MOORESTOWN TOWNSHIP PUBLIC SCHOOLS
MOORESTOWN, NEW JERSEY

Moorestown High School
Arts & Technology: Technology Education

Introduction to Computer Aided Design (CAD) and Architecture
Grades – 9-12

Date : August 2022
Prepared by: *Susan Bennett*
Supervisor: Patricia Rowe

Contents

Course Description and Fundamental Concepts

A54-35
Grades: 9-12 2.5 Crs/Semester
This course will introduce students to the design process with an understanding of manual drafting and computer aided drafting and design techniques (CAD/D). The concepts of geometric construction, sketching, detail drawing, dimensioning, lettering, and basic CAD/D procedures are presented in relation to drafting and design. Students will be introduced to additive printing (3D printing). The course will familiarize students with concepts, processes, and skills required by professionals in the field. Strongly encouraged for students interested in Engineering/Architecture majors in college.

Unit Topics
- The World Graphic Language for Design
- Technical Sketching/ Orthographic Projection
- Architectural Planning
- Pictorials/Cad Drawings
- Model Making

New Jersey Student Learning Standards (NJSLS)

Career and Technical Education (Standard 9.3)

CONTENT AREA:	STANDARD 9.3 CAREER AND TECHNICAL EDUCATION
ARCHITECTURE & CONSTRUCTION CAREER CLUSTER®	

Unit Addressed	PATHWAY:	DESIGN/PRE‑CONSTRUCTION (AC‑DES)
1,2,3,4,5	9.3.12.AC‑DES.1	Justify design solutions through the use of research documentation and analysis of data.
1,2,3,4,5	9.3.12.AC‑DES.2	Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
3,5	9.3.12.AC‑DES.3	Describe the requirements of the integral systems that impact the design of buildings.
1,2,3,4,5	9.3.12.AC‑DES.4	Apply building codes, laws and rules in the project design.
3,5	9.3.12.AC‑DES.5	Identify the diversity of needs, values and social patterns in project design, including accessibility standards.
1,2,3,4,5	9.3.12.AC‑DES.6	Apply the techniques and skills of modern drafting, design, engineering and construction to projects.
1,2,3,4,5	9.3.12.AC‑DES.7	Employ appropriate representational media to communicate concepts and project design.
1,2,3,4,5	9.3.12.AC‑DES.8	Apply standards, applications and restrictions pertaining to the selection and use of construction materials, components and assemblies in the project design.

Computer Science and Design Thinking [(Standard 8)](#)

8.1 Computing Systems

Unit Addressed	Core Idea	Performance Expectations
1, 2, 3,4,5	The usability, dependability, security, and accessibility of devices within integrated systems are important considerations in their design as they evolve.	• 8.1.12.CS.1: Describe ways in which integrated systems hide underlying implementation details to simplify user experiences.
2,3,4,5	A computing system involves interaction among the user, hardware, application software, and system software.	• 8.1.12.CS.2: Model interactions between application software, system software, and hardware. • 8.1.12.CS.3: Compare the functions of application software, system software, and hardware.
3,4,5	Successful troubleshooting of complex problems involves multiple approaches including research, analysis, reflection, interaction with peers and drawing on past experiences.	• 8.1.12.CS.4: Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.

8.1 Networks and the Internet

Unit Addressed	Core Idea	Performance Expectations
	The scalability and reliability of the Internet are enabled by the hierarchy and redundancy in networks. Network topology is determined by many characteristics.	• 8.1.12.NI.1: Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.

	Network security depends on a combination of hardware, software, and practices that protect data while it is at rest, in transit, and in use. The needs of users and the sensitivity of data determine the level of security implemented. Advanced attacks take advantage of common security vulnerabilities.	•8.1.12.NI.2: Evaluate security measures to address various common security threats. • 8.1.12.NI.3: Explain how the needs of users and the sensitivity of data determine the level of security implemented • 8.1.12.NI.4: Explain how decisions on methods to protect data are influenced by whether the data is at rest, in transit. or in use.

