensioning and layering of objects assignment* **Formative Assessment:** - Lab Safety Observations -Class discussions - Web Site Discussion Boards -Instructor Question and Answer Session - Laboratory Session Participation	NJ CCS 8.1 NJ CCS 8.2 8.1.2.A.3 8.1.2.A.4 8.1.8.D.1 8.1.8.D.2 8.1.8.D.3 8.1.12.A.1 8.1.12.A.2 8.1.12.A.3 8.1.12.A.4 8.2.12.A.1 8.2.12.B.2 8.2.12.B.3 8.2.12.C.1 8.2.12.C.2 8.2.12.C.3 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

| MP1 Module 8 | How are objects renamed?

How should you utilize undo and redo operations?

What is difference between regeneration and auto regenerations?

How are features edited?

What is the definition of edit?

How are editing models activated?

How are items deleted and suppressed?

How are feature and component visibility edited? | **Editing Geometry, features and models**

Instructional Strategies:

-Paperless class format
-PowerPoint
- PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Dimensioning and layering of objects assignment

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Editing and Naming of objects in design

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.G.1 |

| MP2 Module 9 | What is sketcher theory?

What is design intent?

How is sketcher display modified?

How are constraints utilized?

What are on-fly constraints?

How are sketching lines utilized?

How are centerlines utilized?

How are Rectangles and parallelograms utilized?

How are sketching circles created?

How are arcs utilized?

How are circular fillets and chamfers utilized? | **Creating Sketcher Geometry**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Formative Assessment:

- Lab Safety Observations
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8.2.12.F.1
8.2.12.F.2
8.2.12.G.1 |

| MP2 Module 10 | What is construction geometry theory?

What are sketching points?

How are geometry tools used within sketcher?

How are sketches manipulated within sketcher?

What are dimensioning entities?

What is sketcher conflict?

How are new file sketches created?

How are sections placed into sketcher? | **Using Sketcher tools**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Objects design creation and rendering of various angles and perspectives

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog
Objects design creation and rendering of various angles and perspectives

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.F.1
8.2.12.F.2
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8.2.12.G.1 |

| MP2 Module 11 | How are sketch features created?

How is sketch setup manipulated?

How is sketch set up specified?

How is sketch references utilized?

How is entity used within sketcher?

How is edge utilized within sketcher

How are edges thickened within sketcher? | **Creating Sketches for features**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.F.3
8.2.12.G.1 |

| MP2 Module 12 | What is Datum feature theory?

What are datum axes?

What are Datum Planes? | **Creating Datum Features: Planes and Axes**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.2
8.2.12.G.1 |

MP2 Module 13	How are solid extrude features created? How are taper added to extrudes? What are Common dashboard Options? How is extrude depth utilized? How is direction feature utilized? How is Thicken Sketch options utilized? How are solid revolve features used? How are Revolve angles utilized? How are adding and removing material automatically accomplished? How is profile rib features created?	**Creating Extrudes, Revolves and Ribs** **Instructional Strategies:** -Paperless class format -PowerPoint - PTC CREO Software - Makerbot Replicator 2.0 3D Design Printer *Object Design and extrusion assignment (negative and positive extrusions)* -Laboratory safety Laboratory learning experiences -Web Portfolio -Blog Postings -Student reflections -Class discussions		**Summative Assessment:** -Web Portfolio - Unit Project- Web Portfolio -Unit Reflection via Blog *Object Design and extrusion assignment (negative and positive extrusions)* **Formative Assessment:** - Lab Safety Observations -Class discussions - Web Site Discussion Boards -Instructor Question and Answer Session - Laboratory Session Participation	NJ CCS 8.1 NJ CCS 8.2 8.1.2.A.2 8.1.2.A.3 8.1.2.A.4 8.1.8.D.1 8.1.8.D.2 8.1.8.D.3 8.1.12.A.2 8.1.12.A.3 8.1.12.A.4 8.2.12.A.1 8.2.12.B.1 8.2.12.B.2 8.2.12.B.3 8.2.12.C.1 8.2.12.C.2 8.2.12.C.3 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

| MP2 Module 14 | How are internal sketches utilized?

How are embedded datum features created? | **Utilizing Internal Sketches and Embedded Programs**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.2
8.2.12.G.1 |

| MP2 Module 15 | How are sweeps with open trajectories created?

How are sweeps with closed trajectories created?

How can sweep feature attributes be analyzed?

How can blends by selecting parallel sections be created?

How can blends by sketching sections be created?

How can blend options be analyzed? | **Creating Sweeps and Blends**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Creating and engineering tubing pipelines.

Playground engineering project

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Creating and engineering tubing pipelines.

