MOORESTOWN TOWNSHIP PUBLIC SCHOOLS
MOORESTOWN, NEW JERSEY

Moorestown High School
Arts & Technology: Technology Education

Honors Computer Aided Design (CAD) and Architecture III

Grades – 10-12

Date : July 2023
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Course Description and Fundamental Concepts

Students will develop a portfolio of technical skills and specific project accomplishments in the areas of Technical drawing and modeling in the fields of design and or architecture. Students will build upon the knowledge they gained in previous CADD and Architecture course work by completing indepth activities in 3D modeling, residential and commercial planning following local and national building codes. Students will expand their knowledge of solid modeling and the use of problem solving techniques to resolve instructional challenges by simulating projects completed by designers, engineers and architects. This course will offer studies and activities in architectural design and engineering that include sustainable design and green building technology. This course will allow students to build competency skills in industry standard professional software packages for design and or architecture.
Prerequisite: Successful completion of Honors Computer Assisted Drafting and Architecture II.

Unit Topics

- CADD Software Review and update familiarization
- Rendering of 3-D models and visual displays
- Technological Presentation
- Advanced Design and modeling in Drafting based software
- Physical modeling techniques and development
- Technological Debate
- Advanced study in architecture or engineering based Drafting software (optional advanced project or certification test)
- Portfolio Development

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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)**
1,2,4,5,&7	9.3.12.AC-DES.1	Justify design solutions through the use of research documentation and analysis of data.
1,2,4,5,6,7,8	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.
1,2,4,5,&7	9.3.12.AC-DES.3	Describe the requirements of the integral systems that impact the design of buildings.
1,2,4,5,&7	9.3.12.AC-DES.4	Apply building codes, laws and rules in the project design.
1,2,4,5,&7	9.3.12.AC-DES.5	Identify the diversity of needs, values and social patterns in project design, including accessibility standards.
1,2,4,5,&7	9.3.12.AC-DES.6	Apply the techniques and skills of modern drafting, design, engineering and construction to projects.
1,2,4,5,7,&8	9.3.12.AC-DES.7	Employ appropriate representational media to communicate concepts and project design.
1,2,4,5,&7	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.

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Computer Science and Design Thinking (Standard 8)

8.1 Computing Systems		
Unit Addressed	**Core Idea**	**Performance Expectations**
1	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.
1	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.
1	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.

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	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	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**
	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.

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1	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.
1	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.

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	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**
1,2,4,5,&7	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.

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1,2,4,5,&7	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**
1,2,4,5,&7	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.
1,2,4,5,&7	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.

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Standard 8.2 Nature of Technology		
Unit Addressed	**Core Idea**	**Performance Expectations**
1,2,4,5,&7	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**
	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.

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8.2 Ethics and Culture		
Unit Addressed	**Core Idea**	**Performance Expectations**
3&6	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
1,2,3,4,5,6,&7	**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
	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.

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	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.
3&6	**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.
	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.
	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.
3&6	**NJSLSA.W6**	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
3&6	**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.
3&6	**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.
3&6	**NJSLSA.W9**	Draw evidence from literary or informational texts to support analysis, reflection, and research.

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1,2,3,4,5,6,7,&8	**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.

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Career Awareness, Exploration, Preparation, and Training (Standard 9.2)

By Grade 12		
Unit Addressed	**Core Idea**	**Standard / Description**
1,2,3,4,5,6,7,&8	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.*
1,2,4,5,&7	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.*

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	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.*
	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.*

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		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*

Life Literacies and Key Skills (Standard 9.4)
List appropriate units below for which standards will be addressed

By Grade 12		
Unit Addressed	**Core Idea**	**Standard / Description**
2,4,5,&7	**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).*
1,2,4,5,&7	**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).*
1,2,4,5,&7	**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.*

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1,2,3,4,5,6,&7	**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*
	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.*
	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.*
3&6	**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.*

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	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).*
	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.*
	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).*

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	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).*
1,2,3,4,5,6,&7	**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.*
1,2,4,5,6,&7	**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
1,2,4,5,&7	**Creating**	*Anchor Standard 1: Generating and conceptualizing ideas.* *Anchor Standard 2: Organizing and developing ideas.* *Anchor Standard 3: Refining and completing products.*
1,2,4,5,&7	**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.*

