Atlantic City High School
New Jersey Core Curriculum and Content Standards
for
Mechanical Drawing 1/CADD(Computer-Aided Drafting & Design)

2017

CAD, or computer-aided drafting and design (CADD), is the use of computer technology for design and design documentation. CAD software replaces manual drafting with an automated process.

<center>**Overview**</center>

The CADD program consists of four years of study.

Mechanical Drawing/CADD 1 This course introduces students to the basic foundations and fundamentals in the production of mechanical/technical drawings. Students begin with the basics of equipment and material usage, then proceed through fundamental drawing techniques and procedures. Drawing emphasis will focus on CADD(Computer-Aided Drafting & Design) using AutoCad PC software in the high school G212B computer lab. Textbooks, CD-ROMs, DVD's, computers, the internet, and hands on training are used in the instruction process.

Mechanical Drawing/CADD 2,3,4 These courses will expand upon the knowledge acquired in CADD 1. Students will learn 3D CADD and more advanced drawing, sculpting, and modeling techniques using AutoDesk's AutoCad, Revit, and Fusion 360 PC software. This course is especially beneficial for students interested in careers related to production design, engineering, architecture, drafting, and construction.

Prerequisite:
None

Mechanical Drawing/CADD 1 Course Description

CADD 1(Computer–Aided Drafting & Design) production consists of 4 units:

Intro. History and Development of Computer-Aided Drafting & Design
Unit 1. Creating Basic CAD Drawings/Designs – Software:
Unit 2. Geometric Construction
Unit 3. Orthographic Projection
Unit 4. Pictorial Drawings
Beyond – 3D CADD

   This course will introduce students to the manufacturing design language of our industrial world. It is a beginning course providing students with an opportunity to develop skills in making and using technical drawings. Students begin with the basics of equipment and material usage, then proceed through fundamental drawing techniques and procedures. Drawing emphasis will focus on CADD (computer aided drafting & Design) using AutoCad PC software in the high school G212B Computer Lab. The student should have a good background in basic mathematics. This course is especially beneficial for students interested in careers related to production design, engineering, drafting, commercial art, graphic arts, and construction. The class will be a complete course in computer assisted drafting techniques. Topics will include lettering, sketching, orthographic representation, isometric drawing, and dimensional layout.

The 21st century is an era that has rapid development of new technologies that may facilitate learning. This infusion of technology is designed to increase student achievement by:

* creating alternative instructional techniques,
* addressing the various learning styles of a diverse student population,
* reducing the world to a more manageable resource, for data retrieval,
* allowing faster and easier access to information, and...
* highlighting new areas of interest

With the infusion of technology across the curriculum, our students will be prepared to engage in the problem solving skills that are critical to their success, community existence and global survival.

Organization of the Standards

NJCCCS 8.1   Educational Technology
   All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

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 collaborate and to create and communicate knowledge.**		
Strand	**A. Technology Operations and Concepts:** *Students demonstrate a sound understanding of technology concepts, systems and operations.*		
Grade Level	Content Statement Students will:	Indicator	Indicator
9-12	Understand and use technology systems.	8.1.12.A.1	Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
	Select and use applications effectively and productively.	8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
		8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
		8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
		8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.