8.1 Impacts of Computing

Unit Addressed	Core Idea	Performance Expectations
1,2,3,4,5	The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.	• 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. • 8.1.12.IC.2: Test and refine computational artifacts to reduce bias and equity deficits. • 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.

8.1 Data and Analysis

Unit Addressed	Core Idea	Performance Expectations
4	Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information.	• 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

Unit Addressed	Core Idea	Performance Expectations
	Choices individuals make about how and where data is organized and stored affects cost, speed, reliability, accessibility, privacy, and integrity.	• 8.1.12.DA.2: Describe the tradeoffs in how and where data is organized and stored. • 8.1.12.DA.3: Translate between decimal numbers and binary numbers. • 8.1.12.DA.4: Explain the relationship between binary numbers and the storage and use of data in a computing device.
	Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.	• 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
	The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data.	•8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

8.1 Algorithms and Programing

Unit Addressed	Core Idea	Performance Expectations
	Individuals evaluate and select algorithms based on performance, reusability, and ease of implementation.	• 8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
	Programmers choose data structures to manage program complexity based on functionality, storage, and performance tradeoffs	• 8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables.
	Tradeoffs related to implementation, readability, and program performance are considered when selecting and combining control structures.	•8.1.12.AP.3: Select and combine control structures for a specific application based upon performance and readability, and identify tradeoffs to justify the choice. • 8.1.12.AP.4: Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue.

	Complex programs are designed as systems of interacting modules, each with a specific role, coordinating for a common overall purpose. Modules allow for better management of complex tasks.	• 8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. • 8.1.12.AP.6: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
	Complex programs are developed, tested and analyzed by teams drawing on the members' diverse strengths using a variety of resources, libraries and tools.	• 8.1.12.AP.7: Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users. • 8.1.12.AP.8: Evaluate and refine computational artifacts to make them more usable and accessible. • 8.1.12.AP.9: Collaboratively document and present design decisions in the development of complex programs.

Standard 8.2 Engineering Design		
Unit Addressed	**Core Idea**	**Performance Expectations**
1,2,3,4,5	Engineering design is a complex process in which creativity, content knowledge, research, and analysis are used to address local and global problems. Decisions on trade-offs involve systematic comparisons of all costs and benefits, and final steps that may involve redesigning for optimization.	• 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers. • 8.2.12.ED.2: Create scaled engineering drawings for a new product or system and make modification to increase optimization based on feedback. • 8.2.12.ED.3: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis. • 8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.

| 2,3,4,5 | Engineering design evaluation, a process for determining how well a solution meets requirements, involves systematic comparisons between requirements, specifications, and constraints. | • 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
• 8.2.12.ED.6: Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor). |

Standard 8.2 Interaction of Technology and Humans

Unit Addressed	Core Idea	Performance Expectations
1,2,3,4,5	Decisions to develop new technology are driven by societal and cultural opinions and demands that differ from culture to culture. 8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints.	8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints.
1,2,3,4,5	Changes caused by the introduction and use of a new technology can range from gradual to rapid and from subtle to obvious, and can change over time. These changes may vary from society to society as a result of differences in a society's economy, politics, and culture.	• 8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation. • 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

Standard 8.2 Nature of Technology

Unit Addressed	Core Idea	Performance Expectations

| 2,3,4,5 | Engineers use science, mathematics, and other disciplines to improve technology. Increased collaboration among engineers, scientists, and mathematicians can improve their work and designs. Technology, product, or system redesign can be more difficult than the original design. | • 8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.
• 8.2.12.NT.2: Redesign an existing product to improve form or function. |

8.2 Effects of Technology on the Natural World

Unit Addressed	Core Idea	Performance Expectations
4,5	Development and modification of any technological system needs to take into account how the operation of the system will affect natural resources and ecosystems. Impacts of technological systems on the environment need to be monitored and must inform decision-making. Many technologies have been designed to have a positive impact on the environment and to monitor environmental change over time.	• 8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product. • 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment. • 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.