Playground engineering project

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
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8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
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MP3 Module 16	What are common dashboard options?	**Creating holes, shells and draft**		**Summative Assessment:**	NJ CCS 8.1 NJ CCS 8.2
	What is hole depth?	**Instructional Strategies:**		-Web Portfolio	8.1.2.A.2
				- Unit Project- Web	8.1.2.A.3
	How are coaxial holes created?	-Paperless class format		Portfolio	8.1.2.A.4
		-PowerPoint			8.4.8.C.1
		- PTC CREO Software		-Unit Reflection via	8.1.8.D.1
	How are linear holes created?	- Makerbot Replicator 2.0 3D Design Printer		Blog	8.1.8.D.2
					8.1.8.D.3
				Ergonomic puzzle	8.1.12.A.1
	How are radial and diameter holes created?	*Ergonomic puzzle project*		*project*	8.1.12.A.2
					8.1.12.A.3
					8.1.12.A.4
					8.2.12.A.1
	How are hole profile options explored?	-Laboratory safety Laboratory learning experiences		**Formative Assessment:**	8.2.12.B.1
					8.2.12.B.2
					8.2.12.C.1
		-Web Portfolio			8.2.12.C.2
	How are shell features created?	-Blog Postings		- Lab Safety	8.2.12.C.3
		-Student reflections		Observations	8.2.12.D.1
		-Class discussions		-Class discussions	8.2.12.E.1
	How are draft features explored and utilized?			- Web Site Discussion Boards	8.2.12.F.1
					8.2.12.F.2
				-Instructor Question and Answer Session	8.2.12.G.1
	How are basic split drafts used?			- Laboratory Session Participation	
	How are draft hinges and pull direction analyzed?				

| MP 3 Module 17 | What is round theory?

How are rounds created by selecting edges?

How are round created by selecting surface and edge?

How are rounds created by selecting two surfaces?

How are full rounds created?

How are round sets utilized?

How are chamfers utilized by selecting edges?

What is the basic chamfer edges dimensioning schemes?

How are chamfer sets created? | **Creating Rounds and Chamfers**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Furniture design challenge

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Furniture design challenge

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
NJ CCS 8.2

8.1.2.A.2
8.1.2.A.3
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.A.1
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
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 |

| MP 3 Module 18 | What is an air circulator?

What are the components of a piston?

How are the components of a piston assembled?

How are a crankshaft and engine block created?

How are an impeller and impeller housing created?

How are a frame and bold created?

How is an Air Circulator assembled? | **Creating an Air Circulator** (project)

Instructional Strategies:

-Paperless class format
-PowerPoint
- PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Air Circulator Project

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Air Circulator Project

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1 NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |

Mp 3 Module 19	How are local groups created? How are copy and pasting features utilized? How are moving and rotating copied features utilized? How are mirroring selected features utilized? How are mirrored pars created?	**Group, Copy and Mirror Tools via Creo** **Instructional Strategies:** -Paperless class format -PowerPoint - PTC CREO Software - Makerbot Replicator 2.0 3D Design Printer *Engineering Design Mirror Layout Project* -Laboratory safety Laboratory learning experiences -Web Portfolio -Blog Postings -Student reflections -Class discussions		**Summative Assessment:** -Web Portfolio - Unit Project- Web Portfolio -Unit Reflection via Blog *Engineering Design Mirror Layout Project* **Formative Assessment:** - Lab Safety Observations -Class discussions - Web Site Discussion Boards -Instructor Question and Answer Session - Laboratory Session Participation	NJ CCS 8.1 NJ CCS 8.2 8.1.2.A.2 8.1.2.A.4 8.4.8.C.1 8.1.8.D.1 8.1.8.D.2 8.1.8.D.3 8.1.12.A.1 8.1.12.A.2 8.1.12.A.3 8.1.12.A.4 8.2.12.B.1 8.2.12.B.2 8.2.12.B.3 8.2.12.C.1 8.2.12.C.2 8.2.12.C.3 8.2.12.D.1 8.2.12.E.1 8.2.12.F.1 8.2.12.F.3 8.2.12.G.1

| MP 4 Module 20 | What is direction-patterning theory?

What is first direction patterning?

What is second direction patterning?

What is axis patterning?

What is axis patterning first direction?

What is Axis patterning second direction?

What is direction patterning in with multiple direction types?

How are reference pattern features created?

How are reference pattern components created? | **Creating Patterns**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Keyboard Pattern Design Project

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Keyboard Pattern Design Project