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 collaborate and to create and communicate knowledge.**	
Strand		**B. Creativity and Innovation:** *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*	
Grade Level	Content Statement Students will:	Indicator	Indicator
9-12	Apply existing knowledge to generate new ideas, products, or processes. Create original works as a means of personal or group expression.	8.1.P.B.1	Create a story about a picture taken by the student on a digital camera or mobile device.
		8.1.2.B.1	Illustrate and communicate original ideas and stories using multiple digital tools and resources.
		8.1.5.B.1	Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.
		8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).
		8.1.12.B.2	Apply previous content knowledge by creating and piloting a digital learning game or tutorial.
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 collaborate and to create and communicate knowledge.**	
Strand		**C. Communication and Collaboration:** *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*	
Grade Level bands	**Content Statement**	**Indicator**	**Indicator**
9-12	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media. Communicate information and ideas to multiple audiences using a variety of media and formats. Develop cultural understanding and global awareness by engaging with learners of other cultures.	8.1.P.C.1	Collaborate with peers by participating in interactive digital games or activities.
		8.1.2.C.1	Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media formats such as online collaborative tools, and social media.
		8.1.5.C.1	Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources for all steps.
		8.1.8.C.1	Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries.
	Contribute to project teams to produce original works or solve problems.	8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or 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 collaborate and to create and communicate knowledge.**		
Strand	**D. Digital Citizenship:** *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*		
Grade Level bands	**Content Statement**	**Indicator**	**Indicator**
9-12	Advocate and practice safe, legal, and responsible use of information and technology.	8.1.12.D.1	Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
	Demonstrate personal responsibility for lifelong learning.	8.1.12.D.2	Evaluate consequences of unauthorized electronic access (e.g., hacking) and disclosure, and on dissemination of personal information.
		8.1.12.D.3	Compare and contrast policies on filtering and censorship both locally and globally.
	Exhibit leadership for digital citizenship.	8.1.12.D.4	Research and understand the positive and negative impact of one's digital footprint.
		8.1.12.D.5	Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs.
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 collaborate and to create and communicate knowledge.**		
Strand	**E: Research and Information Fluency:** *Students apply digital tools to gather, evaluate, and use information.*		
Grade Level bands	**Content Statement** **Students will:**	**Indicator**	**Indicator**
9-12	Plan strategies to guide inquiry. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.	8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks. Process data and report results.	8.1.12.E.2	Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.

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 collaborate and to create and communicate knowledge.		
Strand	F: Critical thinking, problem solving, and decision making: *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*		
Grade Level bands	Content Statement Students will:	Indicator	Indicator
9-12	Identify and define authentic problems and significant questions for investigation. Plan and manage activities to develop a solution or complete a project. Collect and analyze data to identify solutions and/or make informed decisions. Use multiple processes and diverse perspectives to explore alternative solutions.	8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

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

Content Area	Technology		
Standard	8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.		
Strand	A. The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*		
Grade Level	Content Statement Students will be able to understand:	Indicator	Indicator
9-12	The characteristics and scope of technology.	8.2.12.A.1	Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation.
	The core concepts of technology.	8.2.12.A.2	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
	The relationships among	8.2.12.A.3	Research and present information on an existing technological product that has been

technologies and the connections between technology and other fields of study.			repurposed for a different function.

Content Area	Technology
Standard	**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:** **All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.**
Strand	**B. Technology and Society:** *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.*

Grade Level	Content Statement **Students will be able to understand:**	Indicator	Indicator
9-12	The cultural, social, economic and political effects of technology.	**8.2.12.B.1**	Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.
	The effects of technology on the environment.	**8.2.12.B.2**	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
	The role of society in the development and use of technology.	**8.2.12.B.3**	Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
	The influence of technology on history.	**8.2.12.B.4**	Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants.
		8.2.12.B.5	Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review.

Content Area	Technology
Standard	**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:** **All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.**
Strand	**C. Design:** *The design process is a systematic approach to solving problems.*

Grade Level bands	Content Statement **Students will be able to understand:**	Indicator	Indicator
9-12	The attributes of design.	**8.2.12.C.1**	Explain how open source technologies follow the design process.

		8.2.12.C.2	Analyze a product and how it has changed or might change over time to meet human needs and wants.	
	The application of engineering design.	**8.2.12.C.3**	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).	
		8.2.12.C.4	Explain and identify interdependent systems and their functions.	
		8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.	
	The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	**8.2.12.C.6**	Research an existing product, reverse engineer and redesign it to improve form and function.	
		8.2.12.C.7	Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.	