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1,2,4,5,&7	**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.*
1,2,4,5,&7	**Responding**	*Anchor Standard 7: Perceiving and analyzing products.* *Anchor Standard 8: Applying criteria to evaluate products.* *Anchor Standard 9: Interpreting intent and meaning.*

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

Unit/ Topic	Month (w/Approx number of Teaching Days)
Unit 1: CADD Software Review and update familiarization	September (~19 days)
Unit 2: Rendering of 3-D models and visual displays Unit 3: Presentation	October (~19 days)
Unit 2: Rendering of 3-D models and visual displays Unit 3: Presentation Unit 4: Advanced Design and modeling in Drafting based software	November (~16 days)
Unit 3: Presentation Unit 4: Advanced Design and modeling in Drafting based software	December (~15 days)
Unit 5: Physical modeling techniques and development	January (~18 days)
Unit 5: Physical modeling techniques and development Unit 6: Debate	February (~18 days)
Unit 5: Physical modeling techniques and development Unit 6: Debate	March (~15-20 days)
Unit 6: Debate Unit 7: Advanced study in architecture or engineering based Drafting software (optional advanced project or certification test)	April (~15-20 days)
Unit 6: Debate Unit 7: Advanced study in architecture or engineering based Drafting software (optional advanced project or certification test)	May (~18 days)
Unit 8: Portfolio Development	June (~15 days)

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Units Scope and Sequence

Unit Name: 1
CADD Software Review and update familiarization

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

Standards

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

Fundamental Concepts / Big Ideas

- Technical software and techniques continually update and require not only a fundamental knowledge base but continuing education and practice to maintain skills acquired.
- Established design principles are used to evaluate existing design, to collect data, and to guide the design process. The principles include: flexibility, balance, function, and proportion.
- Engineering design and Architecture are influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- A prototype is a working model that is used to test a design concept by making actual observations and necessary adjustments.
- An engineer and architect must not only design a product that works—s/he must consider many other factors, such as safety, environmental concerns, ethical considerations, and risks and benefits.

Learning Objectives

Students will be able to…

- The student will demonstrate systems thinking through the use of technical software in the development of a tutorial based review project which will be made evident through the development portions of the project documentation.
- The student will develop creativity in design thinking and application through the development and implementation of multiple design techniques and ideas throughout the unit which will be made evident through the development portions of the project documentation.
- The student will build skills in the area of technical software proficiency through the conmpetion of tutorial based review activities to refresh knowledge base as well as to learn multiple updates within the software.
- The student will demonstrate critical thinking through the development of unique and original design based ideas which will be further implemented to meet a set of design requirements that are presented to the student and further analyzed by them. :
- Students will work to generate creative and unique designs as they examine design requirements and are encouraged to think outside of the box in potential solutions.
- Students will engage in written documentation of their work via word processing applications where the design development and testing of student developed work.
- 1N. Explain how the world around them guides technological development and engineering design.
- 2T. Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.
- 2W. Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste while solving problems.

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- 2Y. Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.
- 2Z. Use management processes in planning, organizing, and controlling work.
- 4P. Evaluate ways that technology can impact individuals, society, and the environment.
- 4Q. Critique whether existing and proposed technologies use resources sustainably.
- 4R. Assess a technology that minimizes resource use and resulting waste to achieve a goal.
- 5J. Design an appropriate technology for use in a different culture.
- 7W. Determine the best approach by evaluating the purpose of the design.
- 7X. Document trade-offs in the technology and engineering design process to produce the optimal design.
- 7Y. Optimize a design by addressing desired qualities within criteria and constraints.
- 7Z. Apply principles of human-centered design.
- 7AA. Illustrate principles,elements and factors of design.
- 7BB. Implement the best possible solution to a design.
- 7CC. Apply a broad range of design skills to their design process.
- 8N. Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
- 8R. Interpret the results of technology assessment to guide policy development.

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Unit Name: 2

Rendering of 3-D models and visual displays

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

Standards

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

Fundamental Concepts / Big Ideas

- Presentation of design can be as important as design itself.
- Rendering as a project display takes multiple forms and are not limited to the base files created when designing.
- Established design principles are used to evaluate existing design, to collect data, and to guide the design process. The principles include: flexibility, balance, function, and proportion.
- Engineering design and Architecture are influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- A prototype is a working model that is used to test a design concept by making actual observations and necessary adjustments.
- An engineer and architect must not only design a product that works—s/he must consider many other factors, such as safety, environmental concerns, ethical considerations, and risks and benefits.