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |

MP 4 Module 21	What are viewing and editing model properties? What are investigative model units? How are mass properties analyzed? How are measure tolls utilized? How are measure summary tools implemented? How are planar part cross sections created? How is measuring global interface used?	**Measuring and inspection models** **Instructional Strategies:** -Paperless class format -PowerPoint - PTC CREO Software - Makerbot Replicator 2.0 3D Design Printer *Mass, Volume, Density project* -Laboratory safety Laboratory learning experiences -Web Portfolio -Blog Postings -Student reflections -Class discussions		**Summative Assessment:** -Web Portfolio - Unit Project- Web Portfolio -Unit Reflection via Blog *Mass, Volume, Density project* **Formative Assessment:** - Lab Safety Observations -Class discussions - Web Site Discussion Boards -Instructor Question and Answer Session - Laboratory Session Participation	NJ CCS 8.1 NJ CCS 8.2 8.1.2.A.2 8.1.2.A.4 8.4.8.C.1 8.1.8.D.1 8.1.8.D.2 8.1.8.D.3 8.1.12.A.1 8.1.12.A.2 8.1.12.A.3 8.1.12.A.4 8.2.12.B.1 8.2.12.B.2 8.2.12.B.3 8.2.12.C.1 8.2.12.C.2 8.2.12.C.3 8.2.12.D.1 8.2.12.E.1 8.2.12.F.1 8.2.12.F.3 8.2.12.G.1

MP 4 Module 22	What is assembly theory? How is new assembly models created? What is constraint theory? What is assembly constraint status? What are the components of default constraints? How are components oriented? How are constraints used with geometry? How are coincident constraints using datum features created? How are distance constraints created? How are parallel, normal and angle constraints used?	**Assembling with constraints** **Instructional Strategies:** -Paperless class format -PowerPoint - PTC CREO Software - Makerbot Replicator 2.0 3D Design Printer *Engineering Assembly Design Challenge* -Laboratory safety Laboratory learning experiences -Web Portfolio -Blog Postings -Student reflections -Class discussions		**Summative Assessment:** -Web Portfolio - Unit Project- Web Portfolio -Unit Reflection via Blog *Engineering Assembly Design Challenge* **Formative Assessment:** - Lab Safety Observations -Class discussions - Web Site Discussion Boards -Instructor Question and Answer Session - Laboratory Session Participation	NJ CCS 8.1 NJ CCS 8.2 8.1.2.A.2 8.1.2.A.4 8.4.8.C.1 8.1.8.D.1 8.1.8.D.2 8.1.8.D.3 8.1.12.A.1 8.1.12.A.2 8.1.12.A.3 8.1.12.A.4 8.2.12.B.1 8.2.12.B.2 8.2.12.B.3 8.2.12.C.1 8.2.12.C.2 8.2.12.C.3 8.2.12.D.1 8.2.12.E.1 8.2.12.F.1 8.2.12.F.3 8.2.12.G.1

| MP 4 Module 23 | What is connection theory?

How are connected components dragged?

How are components used with slider connection?

How are components used with pin connection?

How are components used with cylinder connections?

How are collision detection settings implemented? | **Assembling with connections**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Engineering Assembly Design Challenge

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Engineering Assembly Design Challenge

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1 NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |
|---|---|---|---|---|

| MP 4 Module 24 | How are explode states created?

How are explode states managed?

How are explode lines utilized?

How are animating exploding states used?

How are exploding states animated? | **Exploding Assemblies**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Exploding Assembly Rendering Design Challenge

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Exploding Assembly Rendering Design Challenge

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |

MP 4 Module 25	What are drawing concepts and theory?	**Drawing, Layout and views**		**Summative Assessment:**	NJ CCS 8.1 NJ CCS 8.2
	What is basic 2-D orientation?	**Instructional Strategies:** -Paperless class format -PowerPoint - PTC CREO Software - Makerbot Replicator 2.0 3D Design Printer		-Web Portfolio - Unit Project- Web Portfolio -Unit Reflection via Blog	8.1.2.A.2 8.1.2.A.4 8.4.8.C.1 8.1.8.D.1 8.1.8.D.2 8.1.8.D.3 8.1.12.A.1
	How is 2-D orientation utilized?				
	How are new drawings and layouts created?	*Wrap- around engineering design challenge*		*Wrap- around engineering design challenge*	8.1.12.A.2 8.1.12.A.3 8.1.12.A.4 8.2.12.B.1
	How are orienting view created?			**Formative Assessment:**	8.2.12.B.2 8.2.12.B.3 8.2.12.C.1
	How are drawing trees utilized?	-Laboratory safety Laboratory learning experiences -Web Portfolio -Blog Postings -Student reflections -Class discussions		- Lab Safety Observations -Class discussions - Web Site Discussion Boards -Instructor Question and Answer Session - Laboratory Session Participation	8.2.12.C.2 8.2.12.C.3 8.2.12.D.1 8.2.12.E.1 8.2.12.F.1 8.2.12.F.3 8.2.12.G.1
	How are drawing sheets implemented?				
	How is projection views created?				
	How is cross section views created?				
	How are detailed views created?				

| MP 4 Module 26 | How are auxiliary views created?

How are exploded views created?

How are annotation concepts and types analyzed?

How are tables from files created?

How are BOM balloons created?

How are deleting, showing and erasing annotations shown?

How are dimension manipulations and clean up utilized?

How are inserting notes completed?

How are drawing associativity analyzed?

