Seymour Public Schools Curriculum

Two Dimensional Engineering Drafting

Curriculum 1213

Unit 1
Foundations of Design

Narrative…….

In this unit, students are provided with an overview of the foundations of design. It will introduce students to the historical changes associated with graphic language, key terms, vocabulary and the impact associated with the communication technologies. The overview will allow them to assess the communication technologies dealing with measurement, sketching, lettering, and simple equipment associated with worldwide graphic communication. They will also be given an overview of the American Nation Standard Institute (ANSI) and its adaptations to the graphic language of drafting and the way the instituted adopted changes have effected today's work place and job descriptions worldwide over history.

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Grade: 9-12	**Subject:**

	Unit 1: Foundations of Design.
	- Language of design
	  - Graphic Language
	  - Artistic and Technical
	- Design Forms and Communications
	- Elements of Design
	  - Sketching, Preliminary design, Working drawing, Prototype, Manufacturing, Advertisement, Sales
	- Scales, Measures, and Measuring Devices
	- Sketching, Proportions, and communications
	- Lettering and communications
	- Tools and equipment
	- Cartesian Coordinate System
	  - Angles, Triangles and Point Locations
	- Media Selection

CCTEPSC Standard	**CTE Standards** ***A. Materials and Processes: Identify and describe the basic elements used in computer aided drafting and design.*** ***D. Interpreting and reading blueprints: Indentify various symbols and interpret and read blueprints.*** ***E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process For creating various types of views using a well-organized process.*** ***Mathematics Standards*** ***1. Extend the understanding of numbers to include integers rational numbers and real numbers*** ***3. Develop strategies for computation and estimation using properties of number systems to solve problems.*** ***Reading Standards*** ***6. Make connection between text and the text and outside experiences and knowledge.*** ***8. Use evidence from the text to draw and or support a conclusion.*** ***9. Use information from the text to make a prediction based on what is read.*** ***SHS Learning Expectations***

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Enduring Understanding	✔ Standards are essential to clear communications ✔ Communication standards are key to relate design intent ✔ Simple ideas need to be transferred, by a mechanical means, into a technical design and media in order for manufacturing to take place. ✔ Communicating design intent clarifies technical design details and ease of manufacturing. ✔ Measurement Standards are essential to clear representation of in a technical rendering. ✔ Standards and proportion are essential to clear representation and communication in a technical rendering. ✔ Accurately communicating design intent clarifies technical design details ✔ Knowledge of basic proportions increases level of understanding and communication ✔ Standards are essential to clear communications ✔ Communicating design intent clarifies technical design details and ease of manufacturing
Essential Questions	1. Language is defined as? How does it relate to technical communications? 2. Two main classifications of communication affect design intent how are they different and which on has influenced technology worldwide? 3. How has the ANSI adapted and changed the technical language? 4. How does the scale affect the methods of communications? 5. How does the relationship between sketching and design development influence communications and the design process? 6. How are proportions so important to basic sketching? 7. How has single stroke lettering techniques influenced technical communications? 8. How is the ability to identify and properly use simple drafting equipment important to technical design? (I.e. Mechanical, Engineering, and Architecture) 9. How important is proper measurement, the ability to identify and properly use equipment for direct measurement, transferring measurement or coping measurements to technical design?

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Content Standard:	**CTE Standards** ***A. Materials and Processes: Identify and describe the basic elements used in computer aided drafting and design***. 2. Describe and demonstrate the process of using mechanical and electronic measuring devices accurately as required by the design intent. 3. Describe and demonstrate the use of graphic communication skills through sketching. 4. Evaluate and select appropriate method of communication for a given problem. 10. Identify basic geometric elements (e.g., line, circle, rectangle, sphere, cube) ***D. Interpreting and reading blueprints: Indentify various symbols and interpret and read blueprints.*** 18. Interpret basic views and dimensions in a working drawing. 20. Interpret drawings, pictures, and symbols. ***E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for creating various types of views using a well-organized process.*** 21. Explain the Cartesian Coordinate System. 31. Explain the use and need for scaled drawings. ***Mathematics Standards*** ***1. Extend the understanding of numbers to include integers rational numbers and real numbers*** ● **Compare, locate, label and order real numbers on number lines, scales, coordinate grids and measurement tools.** ***3. Develop strategies for computation and estimation using properties of number systems to solve problems.*** ● **Select and use appropriate methods for computing to solve problem in a variety of contexts.** ***Reading Standards*** ***8. Use evidence from the text to draw and or support a conclusion.*** ***9. Use information from the text to make a prediction based on what is read.*** ***SHS Student Learning expectations*** 1. Students will think critically and inquisitively. 2. Students will communicate effectively and creatively. 3. Students will access, evaluate, and use information for a variety of tasks and purposes.

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	4. Students will master appropriate content and skills from a variety of disciplines. **(refer to frameworks)**
Performance Expectations (Student outcomes)	**Content Overview:** ✔ History of Language ✔ Language of Drawing ✔ Communication design processes ✔ Importance of drafting and design ✔ Branches of Technical Drafting ✔ Goals of Technical Communication ✔ Sketching ✔ Working Drawings ✔ ANSI ✔ Measurements and their relationship to design ✔ Scales types and the relationship to measurements ✔ Utilizing measurement instruments ✔ Performing basic calculations using measurement instruments ✔ Introduce basic design dimensioning techniques ✔ Measurements and their relationship to design ✔ Sketching and the relationship to measurements and proportions ✔ Utilizing sketching as an instrument of pre-design records ✔ Performing basic calculations using measurement instruments ✔ Introduce basic sketching design techniques ✔ The importance of proportions when sketching ✔ Develop single stoke lettering and their relations to design ✔ Utilizing lettering as an instrument of communication ✔ Perform basic lettering tasks using appropriate technique ✔ Determine the importance of lettering to the completion of a design