Content Area	Technology
Standard	**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:** **All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.**
Strand	**D. Abilities for a Technological World:** *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

Grade Level	Content Statement Students will understand how to:	Indicator	Indicator
9-12	Apply the design process.	**8.2.12.D.1**	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
		8.2.12.D.2	Write a feasibility study of a product to include: economic, market, technical, financial, and management factors, and provide recommendations for implementation.
	Use and maintain technological products and systems.	**8.2.12.D.3**	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.
	Assess the impact of products and systems.	**8.2.12.D.4**	Assess the impacts of emerging technologies on developing countries.
		8.2.12.D.5	Explain how material processing impacts the quality of engineered and fabricated products.
		8.2.12.D.6	Synthesize data, analyze trends and draw conclusions regarding the effect of a technology on the individual, society, or the environment and publish conclusions.

Content Area	Technology	
Standard	**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:** **All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.**	
Strand	**E. Computational Thinking: Programming:** *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.*	

Grade Level bands	Content Statement Students will be able to understand:	Indicator	Indicator
9-12	**Computational thinking and computer programming as tools used in design and engineering.**	**8.2.12.E.1**	Demonstrate an understanding of the problem-solving capacity of computers in our world.
		8.2.12.E.2	Analyze the relationships between internal and external computer components.
		8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
		8.2.12.E.4	Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).

21st Century Life and Careers Standards: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace.

Standard 9 is composed of the Career Ready Practices and Standards 9.1, 9.2, 9.3 and 9.4 which are outlined below:

- **Career Ready Practices**
    Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- **CRP1**. Act as a responsible and contributing citizen and employee.

- **CRP2.** Apply appropriate academic and technical skills.

- **CRP3.** Attend to personal health and financial well-being.

- **CRP4.** Communicate clearly and effectively and with reason.

- **CRP5.** Consider the environmental, social and economic impacts of decisions.

- **CRP6.** Demonstrate creativity and innovation.

- **CRP7.** Employ valid and reliable research strategies.

- **CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.

- **CRP9.** Model integrity, ethical leadership and effective management.

- **CRP10.** Plan education and career paths aligned to personal goals.

- **CRP11.** Use technology to enhance productivity.

- **CRP12.** Work productively in teams while using cultural global competence.

9.1 Personal Financial Literacy
This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

9.2 Career Awareness, Exploration, and Preparation
This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

9.3 Career and Technical Education
All students will apply knowledge about and engage in the process of career awareness, exploration and preparation in order to navigate the globally competitive work environment of the information age.

CONTENT AREA:	STANDARD 9.3 CAREER AND TECHNICAL EDUCATION
ARCHITECTURE & CONSTRUCTION CAREER CLUSTER®	
Number	**Standard statement**
PATHWAY:	DESIGN/PRE-CONSTRUCTION (AC-DES)
9.3.12.AC-DES.6	**Apply the techniques and skills of modern drafting, design, engineering and construction to projects.**
9.3.12.AC-DES.7	**Employ appropriate representational media to communicate concepts and project design.**

9.4 Career and Technical Education
All students who complete a career and technical education program will acquire academic and technical skills for careers in emerging and established professions that lead to technical skill proficiency, credentials, certificates, licenses, and/or degrees.

Strand	9.4.B Architecture & Construction Career Cluster		
Pathway	9.4B(1) Design/Pre-construction		
By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
12	**Technical Skills:** Technical knowledge and skills play a role in all careers within the cluster and pathway.	9.4.12.B.(1).8	Demonstrate communication skills and strategies that are used to work effectively with others
		9.4.12.B.(1).9	Develop technical drawings and draw computer-generated plans to design structures.