How are drawings published? | **Creating Drawing Annotations**

Instructional Strategies:

-Paperless class format
-PowerPoint
- PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Engineering Drawings with Annotations Design Challenge

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Engineering Drawings with Annotations Design Challenge

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |

| MP 4 Module 27 | What is layer theory?

What are part model layers?

How is managing layers created?

How are layer states created?

How are part models used?

How are layers used in assembly models? | **Using Layers**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Quiz

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Quiz

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |

| MP 4 Module 28 | How are suppressed items deleted?

How are features reordered?

How are features inserted?

How are features and sketches redefined?

How is design intent of sketches captured?

How is design intent of features captured?

How is design intent of parts captured?

How is design intent of assemblies captured? | **Capturing and managing design intent**

Instructional Strategies:

-Paperless class format
-PowerPoint
- PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Principals of design quiz

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Principals of design quiz

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |

| MP 4 Module 29 | How do you identify failures and issues?

How do you analyze geometric failures and issues?

How do you analyze open section failures and issues?

How do you reference missing parts?

How do you reference missing components?

What is the resolve mode tool?

How are models recovered?

What is Creo parametric help? | **Resolving failures and seeking help**

Instructional Strategies:

-Paperless class format
-PowerPoint
 - PTC CREO Software
- Makerbot Replicator 2.0 3D Design Printer

Class Discussion and Critique

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

Class Discussion and Critique

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |

| MP 4 Module 30 | What are STL files?

What is Makerbot?

What is filament?

What are general maintenance and safety of Makerbot?

What are constraints of makerbot?

What are they applications of Makerbot?

How can Makerbot transfer Creo Files?

What are prototyping applications?

What are prototyping concerns? | **Makerbot Replicator 2.0 Prototyping with PTC/CREO**

Instructional Strategies:

-Paperless class format
-PowerPoint
- PTC CREO Software
- Makerbot Replicatior 2.0 3D Design Printer

3D Printing and Prototyping of Engineering Design Projects – ergonomic mouse

-Laboratory safety Laboratory learning experiences
-Web Portfolio
-Blog Postings
-Student reflections
-Class discussions | | **Summative Assessment:**

-Web Portfolio
- Unit Project- Web Portfolio

-Unit Reflection via Blog

3D Printing and Prototyping of Engineering Design Projects – ergonomic mouse

Formative Assessment:

- Lab Safety Observations
-Class discussions
- Web Site Discussion Boards
-Instructor Question and Answer Session
- Laboratory Session Participation | NJ CCS 8.1
NJ CCS 8.2

8.1.2.A.2
8.1.2.A.4
8.4.8.C.1
8.1.8.D.1
8.1.8.D.2
8.1.8.D.3
8.1.12.A.1
8.1.12.A.2
8.1.12.A.3
8.1.12.A.4
8.2.12.B.1
8.2.12.B.2
8.2.12.B.3
8.2.12.C.1
8.2.12.C.2
8.2.12.C.3
8.2.12.D.1
8.2.12.E.1
8.2.12.F.1
8.2.12.F.3
8.2.12.G.1 |

2009 New Jersey Core Curriculum Content Standards - Technology

Content Area	Technology		
Standard	**8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.		
Strand	**A. Technology Operations and Concepts**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
P	The use of technology and digital tools requires knowledge and appropriate use of operations and related applications.	8.1.P.A.1	Use the mouse to negotiate a simple menu on the screen (e.g., to print a picture).
		8.1.P.A.2	Use electronic devices (e.g., computer) to type name and to create stories with pictures and letters/words.
		8.1.P.A.3	Identify the "power keys" (e.g., ENTER, spacebar) on a keyboard.
		8.1.P.A.4	Recognize that the number keys are in a row on the top of the keyboard.
		8.1.P.A.5	Use basic technology terms in conversations (e.g., digital camera, battery, screen, computer, Internet, mouse, keyboards, and printer).
		8.1.P.A.6	Turn smart toys on and off.
2	The use of technology and digital tools requires knowledge and appropriate use of operations and related applications.	8.1.2.A.1	Identify the basic features of a computer and explain how to use them effectively.
		8.1.2.A.2	Use technology terms in daily practice.
		8.1.2.A.3	Discuss the common uses of computer applications and hardware and identify their advantages and disadvantages.

		8.1.2.A.4	Create a document with text using a word processing program.
		8.1.2.A.5	Demonstrate the ability to navigate in virtual environments that are developmentally appropriate.
4	The use of technology and digital tools requires knowledge and appropriate use of operations and related applications.	8.1.4.A.1	Demonstrate effective input of text and data using an input device.
		8.1.4.A.2	Create a document with text formatting and graphics using a word processing program.
		8.1.4.A.3	Create and present a multimedia presentation that includes graphics.
		8.1.4.A.4	Create a simple spreadsheet, enter data, and interpret the information.
		8.1.4.A.5	Determine the benefits of a wide range of digital tools by using them to solve problems.
8	The use of technology and digital tools requires knowledge and appropriate use of operations and related applications.	8.1.8.A.1	Create professional documents (e.g., newsletter, personalized learning plan, business letter or flyer) using advanced features of a word processing program.
		8.1.8.A.2	Plan and create a simple database, define fields, input data, and produce a report using sort and query.
		8.1.8.A.3	Create a multimedia presentation including sound and images.
		8.1.8.A.4	Generate a spreadsheet to calculate, graph, and present information.
		8.1.8.A.5	Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.