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Performance Expectations Continued:	**Objectives/Competencies:** 1. Students will understand the development of language and grasp the importance of drawing standards to the production of an object. 2. Student will grasp the different design classifications and their importance to the design process. 3. Students will understand the different applications of the communication design such as mechanical, engineer, architectural and others. 4. Students will be aware of the technical aspect of communication design and the career opportunities that will open if they pursue one of the available fields. 5. Student will understand how and why accepted standards apply to the areas of technical design and to the drafting design process. 6. Students will understand the goals of technical communication when developing sketches and working drawings of a product. 7. Students will understand the relationship between measurements and design solutions. 8. Students will grasp the measurement process using multiple measurement instruments. 9. Students will understand the design applications of the different measuring instruments. 10. Student will apply the skills learned using measuring instruments. 11. Students will grasp basic dimensioning techniques and demonstrate the ability to read and interpret design prints. 12. Students will understand the relationship between measurements and design solutions. 13. Students will grasp the measurement process and its importance to sketching. 14. Students will understand the pre-design applications through the use of sketching. 15. Student will apply visualization techniques used when sketching. 16. Students will grasp basic proportioning techniques and demonstrate the ability to interpret and produce pre-design ideas. 17. Students will understand the relationship between lettering and communication s in design.

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	18. Students will grasp the lettering process and its importance to design. 19. Students will understand the basic techniques of lettering applications. 20. Students will grasp basic proportioning techniques and demonstrate the ability to interpret and produce single stroke lettering.

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
✔ Research ✔ Research Paper ✔ Collaboration ✔ Presentation o Teacher o Student ✔ Using the textbook and internet research the history of language and compare the cause and effect in the natural world. Organize a list for class discussion. ✔ Using the text book along with additional handouts and assessments, perform basic sketching, measurement and single view design activities using multiple drafting tools.	✔ Textbook ✔ Handouts ✔ Internet	**Performance Assessment:** ✔ Using the list write a one page essay that explains the birth of language and its effect on our society. (Typed, double spaced, size 12 times new roman) SHS Learning expectation #1 ✔ Working in groups of two, and using the textbook along with the internet, research one possible career area in the technical drawing fields. Using you research, collaborate, develop and organize a career description to be presented orally to the class. ✔ **Goal** Determine the birth of language and its effect on the developing world. Introduction of careers in the technical drawing field. Determine the appropriate tool needed to be used for the

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		measurement process. □ Determine the appropriate methods needed to apply the sketching process. ✔ **Role** – Research, collaboration group presentation and written essay. ✔ **Audience** – Classmate and instructor. ✔ **Situation** – Identify cause and effect. ✔ **Production** □ Oral presentation □ 1 page essay □ Answer sheet for handout assessments. □ Design sheets. ✔ **Standards** – Rubric □ SHS Learning expectation #1 □ SHS Learning expectation #5 □ SHS Learning expectation #6 ✔ **Situation** □ Research possible career interests. □ Identify cause and effect. ✔ **Other assessments:** □ Unit objective Test

		Teacher observation Student participation Measurement worksheet Individual sketching assignments Single stroke lettering sheet

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Unit 2
Design Fundamentals

Narrative…….

Subject or course name 9

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In this unit, students are provided with an overview of basic design layout of single view objects, geometric construction, orthographic projection, and dimensioning standards used in technical design representing multiple part of the graphic language. The overview will allow them to assess the impact and adaptations of technical design standards and methods used over history to represent products used and needed by society. They will also assess the impact of design preparation associated with communication technologies worldwide.

Grade: 9-12	**Subject:**

Unit 2: Design Fundamentals

- Alphabet of Lines
  - Line type and Line weight
- Single View Design Layouts Standards
  - Lines types, Line weights, circles, angles, and measurement
- Geometric Construction Development
  - Shapes, tangents, bisectors, relations
- Orthographic Projections Standards
  - Multi view design
  - Projection planes
  - Projection lines
  - Angles of projection
    - First & Third

	▪ Views Evaluate methods of Appropriate Communication ▪ Line type, Line weights, Dimensions, Notes Dimension Standards ▪ Linear, and Aligned ▪ Size and Location Edit and Revisions
CCTEPSC Standards	**CTE Standards** ***A. Materials and Processes: Identify and describe the basic elements used in computer aided drafting and design***. ***B. Identifying Hardware and Operating Systems: Identify and describe the basic hardware and operating systems used in computer aided drafting and design.*** ***C. Using Hardware and Operating Systems: Describe the process of utilizing various hardware and operating systems.*** ***D. Interpreting and Reading Blueprints: Identify various symbols to interpret and read blueprints.*** ***E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for creating various types of views using a well-organized process.*** ***Mathematics Standards*** ***1. Extend the understanding of numbers to include integers rational numbers and real numbers*** ***3. Develop strategies for computation and estimation using properties of number systems to solve problems.*** ***Reading Standards*** ***8. Use evidence from the text to draw and or support a conclusion.*** ***9. Use information from the text to make a prediction based on what is read.*** ***SHS Learning Expectation***

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Enduring Understanding	✔ Standards are essential to clear communications ✔ Communication standards are key to relate design intent ✔ Communicating design intent clarifies technical design details and ease of manufacturing. ✔ Accurately communicating design intent clarifies technical design details ✔ Basic design layout is the stepping stone to advanced technical design ✔ Geometric construction is important when transferring ideas into a technical drawing for the purpose of manufacturing in quantity ✔ Orthographic projection and its six principle planes are important when transferring ideas into a technical drawing for ease of manufacturing in quantity. ✔ Orthographic projection techniques enhance the ability to communicate design standards and how they relate to production of products ✔ Dimensioning techniques enhance the visualization of a technical drawing to communicate design standards and how they relate to production of products ✔ Dimensions are essential to proper Multi-view development and clear representation in a technical rendering of a product. ✔ The orthographic projection methods, used in ideas transfer, are unusable to manufacturing companies unless accurately presented dimensions are part of the presentation. ✔ Dimensioning standards are critical to worldwide communication of ideas.
Essential Questions	1. How is the ability to use proper geometric construction techniques important to design representation? 2. How is the ability to identify and properly understand notes, details, and standardized symbols critical for technical design layouts? (I.e. Mechanical, Engineering, and Architecture) 3. How is the ability to identify and properly use the alphabet of lines for simple single view construction important to technical design? (I.e. Mechanical, Engineering, and Architecture) 4. How is the ability of reading and visualizing a printed design important to relating dimensions of a product in worldwide communications? 5. Why is appropriate measurement scale usage so important to basic design communications? 6. How are common projection methods along with proper dimensioning techniques, used to feature an object, necessary when describing a product properly for manufacturing in quantity and quality?