Intro: History and Development of Computer Aided Design					
5 days initially then ongoing	What led to the development of CAD? How was CAD first utilized? Why do we use Computer Aided Drafting and Design?	1. History/ Development of CAD and Information Technology a. Students will develop an understanding of the importance of the computers' role in design and its effects on design by completing design problems on CAD. b. History of CAD c. CAD vs. traditional drafting d. Applications of CAD	9.3.12.AC-DES.6 9.4.12.O, 9.4.12.B 8.2.12.F.1,3 8.2.12.E.1, 8.1.8.D.1 8.1.12.F.1-2	Students will discuss the role and history of computer technology as it relates to drafting and design technologies and, if asked, complete a timeline of its development. Students will compare and contrast several positive and negative aspects of sketched drawings and CAD drawings.	Computers Internet CAD software Projector Study Guides Handouts

Unit 1: Creating Basic CAD Drawings/Designs – Software					
10 weeks initially then ongoing	What is the purpose and importance of drawing standards?	1. Students will be able to navigate the user interface and define and access the various elements. 2. Setting up a drawing to given values, students will learn where and how to enter all the basic drafting settings and what their effects on the drawing are. 3. Students will know and be able to correctly apply CAD draw commands to the completion of a drawing problem. They will know that draw commands create objects and that objects are the smallest part of a drawing. 4. Students will know and be able to apply all basic CAD modify commands to an existing object to change its size, shape or overall appearance. 5. Students will know that CAD edit commands are used to assist them in drawing, editing, and modifying objects and be able to apply all of them correctly to the completion of drawing problems. 6. Students will know that construct commands use existing objects to create new or similar objects and be able to select and apply all of them in the appropriate situation.	9.3.12.AC-DES.6 9.4.12.O, 9.4.12.B 8.2.12.F.1,3 8.2.12.E.1, 8.1.8.D.1 8.1.12.F.1-2	Produce CAD designs/drawings within given constraints applying if asked the design process/problem solving loop to complete the drawing. Students will accurately, correctly, and neatly, complete computer aided drafting and drawing problems for the purpose of learning CAD drawing skills, commands, and their application all of which they will be able to list and explain if asked.	Computer CAD Software Printer/Plotter/output device Projector Study Guides Handouts Internet

		7. Students will know that view commands are used to assist them in how they view a drawing or object and be able to apply them all at their necessary time. 8. Students will know and be able to apply the correct CAD text command to insert and edit text in a drawing based on the given situation.			

Unit 2: Geometric Construction

4 weeks	Why is the ability to recognize and create geometric shapes fundamental in all areas of design and drafting?	Students will need to combine multiple simple geometries to create complex shapes in a CAD drawing, Students will draw geometric elements in an appropriate scale with common geometric relationships to each other.	9.3.12.AC-DES.6 9.4.12.O, 9.4.12.B 8.2.12.F.1,3 8.2.12.E.1, 8.1.8.D.1 8.1.12.F.1-2	The precision with which the students apply the CAD draw commands and the drawing aids to a drawing problem will be assessed.	Computer CAD Software Printer/Plotter/output device Projector Study Guides/Handouts Internet

Unit 3: Orthographic Projection					
8 weeks-ongoing	Why is it necessary to illustrate 2 and 3 view drawings in proper placement to one another? Why are 2-D orthographic drawings used to show true size and appearance of a 3-D object? How is the visual language of design used to communicate a solution to solve a problem?	Students will know that a projection or view is used to provide information about locating specific features such as holes or the intersection of planes. Students will understand that an orthographic projection is a means of representing a 3D object in 2D. Students will understand how to select the front view and where to place it to begin an orthographic projection. Students will understand how to project the other views necessary from the front view. Students will know what the alphabet of lines is and how to apply it to their orthographic projections. Students will be able to use layers to organize objects in their drawings.	9.3.12.AC-DES.6 9.4.12.O, 9.4.12.B 8.2.12.F.1,3 8.2.12.E.1	Students will correctly and accurately apply draw, edit, view, text, dimension, construct, and modify commands to the completion of several CAD drawing/design problems. Students will draw multi-view drawings (traditionally called working drawings) using all appropriate layers and will demonstrate understanding of setting up paper space, the appropriate border and applicable dimensions and using output devices such as the Plotter, Printer.	Computer CAD Software Printer/Plotter Projector Study Guides Handouts

		Students will use advanced modify tools and techniques to complete orthographic projections faster and more accurately.
		
		Students will create dimensions using different dimension commands and their options.
		