12	The use of technology and digital tools requires knowledge and appropriate use of operations and related applications.	8.1.12.A.1	Construct a spreadsheet, enter data, and use mathematical or logical functions to manipulate data, generate charts and graphs, and interpret the results.
		8.1.12.A.2	Produce and edit a multi-page document for a commercial or professional audience using desktop publishing and/or graphics software.
		8.1.12.A.3	Participate in online courses, learning communities, social networks, or virtual worlds and recognize them as resources for lifelong learning.
		8.1.12.A.4	Create a personalized digital portfolio that contains a résumé, exemplary projects, and activities, which together reflect personal and academic interests, achievements, and career aspirations.

Content Area	Technology		
Standard	**8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.		
Strand	**B. Creativity and Innovation**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
P	The use of digital tools and media-rich resources enhances creativity and the construction of knowledge.	8.1.P.B.1	Use a digital camera to take a picture.
2	The use of digital tools and media-rich resources	8.1.2.B.1	Illustrate and communicate original ideas and stories using digital tools and media-rich resources.

	enhances creativity and the construction of knowledge.		
4	The use of digital tools and media-rich resources enhances creativity and the construction of knowledge.	8.1.4.B.1	Produce a media-rich digital story about a significant local event or issue based on first-person interviews.
8	The use of digital tools and media-rich resources enhances creativity and the construction of knowledge.	8.1.8.B.1	Synthesize and publish information about a local or global issue or event on a collaborative, web-based service (also known as a shared hosted service).
12	The use of digital tools and media-rich resources enhances creativity and the construction of knowledge.	8.1.12.B.1	Design and pilot a digital learning game to demonstrate knowledge and skills related to one or more content areas or a real world situation.

Content Area	Technology		
Standard	**8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.		
Strand	**C. Communication and Collaboration**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
P	Digital tools and environments support the learning process and foster collaboration in solving local or global issues and problems.	8.1.P.C.1	Operate frequently used, high-quality, interactive games or activities in either screen or toy-based formats.
		8.1.P.C.2	Access materials on a disk, cassette tape, or DVD. Insert a disk, cassette tape, CD-Rom, DVD, or other storage device and press "play" and "stop."

2	Digital tools and environments support the learning process and foster collaboration in solving local or global issues and problems.	8.1.2.C.1	Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using electronic tools.
4	Digital tools and environments support the learning process and foster collaboration in solving local or global issues and problems.	8.1.4.C.1	Engage in online discussions with learners in the United States or from other countries to understand their perspectives on a global problem or issue.
8	Digital tools and environments support the learning process and foster collaboration in solving local or global issues and problems.	8.1.8.C.1	Participate in an online learning community with learners from other countries to understand their perspectives on a global problem or issue, and propose possible solutions.
12	Digital tools and environments support the learning process and foster collaboration in solving local or global issues and problems.	8.1.12.C.1	Develop an innovative solution to a complex, local or global problem or issue in collaboration with peers and experts, and present ideas for feedback in an online community.

Content Area	Technology
Standard	**8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

Strand	D. Digital Citizenship		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
2	Technological advancements create societal concerns regarding the practice of safe, legal, and ethical behaviors.	8.1.2.D.1	Model legal and ethical behaviors when using both print and non-print information by citing resources.
4	Technological advancements create societal concerns regarding the practice of safe, legal, and ethical behaviors.	8.1.4.D.1	Explain the need for each individual, as a member of the global community, to practice cyber safety, cyber security, and cyber ethics when using existing and emerging technologies.
		8.1.4.D.2	Analyze the need for and use of copyrights.
		8.1.4.D.3	Explain the purpose of an acceptable use policy and the consequences of inappropriate use of technology.
8	Technological advancements create societal concerns regarding the practice of safe, legal, and ethical behaviors.	8.1.8.D.1	Model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics.
		8.1.8.D.2	Summarize the application of fair use and Creative Commons guidelines.
		8.1.8.D.3	Demonstrate how information on a [controversial issue] may be biased.
12	Technological advancements create societal concerns regarding the practice of safe, legal, and ethical behaviors.	8.1.12.D.1	Evaluate policies on unauthorized electronic access (e.g., hacking) and disclosure and on dissemination of personal information.
		8.1.12.D.2	Demonstrate appropriate use of copyrights as well as fair use and Creative Commons guidelines.
		8.1.12.D.3	Compare and contrast international government policies on filters for censorship.