	7. Why is the ability to visualize objects through multiple viewing planes important to design and worldwide communication? 8. How is the ability to identify and properly use dimension standards, notes, details and standardized symbols important for multi-view construction important to technical design? (I.e. Mechanical, Engineering, and Architecture.
Content Standard:	***A. Materials and Processes: Identify and describe the basic elements used in computer aided drafting and design.*** 1. Describe physical objects as geometric entities. 2. Describe and demonstrate the process of using mechanical and electronic measuring devices accurately as required by the design intent. 4. Evaluate and select appropriate method of communication for a given problem. 9. Revise a design and update finished drawings appropriately. 10. Identify basic geometric elements (e.g., line, circle, rectangle, sphere, cube) ***B. Identifying Hardware and Operating Systems: Identify and describe the basic hardware and operating systems used in computer aided drafting and design.*** 12. Identify and describe various types of hardware and software. 13. Identify and describe the purpose of operating system components. ***C. Using Hardware and Operating Systems: Describe the process of utilizing various hardware and operating systems.*** 15. View files names of a storage device. 16. Store, copy, move, and retrieve information to/from various drives. 17. Rename and backup files ***D. Interpreting and Reading Blueprints: Identify various symbols to interpret and read blueprints.*** 18. Interpret basic views and dimensions in a working drawing. 20. Interpret drawings, pictures, and symbols. ***E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for***

	creating various types of views using a well-organized process. 24. Create and edit basic geometry by inputting coordinates. 28. Generate a 2-D Multiview drawing. 31. Explain the use and need for scaled drawings. ***Mathematics Standards*** ***1. Extend the understanding of numbers to include integers rational numbers and real numbers*** • **Compare, locate, label and order real numbers on number lines, scales, coordinate grids and measurement tools.** • **Select and use an appropriate form of numbers (integers, fractions, decimal, ratio, percentage, exponential, scientific notation, irrational) to solve practical problems involving order, magnitude, measures, labels, locations and scale.** ***3. Develop strategies for computation and estimation using properties of number systems to solve problems.*** • ***Select and use appropriate methods for computing to solve problem in a variety of contexts.*** ***Reading Standards*** ***6. Make connection between text and the text and outside experiences and knowledge.*** ***8. Use evidence from the text to draw and or support a conclusion.*** ***9. Use information from the text to make a prediction based on what is read.*** ***SHS Student Learning expectations*** 1. Students will think critically and inquisitively. 2. Students will communicate effectively and creatively. 3. Students will access, evaluate, and use information for a variety of tasks and purposes. 4. Students will master appropriate content and skills from a variety of disciplines.
Performance Expectations (Student outcomes)	✔ Perform simple single view layouts and determine their relationship to technical design intent. ✔ Utilizing simple instruments when developing single view layouts for communication of ideas. ✔ The importance of measurements design standards, feature, notes and symbols in single view technical design ✔ Use Geometric construction techniques to develop shapes and determine their relation to technical design. ✔ Properly use development techniques utilizing simple instrument when developing; lines, arcs, circles, angles, tangents, polygons, parallel and perpendicular lines. ✔ Visualization of an object and their relation to technical design

- ✔ Visualize an object in its six principle planes using orthographic projection
- ✔ Relate the Glass Box Method relationship to orthographic projection.
- ✔ Develop the ability to select necessary views used to properly describe an object.
- ✔ Properly arrange views and project features from view to view using common projection methods in a multi-view drawing.
- ✔ Relay the importance of measurements design standards, feature, notes and symbols in single view and multi-view designs.
- ✔ Use standard dimensioning techniques to support the arrangement and development of the multiple views needed to complete the technical drawing.
- ✔ Visualization and placement of dimension location on a three view representation and their relation to technical design
- ✔ Properly arrange dimensioning in a multi-view drawing
- ✔ Relay the importance of measurements, dimension standards, feature, notes and symbols used in multi-view technical design
- ✔ Use standard dimensioning techniques to support the arrangement and development of the multiple views needed to complete the technical drawing.

Objectives/Competencies:

1. Students will understand the relationship between geometric shapes and their relationship to communicating technical design ideas
2. Students will grasp proper standards and techniques for geometric shape development and their importance to quality and accurate design.
3. Students will grasp basic techniques and demonstrate the ability to create arcs, circles, angles, tangents, parallel lines, perpendicular lines.
4. Students will grasp basic measurement and measurement transfer while creating geometric shapes
5. Students will grasp the basic techniques and demonstrate the ability to construct and identify simple polygons.
6. Students will understand the relationship between simple view layout and communications in technical design.
7. Students will grasp proper standards, notes, details, and symbols and their importance to quality and

	accurate design. 8. Students will grasp basic techniques and demonstrate the ability to produce horizontal, vertical and angular lines to develop a simple single view layout. 9. Students will grasp basic measurement and measurement transfer using appropriate equipment. 10. Students will grasp the alphabet of lines and its relationship with technical design. 11. Students will determine the relationship between the six principle viewing planes of an object and their necessity for communicating a technical design. 12. Students will display the multi-view projection process and demonstrate this understanding by identifying the missing view or views. 13. Student will use the alphabet of lines when projecting appropriate views representing interior hidden lines and center lines. 14. Students will display proper standards of third angle projection and the proper views used to describe an object accurate in a quality design. 15. Students will grasp basic techniques and demonstrate the ability to choose appropriate views and project features using common projection methods 16. Students will grasp basic measurement and measurement transfer while creating appropriate views of an object using orthographic projection 17. Students will grasp the basic techniques and demonstrate the ability to center a multi-view drawing on appropriate media. 18. Students will understand the relationship between the principle view of an object and the dimensions necessary for communicating a technical design. 19. Students will grasp the Dimensioning process for multi-view presentations. 20. Students will grasp basic techniques and demonstrate the ability to choose appropriate location dimensions and their placement on appropriate views 21. Students will grasp the basic techniques and demonstrate the ability to complete a multi-view drawing on appropriate media.