		Understanding the characteristics of a section drawing, students will complete several drawing problems showing the interior features of an object.
		   a. Full section
		   b. Half section
		
		Students will illustrate the true size and shape of an inclined plane with the application of an auxiliary view drawing to a given drawing problem.			

Unit 4: Pictorial Drawings					

4 weeks-ongoing	Why would pictorial drawings be used to model a design?
	
	  What is the relationship between an oblique, perspective and isometric drawing?
		Students will know the steps to produce an isometric drawing in CAD.
		
		Students will know and be able to produce the appropriate type of oblique drawing based on the situation.
		   a. Cabinet
		   b. Cavalier
			9.3.12.AC-DES.6
			9.4.12.O,
			9.4.12.B
			8.2.12.F.1,3
			8.2.12.E.1
				Develop a technological solution to a given problem using pictorial drawings and given constraints.
				
				  Students will apply all necessary CAD commands to the completion of several CAD Pictorial
				Drawings that will accurately and correctly depict an object.
					Computer
					CAD Software
					Printer/Plotter
					Projector

Beyond: 3D CAD, 3D-Modeling & Sculpting					

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New Jersey Core Curriculum and Content Standards
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Mechanical Drawing 2/CADD(Computer-Aided Drafting & Design)

2017

CAD, or computer-aided drafting and design (CADD), is the use of computer technology for design and design documentation. CAD software replaces manual drafting with an automated process.

Overview

Program of Studies Description:

Mechanical Drawing/CADD 2 Course Description

      Designed to further develop CAD skills and increase knowledge in drafting. Students apply their knowledge of drafting to more technical and challenging drafting and design activities. This courses will expand upon the knowledge acquired in CADD 1. Students will learn 3D CADD and more advanced drawing, sculpting, and modeling techniques using AutoDesk's Fusion 360, AutoCad, and Revit PC software. This course is especially beneficial for students interested in careers related to production design, engineering, architecture, drafting, and construction. Three-dimensional modeling software(Fusion 360) is integral part of the curriculum.

Prerequisite: Mechanical Drawing/CADD 1.

Core Content Standards for Mechanical Drawing/CADD 2:

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.

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.

9.1 21st Century Life Skills: All students will demonstrate creative, critical thinking, collaboration and problem solving skills to function successfully as global citizens and workers in diverse ethnic and organizational cultures.

9.3 21st Century Career Awareness, Exploration & Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration and preparation in order to navigate the globally competitive work environment of the information age.

9.4 Career and Technical Education: All students who complete a career and technical education program will acquire academic and technical skills for careers in emerging and established professions that lead to technical skill proficiency, credentials, certificates, licenses, and/or degrees.

The 21st century is an era that has rapid development of new technologies that may facilitate learning. This infusion of technology is designed to increase student achievement by:

* creating alternative instructional techniques,
* addressing the various learning styles of a diverse student population,
* reducing the world to a more manageable resource, for data retrieval,
* allowing faster and easier access to information, and...
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Grade Level	**Content Statement Students will:**	**Indicator**	**Indicator**
9-12	Understand and use technology systems.	8.1.12.A.1	Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
	Select and use applications effectively and productively.	8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.

		8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
		8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
		8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.

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 collaborate and to create and communicate knowledge.**	
Strand		**B. Creativity and Innovation:** *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*	
Grade Level	Content Statement Students will:	Indicator	Indicator
9-12	Apply existing knowledge to generate new ideas, products, or processes. Create original works as a means of personal or group expression.	8.1.P.B.1	Create a story about a picture taken by the student on a digital camera or mobile device.
		8.1.2.B.1	Illustrate and communicate original ideas and stories using multiple digital tools and resources.
		8.1.5.B.1	Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.
		8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).
		8.1.12.B.2	Apply previous content knowledge by creating and piloting a digital learning game or tutorial.