Learning Objectives

Students will be able to…

- The student will demonstrate systems thinking through the development of renderings and displays of specific design projects.
- The student will develop creativity in design thinking and application through the development and implementation of multiple design techniques and ideas throughout the unit which will be made evident through the development portions of the project documentation.
- The student will build skills in the area of technical software in the area of generating renderings and display specific meterials through the development of display meterials which will be shown the the class.
- The student will demonstrate critical thinking through the development of unique and original design based ideas which will be further implemented to meet a set of design requirements that are presented to the student and further analyzed by them. :
- Students will work to generate creative and unique designs as they examine design requirements and are encouraged to think outside of the box in potential solutions.
- Students will engage in written documentation of their work via word processing applications where the design development and testing of student developed work.
- 1N. Explain how the world around them guides technological development and engineering design.
- 2T. Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.
- 2W. Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste while solving problems.

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- 2Y. Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.
- 2Z. Use management processes in planning, organizing, and controlling work.
- 4P. Evaluate ways that technology can impact individuals, society, and the environment.
- 4Q. Critique whether existing and proposed technologies use resources sustainably.
- 4R. Assess a technology that minimizes resource use and resulting waste to achieve a goal.
- 5J. Design an appropriate technology for use in a different culture.
- 7W. Determine the best approach by evaluating the purpose of the design.
- 7X. Document trade-offs in the technology and engineering design process to produce the optimal design.
- 7Y. Optimize a design by addressing desired qualities within criteria and constraints.
- 7Z. Apply principles of human-centered design.
- 7AA. Illustrate principles,elements and factors of design.
- 7BB. Implement the best possible solution to a design.
- 7CC. Apply a broad range of design skills to their design process.
- 8N. Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
- 8R. Interpret the results of technology assessment to guide policy development.

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Unit 3:

Presentation (College programs for Technical Programs such as Architecture or Engineering)

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

Standards

NJSLS -
ITEEA - Standard 4. Impacts of technology.
Standard 5. Influence of Society on Technology and Engineering Education.
Standard 6. History of Technology
NJSLS - Career Awareness, Exploration, Preparation, and Training
NJSLS - Life Literacies and Key Skills
NJSLS - Interdisciplinary Standards

Fundamental Concepts / Big Ideas

- A well rounded and technologically competent individual is able to articulate and present fundamental technological and technical content.
- An engineer must not only design a product that works—s/he must consider many other factors, such as safety, environmental concerns, ethical considerations, and risks and benefits.

Learning Objectives

Students will be able to…

- The student will demonstrate systems thinking through the development of a technical presentation which will be made evident through the actual presentation of the content.
- The student will develop creativity in design thinking and application through the development and implementation of multiple design techniques and ideas throughout the unit which will be made evident through the development portions of the project documentation.
- The student will build skills in the area of research, design and presentation in the development and presentation of content.
- The student will demonstrate critical thinking through the development of an in depth understanding of a base technical content and the presentation of that content.
- 1N. Explain how the world around them guides technological development and engineering design.
- 1Q. Conduct research to inform intentional inventions and innovations that address specific needs and wants.
- 3J. Connect technological progress to the advancement of other areas of knowledge.
- 4P. Evaluate ways that technology can impact individuals, society, and the environment.
- 4Q. Critique whether existing and proposed technologies use resources sustainably.

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Unit Name: 4

Advanced Design and modeling in Drafting based software

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

Standards

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

Fundamental Concepts / Big Ideas

- Technical software programs have integrated and multi step processes that are required to construct some advanced models.
- It is possible for simplistic designs to require complex processes to construct and at the same time complex designs may not require complex processes.
- Established design principles are used to evaluate existing design, to collect data, and to guide the design process. The principles include: flexibility, balance, function, and proportion.
- Engineering design and Architecture are influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- A prototype is a working model that is used to test a design concept by making actual observations and necessary adjustments.
- An engineer and architect must not only design a product that works—s/he must consider many other factors, such as safety, environmental concerns, ethical considerations, and risks and benefits.