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Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
✔ Collaboration ✔ Presentation □ Teacher □ Student ✔ Using the text book along with additional handouts and assessments, perform simple view development, geometric constructions, orthographic projection, and dimensioning activities.	✔ Textbook ✔ Handouts ✔ Assessment tasks	✔ **Goal** – Determine the appropriate methods needed to complete simple single view layouts. ✔ Determine the appropriate methods needed to complete multi-view layouts. ✔ Using the text book along with additional handouts and assessments, perform basic Dimensioning activities. ✔ **Role** – Demonstration, self-application, collaboration and a media application. ✔ **Audience** – Classmates and instructor. ✔ **Situation** – Identify cause and effect. ✔ **Production** – Design sheets. ✔ **Standards** – Rubric □ SHS Learning expectation #5 □ Drafting Rubric **Other Assessments:** ✔ Three simple single view assignments – Straight lines ✔ Handout – Find the missing view ✔ Student based design assignments

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		✔ Teacher Observation ✔ Student Participation

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Unit 3
Computer Aided Design

Narrative…….

In this unit, students are provided with an overview of Computer Aided Design using the Auto Cad 2000 program. The program will enhance means of representing and rendering a product or products in a technical drawing. The overview will challenge student's previous knowledge while they assess the impact and adaptation of the branches of the technical fields in the computer age. Students will need to use methods developed over history to solve visual design problems use a CAD program to transfer ideas by electronic means and generate design sheets meeting required standards to represent a product desired by society. They will assess the impact and adapt to the new technical design standards associated with communication technologies in the computer age worldwide.

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Grade:	Subject:

Unit 3: Computer Aided Design

- AutoCAD Fundamentals
  - Hardware
  - Software

Interpret Basic Views and Dimensions in a working Drawing

- AutoCAD design production
  - Layers, Lines Type, Colors, Format Manipulation
  - View Files of a storage device
  - Store, Copy, Move and Retrieve Information
  - Rename and Back Up Files
  - Keyboard & and Symbols
  - Geometric Elements of Design
    Coordinates, Draw Icons and Commands, Modify Icons and Commands
- Methods of Communication
- Accessing Network Information and Storage
- Insertion, Manipulation, and Placement of Dimensions, Notes and Annotation
- Editing and Revisions of Designs
- Pictorial Design Development
- Auxiliary View Development
- Section View Development
- Scale and Printing
- Research and development design production
- Prototype development and testing

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CCTEPSC Standards	**CTE Standards** ***A. Materials and Processes: Identify and describe the basic elements used in computer aided drafting and design***. ***B. Identifying Hardware and Operating Systems: Identify and describe the basic hardware and operating systems used in computer aided drafting and design.*** ***C. Using Hardware and Operating Systems: Describe the process of utilizing various hardware and operating systems.*** ***D. Interpreting and Reading Blueprints: Identify various symbols to interpret and read blueprints.*** ***E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for creating various types of views using a well-organized process.*** ***Mathematics Standards*** ***1. Extend the understanding of numbers to include integers rational numbers and real numbers*** ***3. Develop strategies for computation and estimation using properties of number systems to solve problems.*** ***Reading Standards*** ***6. Make connection between text and the text and outside experiences and knowledge.*** ***8. Use evidence from the text to draw and or support a conclusion.*** ***9. Use information from the text to make a prediction based on what is read.*** ***SHS Student Learning expectations*** 1. Students will think critically and inquisitively. 2. Students will communicate effectively and creatively. 3. Students will access, evaluate, and use information for a variety of tasks and purposes. 4. Students will master appropriate content and skills from a variety of disciplines.
Enduring Understanding	✔ Computer Aided Design has taken technical communication to a new era. ✔ CAD programs are critical to the presentation of transferring ideas in a precise means, and presenting them via hardcopy or electronic generated files for manufacturing purposes in single quantities and mass quantities.

	✔ Computer Aided Design programs enhance the technician's ability to communicate design standards and how they relate to production of products. ✔ Computer Aided Design programs are now critical to worldwide communication related to manufacturing and production of a product or products. ✔ Use of a Computer Aided Design program as AutoCAD enhances orthographic projection, dimensioning, detail drawings and research abilities on a world level. ✔ CAD programs are a means used by industry to enhance basic design layout and proper usage is the stepping stone to advanced technical design. ✔ CAD programs heighten orthographic projection techniques, enhancing the ability to communicate ideas in design standards and how they relate to production of products worldwide. ✔ Standards and proportions remain essential to proper Multi-view development; the CAD programs clarify the representation of a technical rendering. ✔ Orthographic projection on a CAD program enhances methods used in ideas transfer for the purpose of accurately representing a product to be manufactured in quantity ✔ Research is critical to a presentation of an idea for the purpose of advancing understanding of a technical design ✔ Prototype development enhances the ability of a technical drawing to communicate design needs and how they relate to production of products. ✔ CAD systems enhance the ability to develop ideas and the ability to accurately communicate on global level.
Essential Questions	1. How has the development of Computer Aided Design programs enhanced the branches of Technical Drawing? (I.e. Mechanical, Engineering, Architecture…) 2. How has the ability to use Computer Aided Design programs efficiently, critical to technical design layouts that are necessary for manufacturing a product or products? 3. How is the ability to understand technical design basics, important to understanding design program geometry? 4. How has worldwide communication benefited from computer aided design programs? How is the ability to identify and properly understand notes, details, and standardized symbols critical to the effective use of a CAD program for technical design layouts? (I.e. Mechanical, Engineering, and Architecture) 6. Determine the importance of proper menu usage important understanding of dimensioning techniques for