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 collaborate and to create and communicate knowledge.**	
Strand		**C. Communication and Collaboration:** *Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*	
Grade Level bands	**Content Statement**	**Indicator**	**Indicator**
9-12	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.	8.1.P.C.1	Collaborate with peers by participating in interactive digital games or activities.
		8.1.2.C.1	Engage in a variety of developmentally appropriate learning activities with students in other classes, schools, or countries using various media

	Communicate information and ideas to multiple audiences using a variety of media and formats.	8.1.5.C.1	Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources for all steps.
	Develop cultural understanding and global awareness by engaging with learners of other cultures.	8.1.8.C.1	Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries.
	Contribute to project teams to produce original works or solve problems.	8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or 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 collaborate and to create and communicate knowledge.**
Strand	**D. Digital Citizenship:** *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*

Grade Level bands	Content Statement	Indicator	Indicator
9-12	Advocate and practice safe, legal, and responsible use of information and technology.	8.1.12.D.1	Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
	Demonstrate personal responsibility for lifelong learning.	8.1.12.D.2	Evaluate consequences of unauthorized electronic access (e.g., hacking) and disclosure, and on dissemination of personal information.
		8.1.12.D.3	Compare and contrast policies on filtering and censorship both locally and globally.
	Exhibit leadership for digital citizenship.	8.1.12.D.4	Research and understand the positive and negative impact of one's digital footprint.
		8.1.12.D.5	Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs.

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 collaborate and to create and communicate knowledge.**

Strand		E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*	
Grade Level bands	**Content Statement** **Students will:**	**Indicator**	**Indicator**
9-12	Plan strategies to guide inquiry. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. Evaluate and select information sources and digital tools based on the appropriateness for specific tasks. Process data and report results.	8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
		8.1.12.E.2	Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.

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 collaborate and to create and communicate knowledge.**
Strand		**F: Critical thinking, problem solving, and decision making:** *Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*

Grade Level bands	**Content Statement** **Students will:**	**Indicator**	**Indicator**
9-12	Identify and define authentic problems and significant questions for investigation. Plan and manage activities to develop a solution or complete a project. Collect and analyze data to identify solutions and/or make informed decisions. Use multiple processes and diverse perspectives to explore alternative	8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

	solutions.		

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

Content Area	Technology		
Standard	**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:** **All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.**		
Strand	**A. The Nature of Technology: Creativity and Innovation** *Technology systems impact every aspect of the world in which we live.*		
Grade Level	**Content Statement** **Students will be able to understand:**	**Indicator**	**Indicator**
9-12	The characteristics and scope of technology.	**8.2.12.A.1**	Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation.
	The core concepts of technology.	**8.2.12.A.2**	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
	The relationships among technologies and the connections between technology and other fields of study.	**8.2.12.A.3**	Research and present information on an existing technological product that has been repurposed for a different function.

Content Area	Technology		
Standard	**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:** **All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.**		
Strand	**B. Technology and Society:** *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.*		

Grade Level	Content Statement Students will be able to understand:	Indicator	Indicator
9-12	The cultural, social, economic and political effects of technology.	8.2.12.B.1	Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review.
	The effects of technology on the environment.	8.2.12.B.2	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
	The role of society in the development and use of technology.	8.2.12.B.3	Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
	The influence of technology on history.	8.2.12.B.4	Investigate a technology used in a given period of history, e.g., stone age, industrial revolution or information age, and identify their impact and how they may have changed to meet human needs and wants.
		8.2.12.B.5	Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review.

Content Area	Technology
Standard	8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
Strand	C. Design: *The design process is a systematic approach to solving problems.*

Grade Level	Content Statement Students will be able to understand:	Indicator	Indicator
9-12	The attributes of design.	8.2.12.C.1	Explain how open source technologies follow the design process.
		8.2.12.C.2	Analyze a product and how it has changed or might change over time to meet human needs and wants.
	The application of engineering design.	8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).
		8.2.12.C.4	Explain and identify interdependent systems and their functions.
		8.2.12.C.5	Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.