8.2 Ethics and Culture

Unit Addressed	Core Idea	Performance Expectations

| 4,5 | The ability to ethically integrate new technologies requires deciding whether to introduce a technology, taking into consideration local resources and the role of culture in acceptance. Consequences of technological use may be different for different groups of people and may change over time. Since technological decisions can have ethical implications, it is essential that individuals analyze issues by gathering evidence from multiple perspectives and conceiving of alternative possibilities before proposing solutions. | • 8.2.12.EC.1: Analyze controversial technological issues and determine the degree to which individuals, businesses, and governments have an ethical role in decisions that are made.
• 8.2.12.EC.2: Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded.
• 8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.
• 8.2.12.ETW.4: Research 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. |

English Companion Standards
List grade-level appropriate companion standards for *History, Social Studies, Science and Technical Subjects (CTE/Arts) 6-12.* English Companion Standards are *required* in these subject/content areas.

Unit Addressed	Standard #	Standard Description
	NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
	NJSLSA.R2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
	NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text
1,2,3,4,5	**NJSLSA.R4**	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
	NJSLSA.R5	Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

	NJSLSA.R6	Assess how point of view or purpose shapes the content and style of a text.
	NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
	NJSLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
4	NJSLSA.R10	Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
	NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
	NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
	NJSLSA.W3	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
2,3,4	NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
	NJSLSA.W5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
2,3,4,5	NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
1,2,3,4,5	NJSLSA.W7	Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.
1,2,3,4,5	NJSLSA.W8	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
1,2,3,4	NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
	NJSLSA.W10	Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Career Awareness, Exploration, Preparation, and Training ([Standard 9.2](#))

By Grade 12		
Unit Addressed	**Core Idea**	**Standard / Description**
5	There are strategies to improve one's professional value and marketability.	***9.2.12.CAP.1****: Analyze unemployment rates for workers with different levels of education and how the economic, social, and political conditions of a time period are affected by a recession.* ***9.2.12.CAP.2****: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.* ***9.2.12.CAP.3****: Investigate how continuing education contributes to one's career and personal growth.*
1.2.3.4.5	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.	***9.2.12.CAP.4****: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.* ***9.2.12.CAP.5****: Assess and modify a personal plan to support current interests and postsecondary plans.* ***9.2.12.CAP.6****: Identify transferable skills in career choices and design alternative career plans based on those skills.* ***9.2.12.CAP.7****: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.* ***9.2.12.CAP.8****: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.* ***9.2.12.CAP.9****: Locate information on working papers, what is required to obtain them, and who must sign them.* ***9.2.12.CAP.10****: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).* ***9.2.12.CAP.11****: Demonstrate an understanding of Free Application for Federal Student Aid (FAFSA) requirements to apply for postsecondary education.*

	An individual's income and benefit needs and financial plan can change over time.	*9.2.12.CAP.12: Explain how compulsory government programs (e.g., Social Security, Medicare) provide insurance against some loss of income and benefits to eligible recipients.* *9.2.12.CAP.13: Analyze how the economic, social, and political conditions of a time period can affect the labor market.*
4,5	Securing an income involves an understanding of the costs and time in preparing for a career field, interview and negotiation skills, job searches, resume development, prior experience, and vesting and retirement plans.	*9.2.12.CAP.14: Analyze and critique various sources of income and available resources (e.g., financial assets, property, and transfer payments) and how they may substitute for earned income.*
	Understanding income involves an analysis of payroll taxes, deductions and earned benefits.	*9.2.12.CAP.15: Demonstrate how exemptions, deductions, and deferred income (e.g., retirement or medical) can reduce taxable income.* *9.2.12.CAP.16: Explain why taxes are withheld from income and the relationship of federal, state, and local taxes (e.g., property, income, excise, and sales) and how the money collected is used by local, county, state, and federal governments.* *9.2.12.CAP.17: Analyze the impact of the collective bargaining process on benefits, income, and fair labor practice.* *9.2.12.CAP.18: Differentiate between taxable and nontaxable income from various forms of employment (e.g., cash business, tips, tax filing and withholding).* *9.2.12.CAP.19: Explain the purpose of payroll deductions and why fees for various benefits (e.g., medical benefits) are taken out of pay, including the cost of employee benefits to employers and self-employment income.* *9.2.12.CAP.20: Analyze a Federal and State Income Tax Return.*
	There are ways to assess a business's feasibility and risk and to align it with an individual's financial goals.	*9.2.12.CAP.21: Explain low-cost and low-risk ways to start a business.*

| | | *9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.* |
| | | *9.2.12.CAP.23: Identify different ways to obtain capital for starting a business* |