		8.1.12.D.4	Explain the impact of cyber crimes on society.

Content Area	Technology		
Standard	**8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.		
Strand	**E. Research and Information Literacy**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
P	Effective use of digital tools assists in gathering and managing information.	8.1.P.E.1	Use the Internet to explore and investigate questions with a teacher's support.
2	Effective use of digital tools assists in gathering and managing information.	8.1.2.E.1	Use digital tools and online resources to explore a problem or issue affecting children, and discuss possible solutions.
4	Effective use of digital tools assists in gathering and managing information.	8.1.4.E.1	Investigate a problem or issue found in the United States and/or another country from multiple perspectives, evaluate findings, and present possible solutions, using digital tools and online resources for all steps.
		8.1.4.E.2	Evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.
8	Effective use of digital tools assists in gathering and managing information.	8.1.8.E.1	Gather and analyze findings using data collection technology to produce a possible solution for a content-related or real-world problem.
12	Effective use of digital tools	8.1.12.E.1	Develop a systematic plan of investigation with

	assists in gathering and managing information.		peers and experts from other countries to produce an innovative solution to a state, national, or worldwide problem or issue.
		8.1.12.E.2	Predict the impact on society of unethical use of digital tools, based on research and working with peers and experts in the field.

Content Area	Technology		
Standard	**8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.		
Strand	**F. Critical Thinking, Problem Solving, and Decision-Making**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
P	Information accessed through the use of digital tools assists in generating solutions and making decisions.	8.1.P.F.1	Navigate the basic functions of a browser, including how to open or close windows and use the "back" key.
2	Information accessed through the use of digital tools assists in generating solutions and making decisions.	8.1.2.F.1	Use mapping tools to plan and choose alternate routes to and from various locations.
4	Information accessed through the use of digital tools assists in generating solutions and making decisions.	8.1.4.F.1	Select and apply digital tools to collect, organize, and analyze data that support a scientific finding.
8	Information accessed through the use of digital tools assists	8.1.8.F.1	Use an electronic authoring tool in collaboration with learners from other countries to evaluate and

	in generating solutions and making decisions.		summarize the perspectives of other cultures about a current event or contemporary figure.
12	Information accessed through the use of digital tools assists in generating solutions and making decisions.	8.1.12.F.1	Select and use specialized databases for advanced research to solve real-world problems.
		8.1.12.F.2	Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address educational, career, personal, and social needs.

Content Area	Technology		
Standard	**8.2 Technology Education, Engineering, and Design:** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.		
Strand	**A. Nature of Technology: Creativity and Innovation**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
2	Technology products and systems impact every aspect of the world in which we live.	8.2.2.A.1	Describe how technology products, systems, and resources are useful at school, home, and work.
4	Technology products and systems impact every aspect of the world in which we live.	8.2.4.A.1	Investigate factors that influence the development and function of technology products and systems.
		8.2.4.A.2	Using a digital format, compare and contrast how a technology product has changed over time due to economic, political, and/or cultural influences.
8	Technology products and systems impact every aspect of the world in which we live.	8.2.8.A.1	Explain the impact of globalization on the development of a technological system over time.

12	Technology products and systems impact every aspect of the world in which we live.	8.2.12.A.1	Design and create a technology product or system that improves the quality of life and identify trade-offs, risks, and benefits.

Content Area	Technology		
Standard	**8.2 Technology Education, Engineering, and Design:** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.		
Strand	**B. Design: Critical Thinking, Problem Solving, and Decision-Making**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
2	The design process is a systematic approach to solving problems.	8.2.2.B.1	Brainstorm and devise a plan to repair a broken toy or tool using the design process.
		8.2.2.B.2	Investigate the influence of a specific technology on the individual, family, community, and environment.
4	The design process is a systematic approach to solving problems.	8.2.4.B.1	Develop a product using an online simulation that explores the design process.
		8.2.4.B.2	Design an alternative use for an existing product.
		8.2.4.B.3	Explain the positive and negative effect of products and systems on humans, other species, and the environment.
		8.2.4.B.4	Compare and contrast how technology transfer happens within a technology, among technologies, and among other fields of study.
8	The design process is a	8.2.8.B.1	Design and create a product that addresses a real-

	systematic approach to solving problems.		world problem using the design process and working with specific criteria and constraints.
		8.2.8.B.2	Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation.
		8.2.8.B.3	Solve a science-based design challenge and build a prototype using science and math principles throughout the design process.
12	The design process is a systematic approach to solving problems.	8.2.12.B.1	Design and create a product that maximizes conservation and sustainability of a scarce resource, using the design process and entrepreneurial skills throughout the design process.
		8.2.12.B.2	Design and create a prototype for solving a global problem, documenting how the proposed design features affect the feasibility of the prototype through the use of engineering, drawing, and other technical methods of illustration.
		8.2.12.B.3	Analyze the full costs, benefits, trade-offs, and risks related to the use of technologies in a potential career path.