	The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	8.2.12.C.6	Research an existing product, reverse engineer and redesign it to improve form and function.
		8.2.12.C.7	Use a design process to devise a technological product or system that addresses a global problem, provide research, identify trade-offs and constraints, and document the process through drawings that include data and materials.

Content Area	Technology
Standard	**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:** **All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.**
Strand	**D. Abilities for a Technological World:** *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

Grade Level	Content Statement Students will understand how to:	Indicator	Indicator
9-12	Apply the design process.	8.2.12.D.1	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
		8.2.12.D.2	Write a feasibility study of a product to include: economic, market, technical, financial, and management factors, and provide recommendations for implementation.
	Use and maintain technological products and systems.	8.2.12.D.3	Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.
	Assess the impact of products and systems.	8.2.12.D.4	Assess the impacts of emerging technologies on developing countries.
		8.2.12.D.5	Explain how material processing impacts the quality of engineered and fabricated products.
		8.2.12.D.6	Synthesize data, analyze trends and draw conclusions regarding the effect of a technology on the individual, society, or the environment and publish conclusions.

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

		environment.		
Strand		**E. Computational Thinking: Programming:** *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.*		
Grade Level bands	**Content Statement Students will be able to understand:**	**Indicator**	**Indicator**	
9-12	**Computational thinking and computer programming as tools used in design and engineering.**	**8.2.12.E.1**	Demonstrate an understanding of the problem-solving capacity of computers in our world.	
		8.2.12.E.2	Analyze the relationships between internal and external computer components.	
		8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).	
		8.2.12.E.4	Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).	

21st Century Life and Careers Standards: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace.

Standard 9 is composed of the Career Ready Practices and Standards 9.1, 9.2, 9.3 and 9.4 which are outlined below:

- **Career Ready Practices**
  Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- **CRP1**. Act as a responsible and contributing citizen and employee.

- **CRP2.** Apply appropriate academic and technical skills.

- **CRP3.** Attend to personal health and financial well-being.

- **CRP4.** Communicate clearly and effectively and with reason.

- **CRP5.** Consider the environmental, social and economic impacts of decisions.

- **CRP6.** Demonstrate creativity and innovation.

- **CRP7.** Employ valid and reliable research strategies.

- **CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.

- **CRP9.** Model integrity, ethical leadership and effective management.

- **CRP10.** Plan education and career paths aligned to personal goals.

- **CRP11.** Use technology to enhance productivity.

- **CRP12.** Work productively in teams while using cultural global competence.

9.1 Personal Financial Literacy

This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

9.2 Career Awareness, Exploration, and Preparation

This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

9.3 Career and Technical Education

All students will apply knowledge about and engage in the process of career awareness, exploration and preparation in order to navigate the globally competitive work environment of the information age.

CONTENT AREA:	STANDARD 9.3 CAREER AND TECHNICAL EDUCATION
ARCHITECTURE & CONSTRUCTION CAREER CLUSTER®	
Number	**Standard statement**
PATHWAY:	*DESIGN/PRE-CONSTRUCTION (AC-DES)*
9.3.12.AC-DES.6	**Apply the techniques and skills of modern drafting, design, engineering and construction to projects.**
9.3.12.AC-DES.7	**Employ appropriate representational media to communicate concepts and project design.**

9.4 Career and Technical Education

All students who complete a career and technical education program will acquire academic and technical skills for careers in emerging and
established professions that lead to technical skill proficiency, credentials, certificates, licenses, and/or degrees.

Strand	9.4.B Architecture & Construction Career Cluster		
Pathway	9.4B(1) Design/Pre-construction		
By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
12	**Technical Skills:** Technical knowledge and skills play a role in all careers within the cluster and pathway.	9.4.12.B.(1).8	Demonstrate communication skills and strategies that are used to work effectively with others
		9.4.12.B.(1).9	Develop technical drawings and draw computer-generated plans to design structures.

Course Performance Objectives and Lesson Plans
Upon completion of this program the student should be able to:

1. Define drafting.

   1. Select areas of specialization within the drafting profession and name areas in which a drafter and a drawing will be evaluated.