<table>
<tr><td>Life Literacies and Key Skills (<u>Standard 9.4</u>)
List appropriate units below for which standards will be addressed</td></tr>
</table>

By Grade 12		
Unit Addressed	**Core Idea**	**Standard / Description**
1,2,3,4,5	**Creativity and Innovation**: With a growth mindset, failure is an important part of success.	*9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).*
1,2,3,4,5	**Creativity and Innovation**: Innovative ideas or innovation can lead to career opportunities.	*9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).* *9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).*
4,5	**Critical Thinking and Problem-solving:** Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.	*9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).* *9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).* *9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).* *9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.*

4,5	**Digital Citizenship:** Laws govern the use of intellectual property and there are legal consequences to utilizing or sharing another's original works without permission or appropriate credit.	***9.4.12.DC.1****: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content (e.g., 6.1.12.CivicsPR.16.a).* ***9.4.12.DC.2****: Compare and contrast international differences in copyright laws and ethics*
2	**Digital Citizenship:** Laws govern many aspects of computing, such as privacy, data, property, information, and identity. These laws can have beneficial and harmful effects, such as expediting or delaying advancements in computing and protecting or infringing upon people's rights.	***9.4.12.DC.3****: Evaluate the social and economic implications of privacy in the context of safety, law, or ethics (e.g., 6.3.12.HistoryCA.1).* ***9.4.12.DC.4****: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users (e.g., 8.1.12.NI.3).* ***9.4.12.DC.5****: Debate laws and regulations that impact the development and use of software.*
2	**Digital Citizenship:** Cultivating online reputations for employers and academia requires separating private and professional digital identities.	***9.4.12.DC.6****: Select information to post online that positively impacts personal image and future college and career opportunities.*
	Digital Citizenship: Digital communities influence many aspects of society, especially the workforce. The increased connectivity between people in different cultures and different career fields have changed the nature, content, and responsibilities of many careers.	***9.4.12.DC.7****: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).*
	Digital Citizenship: Network connectivity and computing capability extended to objects, sensors and everyday items not normally considered computers allows these devices to generate, exchange, and consume data with minimal human intervention. Technologies such as Artificial Intelligence (AI) and blockchain can help minimize the effect of climate change.	***9.4.12.DC.8****: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.*

4,5	**Global and Cultural Awareness:** Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.	*9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).*
4	**Information and Media Literacy:** Advanced search techniques can be used with digital and media resources to locate information and to check the credibility and the expertise of sources to answer questions, solve problems, and inform the decision-making.	*9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information.* *9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.*
1,2,3,4,5	**Information and Media Literacy:** Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully	*9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)* *9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4).*
	Information and Media Literacy: In order for members of our society to participate productively, information needs to be shared accurately and ethically.	*9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).* *9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).*
	Information and Media Literacy: Accurate information may help in making valuable and ethical choices.	*9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJSLSA.W1, 7.1.AL.PRSNT.4).*

	Information and Media Literacy: Media have embedded values and points of view.	*9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations (e.g., NJSLSA.R6, 7.1.AL.IPRET.6).* *9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media (e.g., 1.5.12acc.C2a, 7.1.IL.IPRET.4).*
	Technology Literacy: Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.	*9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).* *9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.*
4,5	**Technology Literacy:** Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.	*9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.* *9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).*

Interdisciplinary Connections (2020 NJSLS)
List any other content standards addressed as well as appropriate units. All arts integration connections may be listed within this chart.