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

Strand	C. Technological Citizenship, Ethics, and Society		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
2	Knowledge and understanding of human, cultural, and societal values are fundamental when designing technology systems and products in the global society.	8.2.2.C.1	Demonstrate how reusing a product affects the local and global environment.
4	Knowledge and understanding of human, cultural, and societal values are fundamental when designing technology systems and products in the global society.	8.2.4.C.1	Explain the impact of disposing of materials in a responsible way.
		8.2.4.C.2	Explain the purpose of trademarks and the impact of trademark infringement on businesses.
		8.2.4.C.3	Examine ethical considerations in the development and production of a product from its inception through production, marketing, use, maintenance, and eventual disposal by consumers.
8	Knowledge and understanding of human, cultural, and societal values are fundamental when designing technology systems and products in the global society.	8.2.8.C.1	Explain the need for patents and the process of registering one.
		8.2.8.C.2	Compare and contrast current and past incidences of ethical and unethical use of labor in the United States or another country and present results in a media-rich presentation.
12	Knowledge and understanding of human, cultural, and societal values are fundamental when designing technology systems and products in the global society.	8.2.12.C.1	Analyze the ethical impact of a product, system, or environment, worldwide, and report findings in a web-based publication that elicits further comment and analysis.
		8.2.12.C.2	Evaluate ethical considerations regarding the sustainability of resources that are used for the

			design, creation, and maintenance of a chosen product.
		8.2.12.C.3	Evaluate the positive and negative impacts in a design by providing a digital overview of a chosen product and suggest potential modifications to address the negative impacts.

Content Area	Technology		
Standard	**8.2 Technology Education, Engineering, and Design:** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.		
Strand	**D. Research and Information Fluency**		
By the end of grade	Content Statement	CPI#	Cumulative Progress Indicator (CPI)
2	Information-literacy skills, research, data analysis, and prediction provide the basis for the effective design of technology systems.	8.2.2.D.1	Collect and post the results of a digital classroom survey about a problem or issue and use data to suggest solutions.
4	Information-literacy skills, research, data analysis, and prediction provide the basis for the effective design of technology systems.	8.2.4.D.1	Analyze responses collected from owners/users of a particular product and suggest modifications in the design of the product based on their responses.
8	Information-literacy skills, research, data analysis, and prediction provide the basis	8.2.8.D.1	Evaluate the role of ethics and bias on trend analysis and prediction in the development of a product that impacts communities in the United

	for the effective design of technology systems.		States and/or other countries.
12	Information-literacy skills, research, data analysis, and prediction provide the basis for the effective design of technology systems.	8.2.12.D.1	Reverse-engineer a product to assist in designing a more eco-friendly version, using an analysis of trends and data about renewable and sustainable materials to guide your work.

Content Area	Technology		
Standard	**8.2 Technology Education, Engineering, and Design:** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.		
Strand	**E. Communication and Collaboration**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
2	Digital tools facilitate local and global communication and collaboration in designing products and systems.	8.2.2.E.1	Communicate with students in the United States or other countries using digital tools to gather information about a specific topic and share results.
4	Digital tools facilitate local and global communication and collaboration in designing products and systems.	8.2.4.E.1	Work in collaboration with peers to produce and publish a report that explains how technology is or was successfully or unsuccessfully used to address a local or global problem.
8	Digital tools facilitate local and global communication and collaboration in designing products and systems.	8.2.8.E.1	Work in collaboration with peers and experts in the field to develop a product using the design process, data analysis, and trends, and maintain a digital log with annotated sketches to record the development

			cycle.
12	[Digital tools](#) facilitate local and global communication and collaboration in designing products and systems.	8.2.12.E.1	Use the design process to devise a technological product or system that addresses a global issue, and provide documentation through drawings, data, and materials, taking the relevant cultural perspectives into account throughout the design and development process.

Content Area	Technology		
Standard	**8.2 Technology Education, Engineering, and Design:** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.		
Strand	**F. Resources for a Technological World**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
2	Technological products and systems are created through the application and appropriate use of technological resources.	8.2.2.F.1	Identify the resources needed to create technological products and systems.
4	Technological products and systems are created through the application and appropriate use of technological resources.	8.2.4.F.1	Describe how resources are used in a technological product or system.
		8.2.4.F.2	Explain how resources are processed in order to produce technological products and systems.
8	Technological products and systems are created through	8.2.8.F.1	Explain the impact of resource selection and processing in the development of a common

	the application and appropriate use of technological resources.		technological product or system.
		8.2.8.F.2	Explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment (e.g., by using recycled metals, alternate energy sources) and the economy.
12	Technological products and systems are created through the application and appropriate use of technological resources.	8.2.12.F.1	Determine and use the appropriate application of resources in the design, development, and creation of a technological product or system.
		8.2.12.F.2	Explain how material science impacts the quality of products.
		8.2.12.F.3	Select and utilize resources that have been modified by digital tools (e.g., CNC equipment, CAD software) in the creation of a technological product or system.