	direct measurement and transferring or coping measurements on a CAD system. 7. How does the CAD program change the common projection methods used to feature an object when describing a product properly for manufacturing in quantity and quality? 8. How are adapting CAD program dimensioning techniques, styles and practices of relating direct measurement and transferring or coping of measurements importance to worldwide communications? . How is the ability to generating electronic and hard copy printed design important to worldwide communications? 10. How is the ability to identify design format for Pictorial view construction important to technical design? (I.e. Mechanical, Engineering, and Architecture. 11. How does a prototype enhance the ability to identify and properly understand notes, details, and standardized symbols used in technical design layouts? (I.e. Mechanical, Engineering, and Architecture) 12. How are ever developing and adapting CAD program directly related to worldwide communications?
Content Standard:	***A . Materials and Processes: Identify and describe the basic elements used in computer aided drafting and design***. 4. Evaluate and select appropriate method of communication for a given problem. 5. Send and access information through a network. 8. Evaluate choice and placement of dimensions, notes and annotations to clearly communicate design intent. 9. Revise a design and update finished drawings appropriately. 10. Identify basic geometric elements (e.g., line, circle, rectangle, sphere, cube) ***B. Identifying Hardware and Operating Systems: Identify and describe the basic hardware and operating systems used in computer aided drafting and design.*** 12. Identify and describe various types of hardware and software. 13. Identify and describe the purpose of operating system components. ***C. Using Hardware and Operating Systems: Describe the process of utilizing various hardware and operating systems.***

15. View files names of a storage device.
16. Store, copy, move, and retrieve information to/from various drives.
17. Rename and backup files

D. Interpreting and Reading Blueprints: Identify various symbols to interpret and read blueprints.

18. Interpret basic views and dimensions in a working drawing.
20. Interpret drawings, pictures, and symbols.

E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for creating various types of views using a well-organized process.

23. Create and manipulate line types, colors and layers/levels.
24. Create and edit basic geometry by inputting coordinates.
25. Insert and manipulate text and fonts.
26. Explain and demonstrate the process for creating orthographic, isometric, section views, and auxiliary view.
27. Insert and manipulate dimensions.
28. Generate a 2-D multi view drawing.
29. Generate a pictorial drawing.
30. Scale and print hard copy of output device.
31. Explain the use and need for scaled drawings.

Mathematics Standards

1. Extend the understanding of numbers to include integers rational numbers and real numbers

- **Compare, locate, label and order real numbers on number lines, scales, coordinate grids and measurement tools.**
- **Select and use an appropriate form of numbers (integers, fractions, decimal, ratio, percentage, exponential, scientific notation, irrational) to solve practical problems involving order, magnitude, measures, labels, locations and scale.**

3. Develop strategies for computation and estimation using properties of number systems to solve problems.

- ***Select and use appropriate methods for computing to solve problem in a variety of contexts.***

Reading Standards

6. Make connection between text and the text and outside experiences and knowledge.

8. Use evidence from the text to draw and or support a conclusion.

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	9. Use information from the text to make a prediction based on what is read. ***SHS Student Learning expectations*** 1. Students will think critically and inquisitively. 2. Students will communicate effectively and creatively. 3. Students will access, evaluate, and use information for a variety of tasks and purposes. 4. Students will master appropriate content and skills from a variety of disciplines. (refer to frameworks)
Performance Expectations (Student outcomes)	Content Overview: ✔ Introduction of Hardware and software for a basic computer system. ✔ Creating a folder for an electronic portfolio ✔ Accessing the AutoCAD 2000 program ✔ Creation of a design page o Page Limits o Units o Toolbars o Layers o Line type o Line weight o Line color ✔ Load appropriate tool bars ✔ Save and Save-as Commands ✔ Simple AutoCAD design command menus o Icon o Pull down o Simple AutoCAD design commands o Simple single view CAD designs ✔ AutoCAD draw commands for basic multi-view designs ✔ AutoCAD modification commands for design production

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	✔ AutoCAD file and folder maintenance ✔ Application of a CAD system to enhance the visualize an object in its six principle planes using orthographic projection techniques ✔ Apply the developmental practices and techniques when selecting necessary views used to properly describe an object using a CAD system. ✔ Properly arrange views in a multi-view drawing while using a CAD system ✔ Properly project features from view to view using common projection methods using a CAD system ✔ Techniques used to apply measurements design standards, feature, notes and symbols in single, and Multi-view technical designs. ✔ Printing and plotting techniques used with a CAD system. ✔ Proper dimensioning and representation of a product in a technical design ✔ Dimensioning standards and style. o Placement of dimensions o Dimensioning Style o Dimensioning Format ✔ The use of and importance of measurements, dimension standards, features, notes and symbols generated on a CAD system for appropriate worldwide communication. ✔ Use of CAD generated dimensioning style and techniques to support the arrangement and dimensions on a working drawing. ✔ Visualization and Creation of a computer generated Pictorial Design. ✔ Proper axis layout and representation of a 3D product in a technical design ✔ Pictorial standards and style. o Isometric Designs o Oblique Designs o Perspective Designs ✔ Properly insert a pictorial design into a computer generated multi-view working drawing ✔ Use of CAD generated grid set-up to support the axis arrangement and layout and visual representation.

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Objectives/Competencies:

1. Students will understand and identify the relationship between hardware and software of a computer system.
2. Students will identify the basic Hardware components used to run a computer Aided Design program.
3. Students will create a folder using the computer to electronically store a drafting portfolio.
4. Students will be able to boot-up and achieve access the AutoCAD program from the network.
5. Students will create a design page using AutoCAD for future design creations.
6. Students will be able to use the save and save-as commands to end the AutoCAD program effectively.
7. Students will be able to determine simple Icons and menu functions to effectively use the AutoCAD program.
8. Students will use the AutoCAD program to create single view designs.
9. Students will demonstrate the ability to accomplish basis network folder maintenance for their electronic portfolio.
10. Students will use AutoCAD pull down and icon menus needed to solve design problems.
11. Students will apply AutoCAD draw commands while creating multi-view design\problems.
12. Students will apply AutoCAD modify commands while creating a multi-view design problems.
13. Students will properly use the format menu to align line type with layer usage when solving design problems.