Visual & Performing Arts Integration (Standard 1)
List appropriate units below for which standards (1.1 through 1.5) may be addressed

Unit Addressed	Artistic Process	Anchor Standard
1,2,3,4,5	**Creating**	*Anchor Standard 1: Generating and conceptualizing ideas.* *Anchor Standard 2: Organizing and developing ideas.* *Anchor Standard 3: Refining and completing products.*
1,2,3,4,5	**Connecting**	*Anchor Standard 10: Synthesizing and relating knowledge and personal experiences to create products.* *Anchor Standard 11: Relating artistic ideas and works within societal, cultural, and historical contexts to deepen understanding.*
1,2,3,4,5	**Performing/ Presenting/ Producing**	*Anchor Standard 4: Selecting, analyzing, and interpreting work.* *Anchor Standard 5: Developing and refining techniques and models or steps needed to create products.* *Anchor Standard 6: Conveying meaning through art.*
1,2,3,4,5	**Responding**	*Anchor Standard 7: Perceiving and analyzing products.* *Anchor Standard 8: Applying criteria to evaluate products.* *Anchor Standard 9: Interpreting intent and meaning.*

Pacing Guide (All Dates are approximate based on the school calendar)

Unit/ Topic	Month (w/Approx number of Teaching Days)
The World of Graphic Language for Design	**September** (~19 days)
Technical Sketching/Orthographic Drawings	**October** (~19 days)
Architectural Planning	**November** (~16 days)
Pictorial CAD Drawings	**December** (~15 days)
Model Making	**January** (~18 days)
The World Graphic Language for Design	**February** (~18 days)
Technical Sketching/Orthographic Drawings	**March** (~15-20 days)
Architectural Planning	**April** (~15-20 days)
Pictorial CAD Drawings	**May** (~18 days)
Model Making	**June** (~15 days)

Unit Name: 1

The World Graphic Language for Design

Learning Goals: What do I want my students to learn?

Standards

NJSLS - 9.3.12.AC‑DES.1, 9.3.12.AC‑DES.2, 9.3.12.AC‑DES.3, 9.3.12.AC‑DES.6, 9.3.12.AC‑DES.7, 9.3.12.AC‑DES.8, 8.1.12.CS.1, 8.1.12.IC.3, 8.2.12.ED.2, 8.2.12.ITH.1, 8.2.12.ITH.3
NJSLS - Career Awareness, Exploration, Preparation, and Training
NJSLS - Life Literacies and Key Skills
NJSLS - Interdisciplinary Standards

Fundamental Concepts / Big Ideas

- Through the use of nationally accepted standards, how are drafting tools and materials used to complete technical drawings?
- Through the use of creativity, innovation and exploration how does one apply the design principles in relation to technology?

Learning Objectives

Students will be able to…
- Use drafting tools accurately.
- Draw clean and concise lines.
- Persuade people who make decisions about a project that an idea is good.
- Develop a refined sketch of a proposed solution to a problem.
- Give ideas to others so that they can problem solve.
- Show that there are many ways to look at or solve a problem.
- Identify careers related to drafting and design.

Unit Name: 2

Technical Sketching/Orthographic Drawings

Learning Goals: What do I want my students to learn?

Standards

NJSLS - 9.3.12.AC‑DES.1, 9.3.12.AC‑DES.2, 9.3.12.AC‑DES.2, 9.3.12.AC‑DES.6, 9.3.12.AC‑DES.7, 9.3.12.AC‑DES.8, 8.1.12.CS.1, 8.1.12.IC.3, 8.2.12.ED.2, 8.2.12.ITH.1, 8.2.12.ITH.3
NJSLS - Career Awareness, Exploration, Preparation, and Training
NJSLS - Life Literacies and Key Skills
NJSLS - Interdisciplinary Standards

Fundamental Concepts / Big Ideas

- A technical drawing will represent a part that is three dimensional (width, height, depth) to the eye as three views, on the flat plane of the drawing paper.