Content Area	Technology		
Standard	**8.2 Technology Education, Engineering, and Design:** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.		
Strand	**G. The Designed World**		
By the end of grade	**Content Statement**	**CPI#**	**Cumulative Progress Indicator (CPI)**
2	The designed world is the product of a design process that provides the means to convert resources into	8.2.2.G.1	Describe how the parts of a common toy or tool interact and work as part of a system.
		8.2.2.G.2	Explain the importance of safety in the use and selection of appropriate tools and resources for a

	products and systems.		specific purpose.
4	The designed world is the product of a design process that provides the means to convert resources into products and systems.	8.2.4.G.1	Examine a malfunctioning tool and use a step-by-step process to troubleshoot and present options to repair the product.
		8.2.4.G.2	Explain the functions of a system and subsystems.
		8.2.4.G.3	Evaluate the function, value, and aesthetics of a technological product, system, or environment from the perspective of the user and the producer.
8	The designed world is the product of a design process that provides the means to convert resources into products and systems.	8.2.8.G.1	Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
		8.2.8.G.2	Explain the interdependence of a subsystem that operates as part of a system.
12	The designed world is the product of a design process that provides the means to convert resources into products and systems.	8.2.12.G.1	Analyze the interactions among various technologies and collaborate to create a product or system demonstrating their interactivity.

Curriculum Scope and Sequence Chart- Engineering Graphics

Curriculum Scope and Sequence		
Content Area: Science and Engineering Academy	Name of Course: Engineering Graphics/ Science & Engineering Academy	Grade Level(s): 10th Grade
General Overview and Pacing		
	Topic/Unit Name	Suggested Pacing (Days/Weeks)
PTC CREO Software/ MakerBot 2.0	History of Engineering Design and Processes	5 days
PTC CREO Software/ MakerBot 2.0	Communicating Engineering Drawings and Design	15 days
PTC CREO Software/ MakerBot 2.0	Computer Aided Design and Computer Aided Machining Introduction	3-5 days
PTC CREO Software/ MakerBot 2.0	PTC Creo Parametric Basic Modeling Process	7-10 Days
PTC CREO Software/ MakerBot 2.0	Understanding Creo Parametric Concepts	3-5 Days
PTC CREO Software/ MakerBot 2.0	Using the PTC Creo parametric Interface	3-5 Days
PTC CREO Software/ MakerBot 2.0	Selecting Geometric Features and Models	4-7 Days
PTC CREO Software/ MakerBot 2.0	Editing Geometric Features and Models	5-7 Days
PTC CREO Software/ MakerBot 2.0	Creating Sketcher Geometry	5-7 Days
PTC CREO Software/ MakerBot 2.0	Utilizing Sketcher Tools	5-7 Days
PTC CREO Software/ MakerBot 2.0	Creating Sketches for Features	3-5 Days
PTC CREO Software/ MakerBot 2.0	Creating Datum Features, Planes and Axis	5-7 Days

PTC CREO Software/ MakerBot 2.0	Creating Extrudes, Revolves and Ribs	10-12 Days
PTC CREO Software/ MakerBot 2.0	Utilizing Internal Sketches and Embedded Programs	5-7 Days
PTC CREO Software/ MakerBot 2.0	Creating Sweeps and Blends	10-12 Days
PTC CREO Software/ MakerBot 2.0	Creating holes, shells and draft	8-10 Days
PTC CREO Software/ MakerBot 2.0	Creating Rounds and Chamfers	8-10 Days
PTC CREO Software/ MakerBot 2.0	Creating an Air Circulator	12-14 Days
PTC CREO Software/ MakerBot 2.0	Group, Copy and Mirror Tools	5-7 Days
PTC CREO Software/ MakerBot 2.0	Creating Patterns	5-7 Days
PTC CREO Software/ MakerBot 2.0	Measuring and Inspection Models	8-10 Days
PTC CREO Software/ MakerBot 2.0	Assembling with Constraints	10-14 days
PTC CREO Software/ MakerBot 2.0	Assembling with Connetions	10 -12 Days
PTC CREO Software/ MakerBot 2.0	Exploding Assemblies	3-5 Days
PTC CREO Software/ MakerBot 2.0	Drawing Layout and View	3-5 Days
PTC CREO Software/ MakerBot 2.0	Creating Drawing Annotations	4-5 Days
PTC CREO Software/ MakerBot 2.0	Layer Utilization	2-4 Days

PTC CREO Software/ MakerBot 2.0	Capturing Design Intent	3-5 Days
PTC CREO Software/ MakerBot 2.0	Resolving Failures	2-4 Days
PTC CREO Software/ MakerBot 2.0	Makerbot / Prototyping / 3D Printing	10 Days