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14. Students will adapt the relationship between the six principle viewing planes of an object and their necessity for communicating a technical design to the AutoCAD application.
15. Student will align the AutoCAD system with the alphabet of lines and adapt to the usage when projecting appropriate views representing interior hidden lines and center lines.
16. Students will show proficiency when applying proper standards of third angle projection and the proper views used to describe an object accurate in a quality AutoCAD design.
17. Students will show computer proficiency with basic techniques and demonstrating the ability to appropriate views and project features using common projection methods using a CAD system.
18. Students will adapt to the CAD system when applying measurement and measurement transfer needed during view construction.
19. Students will grasp the basic techniques and demonstrate the ability to center a multi-view drawing on appropriate media.
20. Students will transfer files from a network to a CAD folder.
21. Students will select appropriate multimedia and plot to a network plotter and or printer.
22. Students will demonstrate an understanding of the relationship between the principle views of an object and the appropriate dimensions necessary for communicating a technical design.
23. Students will grasp and adapt to the CAD systems dimensioning process for multi-view presentations.
24. Students will appropriately choose dimension locations on a CAD system for geometric shapes and views.
25. Students will generate a complete working drawing with dimensions, grasping the basic techniques needed for global communications in manufacturing.
26. Students will proficiently demonstrate the production of a product using appropriate drafting techniques andmedia selection.
27. Students will demonstrate an understanding of the relationship between the principle views of an object and the relationship to pictorial design that is necessary for communicating a technical design.

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	28. Students will grasp and adapt to the CAD systems pictorial design process needed for multi-view presentation clarity. 29. Students will appropriately location geometric shapes and views in a pictorial design using a CAD system. 30. Students will generate a complete working drawing; including multi views fully dimensioned and enhanced by one form of pictorial design, needed for global communications in manufacturing.

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
✔ Smart Board Presentations ✔ Handouts: □ Menu command handout □ Layer usage handout ✔ Student based design assignments ✔ Teacher Observation ✔ Student Participation ✔ Using the text book along with additional handouts and assessments computer generated pictorial design activities will be used to complete working drawing designs.	✔ Textbook ✔ AutoCAD program ✔ Internet	**Performance assessments:** **Goal** – ✔ Determine the appropriate Icons and Menus needed to complete single view layouts. ✔ Determine the appropriate techniques practices and methods needed to complete multi- view layouts using AutoCAD. ✔ Layouts working drawings with a pictorial. ✔ Determine the appropriate CAD dimensioning standards needed to complete multi-view layouts working drawings. ✔ ✔ Determine the appropriate pictorial design style needed to complete multi- view layouts working drawings. ✔ Use the Web to research a design idea. Develop the idea and complete

		multi- view ✔ Develop a prototype from the design and prepare it for testing specifications ✔ **Role** – Demonstration, self-application, collaboration and a media application. ✔ **Audience** – Classmates and instructor. ✔ **Situation** – Identify cause and effect. ✔ **Production** – Design sheets. ✔ **Standards** – Rubric • SHS Learning expectation #5 • Drafting Rubric

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Three Dimensional Engineering Drafting

Curriculum2013

Unit 4
Three Dimensional Modeling

Narrative…….

In this unit, students are provided with an introduction to the Solid Works Computer Aided Drafting program. The program will offer an enhanced means of representing and rendering a product or products in a technical design. The overview will challenge student's previous knowledge while they assess the impact and adaptation of multiple CAD programs and adapt their knowledge from one program to another used in the technical fields in the computer age. Students will need to use methods developed over history to solve visual design problems using the solidworks program. It is an advanced means of visual sketching into three dimensional modeling by electronic means and generates design sheets meeting required standards to represent a product desired by society. They will assess the impact and adapt to the new technical design standards associated with communication technologies in the computer age worldwide. Students will use solidsworks to produce simple and complex parts, assemblies and 2d drawings using the essentials of solidworks. The solidworks 3D modeling program will introduce each student to a new era in engineering design. Furthering their education with the solidworks program will bring them one step closer to a global competitor in the technical and ever changing world of engineering.

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Grade:	**Subject:**
	Unit 4: Introduction to Solid Works Essentials
	Three Dimensional Modeling
	- Solid Works Essentials
	  - Three Dimensional Design Techniques
	- Maker Bots Essentials
	  - Three dimensional Printing Techniques

CCTEPSC Standard	**CTE Standards** ***A. Materials and Processes: Identify and describe the basic elements used in computer aided drafting and design.*** ***B. Identifying Hardware and Operating Systems: Identify and describe the basic hardware and operating systems used in computer aided drafting and design.*** ***C. Using Hardware and Operating Systems: Describe the process of utilizing various hardware and operating systems.*** ***D. Interpreting and Reading Blueprints: Identify various symbols to interpret and read blueprints.*** ***E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for creating various types of views using a well-organized process.*** ***F. Drawing and Designing Assemblies: Create assemblies and views in 3-D format.*** **G. *Using a 3-D Model: Describe and demonstrate the process for converting 2-D drawings to a 3-D format as well as the process for creating construction planes.*** ***Mathematics Standards*** ***1. Extend the understanding of numbers to include integers rational numbers and real numbers*** ***3. Develop strategies for computation and estimation using properties of number systems to solve problems.*** ***Reading Standards*** ***6. Make connection between text and the text and outside experiences and knowledge.***

	8. Use evidence from the text to draw and or support a conclusion. ***9. Use information from the text to make a prediction based on what is read.*** ***SHS Learning Expectations***
Enduring Understanding	✔ Three dimensional modeling is the newest means of technical communication in a new era. ✔ Solid Works programs provide an easy means of transferring ideas in a precise means, and presenting them via a three dimension model. ✔ Solid Works enhance the technician's ability to communicate design standards through a sketch based design, relating directly to the production of products. ✔ The Solid Works CAD programs are critical to worldwide communication related to manufacturing and production of a product or products. ✔ Use of a Solid Works programs enhances orthographic projection, dimensioning, detail drawings and research abilities on a world level.
Essential Questions	1. How has the development of Solid Works CAD programs enhanced the branches of Technical Drawing? (I.e. Mechanical, Engineering, Architecture…) 2. How has the ability to use Computer Aided Design programs efficiently, critical to technical design layouts that are necessary for manufacturing a product or products? 3. How is the ability to understand technical design basics, important to understanding design program geometry? 4. How has worldwide communication benefited from computer aided design programs? 5. How does the CAD program change the common projection methods used to feature an object when describing a product properly for manufacturing in quantity and quality?
Content Standard:	***A. Materials and Processes: Identify and describe the basic elements used in computer aided drafting and design***.