   2. Read reference materials and ANSI standards.

   3. Identify the purpose of the components found in the AutoCAD graphics screen.

   4. Obtain HELP when using AutoCAD commands.

   5. Maintain AutoCAD files.

2. State the purpose and procedures for various types of sketching and lettering.

1. Neatly letter freehand.

2. Place notes and specifications on drawings.

3. Practice use of DTEXT, STYLE and MTEXT commands. Edit and change text.

3. Label points and surfaces, construct auxiliaries of lines, points, planes and curved surfaces, determine true angle between planes and determine shortest distance between lines.

   1. Apply LINE, MULTIPLE, POLYGON, and RECTANG commands.

   2. Apply CIRCLE, DRAGMODE, ARC, ELLIPSE, and DONUT commands.

   3. Apply the ERASE, REDRAW, and OOPS commands, transparent commands, and object selection options.

   4. Introduce alternative methods for selecting and editing entities.

   5. Apply the U, REDO, and UNDO commands.

4. Identify basic drafting tools.

   1. Demonstrate the ability to use various drafting tools and properly care for them.

   2. Operate printer/plotter.

5. Describe measuring devices.
   1. Accurately measure with devices using various scale ratios.
   2. Utilize the ZOOM, REGEN, and VIEWRES commands.
   3. Apply PAN and VIEW commands.
   4. Create and use viewports.
   5. Prepare for a new drawing using DDUNITS, LIMITS and STATUS commands.
   6. Create prototype drawings.

6. Geometric construction.
    1. Identify and construct basic geometric shapes.

    2. Enter coordinates using the absolute, relative, and polar methods.

    3. Apply the object snap feature and the APERATURE, OSNAP, and DDOSNAP commands.

    4. Control AutoCAD features including the coordinate display, ortho, the TIME command, the AutoCAD Text and Command Windows, and the SAVETIME system variable.

7. Orthographic construction.

    1. Identify planes and lines, and construct missing hidden and visible lines, views, points and planes in orthographic views.

    2. Apply the GRID, SNAP, XLINE, and RAY commands.

    3. Control layers and linetypes.

8. Dimensioning.

    1. Relate dimensioning to correct size, shape and location.

    2. Apply dimensioning capabilities, including associative dimensioning and basic dimensioning system variables.

    3. Apply basic tolerancing features.

9. Manufacturing processes.

    1. Design parts for manufacturing processes.
    2. Alter entities using the CHAMFER, BREAK, FILLET, OFFSET, and MLINE commands.
    3. Apply the CHANGE, MOVE, COPY, and MIRROR commands.
    4. Create rectangular and polar arrays.

5. Modify entities by using the STRETCH, SCALE, ROTATE, TRIM, EXTEND, and LENGTHEN

6. Apply the TRACE, SOLID, and FILL commands.

7. Apply polylines and spline curves.

10. Identify fasteners and symbols.

   1. Construct material symbols and hardware drawings.

   2. Create and insert blocks.

   3. Create and use library of symbols.

11. Identify interior details.
   1. Construct symbols, full, half, offset, broken out, removed, revolved, rib, aligned and assembly sections.

   2. Apply HATCH and SKETCH commands.

12. Pictorial drawing.

   1. Measure in isometric and oblique, construct angles, construct circles and construct oblique and isometric drawings of various objects.

   2. Create isometrics using SNAP and ISOPLANE commands.

13. Assembly and working drawings.

   1. Prepare assembly drawings illustrating dimensioning tolerances.

   2. Prepare complete working drawings with accuracy.

   3. Generate Bill of Materials using the ATTEXT command.

14. Apply AutoCAD'S 3D Modeling capability.

1. Utilize X/Y/Z point filters.

2. Construct 3D wireframe models using user coordinate systems.

3. Apply the REVSURF and RULESURF commands to the construction of 3D curved surfaces.

4. Create and edit 3D primitives.

5. Shade and render 3D models.

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