Learning Objectives

Students will be able to…
- Use tools safely and accurately.
- Select and use tools for specific tasks
- Use drawing tools to draw clean and concise lines
- Create drawings that will help to persuade or educate people about a design concept.
- Develop a refined drawing of a proposed solution to a problem.
- Represent a drawing orthographically

Unit Name: 3

Architectural Planning

Learning Goals: What do I want my students to learn?

Standards

NJSLS - 9.3.12.AC‑DES.1, 9.3.12.AC‑DES.2, 9.3.12.AC‑DES.3, 9.3.12.AC‑DES.4, 9.3.12.AC‑DES.5, 9.3.12.AC‑DES.6, 9.3.12.AC‑DES.7, 9.3.12.AC‑DES.8 , 8.1.12.CS.1, 8.1.12.CS.2, 8.1.12.CS.4, 8.1.12.IC.3, 8.2.12.ED.1, 8.2.12.ED.2, 8.2.12.ED.3, 8.2.12.ED.5, 8.2.12.ED.6, 8.2.12.ITH.1, 8.2.12.ITH.3, 8.2.12.NT.1, 8.2.12.NT.2, 8.2.12.ETW.1, 8.2.12.EC.2,   8.2.12.ETW.4

NJSLS - Career Awareness, Exploration, Preparation, and Training
NJSLS - Life Literacies and Key Skills
NJSLS - Interdisciplinary Standards

Fundamental Concepts / Big Ideas

- Architectural designs are created with innovative ideas, nationally accepted standards, drafting tools, and computer software/hardware.

Learning Objectives

Students will be able to…
- Explain and demonstrate the use of architectural drawing tools.
- Draw letters according to an acceptable architectural lettering technique and style.
- Use Architectural lines to represent information in a clear and accurate manner.
- Communicate important details on architectural plans by using nationally accepted symbols.

Unit Name: 4

Pictorial CAD Drawings

<div style="background:black;color:white;text-align:center">

Learning Goals: What do I want my students to learn?

</div>

Standards

Fundamental Concepts / Big Ideas

- Computer aided drafting / design and its applications teach students how to apply CAD to common drafting tasks.

Learning Objectives

Students will be able to…
- Draw lines using commands and its options.
- Use the various coordinate systems
- Use the erase commands to clear the drawing area.
- Draw circles using options of the circle command.
- Draw arcs, rectangles, ellipses, polygons, donuts and add text using variou options.
- Use the hatching command.
- Use the zoom and pan commands.
- Draw different types of sectionals that will be utilized in working drawings.
- Set up different units of measure using the units command.
- Set up files to save their work.
- Use measurement to create accurate drawings.

Unit Name: 5

Models

Standards
NJSLS - 9.3.12.AC‑DES.1, 9.3.12.AC‑DES.2, 9.3.12.AC‑DES.3, 9.3.12.AC‑DES.4, 9.3.12.AC‑DES.5, 9.3.12.AC‑DES.6, 9.3.12.AC‑DES.7, 9.3.12.AC‑DES.8 , 8.1.12.CS.1, 8.1.12.CS.2, 8.1.12.CS.4, 8.1.12.IC.3, 8.2.12.ED.1, 8.2.12.ED.2, 8.2.12.ED.3, 8.2.12.ED.5, 8.2.12.ED.6, 8.2.12.ITH.1, 8.2.12.ITH.3, 8.2.12.NT.1, 8.2.12.NT.2, 8.2.12.ETW.1, 8.2.12.EC.2,   8.2.12.ETW.4   *NJSLS - Career Awareness, Exploration, Preparation, and Training*   *NJSLS - Life Literacies and Key Skills*   *NJSLS - Interdisciplinary Standards*

Fundamental Concepts / Big Ideas
● Architectural models are used to visualize the appearance, function, and construction of a design.   ● Architectural model provides a three dimensional view of an architectural design.

Learning Objectives
Students will be able to…   ● Explain the various types of architectural models used to represent residential structures.   ● Identify the features included in an architectural model.   ● Construct an Architectural model of a residential house.   ● Demonstrate the safe and proper use of tools and materials.   Please contact the content supervisor for any questions.