	4. Evaluate and select appropriate method of communication for a given problem. 6. Express a design of an object as a 3D model. 7. Export and import images/files in a variety of file formats. 8. Evaluate choice and placement of dimensions, notes and annotations to clearly communicate design intent. 9. Revise a design and update finished drawings appropriately. 10. Identify basic geometric elements (e.g., line, circle, rectangle, sphere, cube) 11. Describe and apply the basic geometric concepts to building 3D models (e.g., tangent, parallel concentric, etc.). ***B. Identifying Hardware and Operating Systems: Identify and describe the basic hardware and operating systems used in computer aided drafting and design.*** 12. Identify and describe various types of hardware and software. 13. Identify and describe the purpose of operating system components. 14. Define and apply computer terminology. ***C. Using Hardware and Operating Systems: Describe the process of utilizing various hardware and operating systems.*** 15. View files names of a storage device. 16. Store, copy, move, and retrieve information to/from various drives. 17. Rename and backup files ***D. Interpreting and Reading Blueprints: Identify various symbols to interpret and read blueprints.*** 18. Interpret basic views and dimensions in a working drawing. 19. Identify geometric tolerance symbols. 20. Interpret drawings, pictures, and symbols. ***E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for creating various types of views using a well-organized process.*** 25. Insert and manipulate text and fonts. 26. Explain and demonstrate the process for creating orthographic, isometric, section views, and auxiliary view. 27. Insert and manipulate dimensions. 28. Generate a 2-D multi view drawing. 30. Scale and print hard copy of output device. 31. Explain the use and need for scaled drawings.

F. Drawing and Designing Assemblies: Create assemblies and views in 3-D format.

32. Create an assembly in 3-D geometry.
33. Create an exploded view of a 3-D assembly.

G. *Using a 3-D Model: Describe and demonstrate the process for converting 2-D drawings to a 3-D format as well as the process for creating construction planes.*

34. Create and manipulate construction planes.
35. Generate/modify geometric components on construction planes.
36. Create a 2-D drawing from a 3-D model.
37. Create a 3-D model from a 2-D drawing.

Mathematics Standards

1. Extend the understanding of numbers to include integers rational numbers and real numbers

- **Compare, locate, label and order real numbers on number lines, scales, coordinate grids and measurement tools.**
- **Select and use an appropriate form of numbers (integers, fractions, decimal, ratio, percentage, exponential, scientific notation, irrational) to solve practical problems involving order, magnitude, measures, labels, locations and scale.**

3. Develop strategies for computation and estimation using properties of number systems to solve problems.

- ***Select and use appropriate methods for computing to solve problem in a variety of contexts.***

Reading Standards

6. Make connection between text and the text and outside experiences and knowledge.
8. Use evidence from the text to draw and or support a conclusion.
9. Use information from the text to make a prediction based on what is read.

SHS Student Learning expectations

1. Students will think critically and inquisitively.
2. Students will communicate effectively and creatively.
3. Students will access, evaluate, and use information for a variety of tasks and purposes.
4. Students will master appropriate content and skills from a variety of disciplines.

	(refer to frameworks)
Performance Expectations (Student outcomes)	**Content Overview:** **SolidWorks Essentials:** Computer Interface ▪ How you interact with the computer ● Mouse, buttons, menus and model elements ● Find, open, edit, create, copy, and save files ● Run program ● Graphic Display, Tool Bars, Feature Manager, Property Manager and Configuration Manager. ● Setting up a root folder ● File and folder management basics Engineering Design Process ▪ 2D Sketching techniques ● Design Intent ● Sketch Entities ● Sketch Tools ● Relations ● Smart Dimensions ▪ 3D Modeling techniques ● Boss/Base Creation ○ Extrude, Revolve , Sweep, Loft and Boundary ● Boss/Base Cuts ○ Extrude, Revolve , Sweep, Loft, Boundary and Hole Wizard ● Boss/Base Features ○ Fillets/Rounds, Drafts, Shelling, Ribbings, Patterns, Mirrors, Wraps and Domes ▪ Reference Geometry ● Planes, Live Planes, Axis, coordinate System and Point ▪ Engineering Drawings ● View and Model Transfer ● Dimensioning Transfer and Editing ● Title Page Creation ▪ 3Dimensional Printing ● Z Print Software Basics

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Competency Objectives:

- **At the completion of this unit, the students will be able**
  - Effectively use SolidWorks and windows to set up a root folder.
  - Open SolidWorks and set up design specifications.
  - Apply proper conventions when naming a drawing.
  - Analyze and address all menus and sub menus on design screen.
  - Analyze and address graphic display, tool bars and all manager windows.
  - Apply and analyze SolidWorks Software application basics of design.
  - Apply and analyze sketching techniques.
  - Apply and analyze smart dimension techniques.
  - Apply and analyze 3D modeling techniques.
  - Apply and analyze the z-print and edit pro software for 3D printing.
  - Apply proper tools and techniques for 3D printing solidification.
  - Analyze the Solid Works CAD program.
  - Develop a working knowledge with the programs essentials.
  - Enhance the presentation of a design using the three dimensional modeling program

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
✔ Smart Board Presentations ✔ Handouts: Menu command handout Layer usage handout ✔ Student based design assignments	✔ Textbook ✔ Solid Works program	**Performance assessments:** ✔ **Goal** – Adapt to the solid modeling program using basic sketching, dimensioning, extruding and extrude cutting techniques to create a solid model. ✔ **Role** – Demonstration, self-application, collaboration and a media application.

✔ Teacher Observation ✔ Student Participation ✔ Using the text book along with additional handouts and assessments computer generated pictorial design activities will be used to complete working drawing designs.		✔ **Audience** – Classmates and instructor. ✔ **Situation** – Identify cause and effect. ✔ **Production** – Design sheets. ✔ **Standards** – Rubric • SHS Learning expectation #5 • Drafting Rubric

Three Dimensional Engineers Drafting

Curriculum2013

Unit 5
Engineering Process

Narrative:

Subject or course name 38

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Unit two will continue to introduce the engineering process to the students using SolidWorks as our computer Aided Design program. It is designed to advance student technical knowledge along with the imagination and engineering skills. Students will delve deeper into the solid modeling program using new tools to better understand material properties, assembly processes and motion of interconnecting parts.

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Grade:
10-12
	Unit Two: Engineering Process
	- Three Dimensional Assemblies
	  - Three Dimensional Assembly Processes
	  - Exploded View Assembly Processes
	- Maker Bots
	  - Three dimensional Printing Techniques

CCTEPSC **Standard**	**CTE Standards** ***B. Identifying Hardware and Operating Systems: Identify and describe the basic hardware and operating systems used in computer aided drafting and design.*** ***F. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for creating various types of views using a well-organized process.*** ***F. Drawing and Designing Assemblies: Create assemblies and views in 3-D format.*** **G. *Using a 3-D Model: Describe and demonstrate the process for converting 2-D drawings to a 3-D format as well as the process for creating construction planes.*** ***Mathematics Standards*** ***1. Extend the understanding of numbers to include integers rational numbers and real numbers*** ***3. Develop strategies for computation and estimation using properties of number systems to solve problems.*** ***Reading Standards*** ***6. Make connection between text and the text and outside experiences and knowledge.*** ***8. Use evidence from the text to draw and or support a conclusion.*** ***9. Use information from the text to make a prediction based on what is read.*** ***SHS Learning Expectations***

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Enduring Understanding	✔ CAD systems enhance the ability to develop ideas and the ability to accurately communicate on global level. ✔ Three dimensional solid modeling is the newest means of technical communication in a new era. ✔ Solid Works programs provide an easy means of transferring ideas in a precise means, and presenting them via a three dimension model. ✔ Solid Works enhance the technician's ability to communicate design standards through design analysis, relating directly to the production of products. ✔ The Solid Works CAD programs are critical to worldwide communication related to manufacturing and production of a product or products. ✔ Use of a Solid Works programs enhances orthographic projection, dimensioning, detail drawings and research through mean of detail material rendering on a world level.
Essential Questions	1. Why is part assembly a critical area of concern in the engineering design process? 2. How has the SolidWorks program enhanced design effectiveness? 3. How has the application of material rendering software changed the perspective of completed designs? 4. How can part animation be used effectively during a design process? 5. Can model surfaces affect design communications?
Content Standard:	***B. Identifying Hardware and Operating Systems: Identify and describe the basic hardware and operating systems used in computer aided drafting and design.*** 12. Identify and describe various types of hardware and software. 13. Identify and describe the purpose of operating system components.

14. Define and apply computer terminology.

E. Creating and Manipulating Mechanical Drawing Information: Describe and demonstrate the process for creating various types of views using a well-organized process.

22. Describe the process for setting and manipulating drawing elements.

F. Drawing and Designing Assemblies: Create assemblies and views in 3-D format.

32. Create an assembly in 3-D geometry.

33. Create an exploded view of a 3-D assembly.

G. *Using a 3-D Model: Describe and demonstrate the process for converting 2-D drawings to a 3-D format as well as the process for creating construction planes.*

34. Create and manipulate construction planes.

35. Generate/modify geometric components on construction planes.

36. Create a 2-D drawing from a 3-D model.

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- ***Select and use appropriate methods for computing to solve problem in a variety of contexts.***

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	SHS Student Learning expectations 1. Students will think critically and inquisitively. 2. Students will communicate effectively and creatively. 3. Students will access, evaluate, and use information for a variety of tasks and purposes. 4. Students will master appropriate content and skills from a variety of disciplines. **(refer to frameworks)**

Performance Expectations (Student outcomes)	**Content Overview:**
	Engineering Process:
	- Assembly of Parts
	  - Insert Components
	  - Mating parts
	  - Linear Component Pattern
	  - Smart Fasteners
	  - Hardware Down Load
	  - Tool box
	  - Assembly Features
	  - Holes Series, Hole Wizard, Simple Hole, Extrude Cut, Revolve Cut and Weld Symbols
	  - Reference Geometry
	  - Planes, Axis, Coordinate System, Points and Mate references.
	- Animation of parts
	  - Motion Manager
	- Material Rendering
	  - Material, Lights, Shadows and Background
	- Shaded Rendering

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	▪ Material Type ▪ Model Surface ▪ Color, Texture, Surface Finish and Illumination ▪ Design Analysis **Competency Objectives:** **At the completion of this unit, the students will be able to:** ▪ Apply and analyze assembly techniques. ▪ Apply and analyze techniques used to render a drawing. ▪ Use and download toolboxes to complete a design ▪ Apply and analyze Animation techniques. ▪ Apply and analyze techniques used to change a models surface texture. ▪ Apply and analyze techniques used for design analysis for a designed part

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
✔ Research ✔ Collaboration ✔ Presentation o Teacher o Student ✔ Smart Board Demonstrations ✔ 3D Printer Demonstrations	✔ Online Tutorial ✔ Text Book	✔ Practical Designs ✔ CFA Bench Marks ✔ 3D Printed Models ✔ Rubrics ✔ Digital Portfolio