Learning Objectives

Students will be able to…

- The student will demonstrate systems thinking through the development of a project that requires integrated and multi step processes within technical software utilizing advanced design features and techniques which will be made evident through the development portions of the project documentation.
- The student will develop creativity in design thinking and application through the development and implementation of multiple design techniques and ideas throughout the unit which will be made evident through the development portions of the project documentation.
- The student will build skills in the area of advanced design features and techniques through the development of a design within modeling software which requires the use of advanced techniques.
- The student will demonstrate critical thinking through the development of unique and original design based ideas which will be further implemented to meet a set of design requirements that are presented to the student and further analyzed by them. :
- Students will work to generate creative and unique designs as they examine design requirements and are encouraged to think outside of the box in potential solutions.
- Students will engage in written documentation of their work via word processing applications where the design development and testing of student developed work.
- 1N. Explain how the world around them guides technological development and engineering design.
- 2T. Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify

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conflicting considerations before the entire system is developed and to aid in design decision making.

- 2W. Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste while solving problems.
- 2Y. Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.
- 2Z. Use management processes in planning, organizing, and controlling work.
- 4P. Evaluate ways that technology can impact individuals, society, and the environment.
- 4Q. Critique whether existing and proposed technologies use resources sustainably.
- 4R. Assess a technology that minimizes resource use and resulting waste to achieve a goal.
- 5J. Design an appropriate technology for use in a different culture.
- 7W. Determine the best approach by evaluating the purpose of the design.
- 7X. Document trade-offs in the technology and engineering design process to produce the optimal design.
- 7Y. Optimize a design by addressing desired qualities within criteria and constraints.
- 7Z. Apply principles of human-centered design.
- 7AA. Illustrate principles,elements and factors of design.
- 7BB. Implement the best possible solution to a design.
- 7CC. Apply a broad range of design skills to their design process.
- 8N. Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
- 8R. Interpret the results of technology assessment to guide policy development.

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Unit Name: 5

Physical modeling techniques and development

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

Standards

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

Fundamental Concepts / Big Ideas

- The construction of a physical model is an integral part of the presentation of design.
- THe skill set of building a physical model differs greatly from the design within software.
- Established design principles are used to evaluate existing design, to collect data, and to guide the design process. The principles include: flexibility, balance, function, and proportion.
- Engineering design and Architecture are influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- A prototype is a working model that is used to test a design concept by making actual observations and necessary adjustments.
- An engineer and architect must not only design a product that works—s/he must consider many other factors, such as safety, environmental concerns, ethical considerations, and risks and benefits.

Learning Objectives

Students will be able to…

- The student will demonstrate systems thinking through the development of a physical model representation of a technical design.
- The student will develop creativity in design thinking and application through the development and implementation of multiple design techniques and ideas throughout the unit which will be made evident through the development portions of the project documentation.
- The student will build skills in the area of modeling and construction through the (development of a physical representation of a technical design.
- The student will demonstrate critical thinking through the development of unique and original design based ideas which will be further implemented to meet a set of design requirements that are presented to the student and further analyzed by them. :
- Students will work to generate creative and unique designs as they examine design requirements and are encouraged to think outside of the box in potential solutions.
- Students will engage in written documentation of their work via word processing applications where the design development and testing of student developed work.
- 1N. Explain how the world around them guides technological development and engineering design.
- 2T. Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.
- 2W. Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and

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waste while solving problems.

- 2Y. Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.
- 2Z. Use management processes in planning, organizing, and controlling work.
- 4P. Evaluate ways that technology can impact individuals, society, and the environment.
- 4Q. Critique whether existing and proposed technologies use resources sustainably.
- 4R. Assess a technology that minimizes resource use and resulting waste to achieve a goal.
- 5J. Design an appropriate technology for use in a different culture.
- 7W. Determine the best approach by evaluating the purpose of the design.
- 7X. Document trade-offs in the technology and engineering design process to produce the optimal design.
- 7Y. Optimize a design by addressing desired qualities within criteria and constraints.
- 7Z. Apply principles of human-centered design.
- 7AA. Illustrate principles,elements and factors of design.
- 7BB. Implement the best possible solution to a design.
- 7CC. Apply a broad range of design skills to their design process.
- 8N. Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
- 8R. Interpret the results of technology assessment to guide policy development.

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Unit Name 6: Technological debate (zoning debate for architecture topic & appropriate / green technology topic for CADD topic)

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

Standards

NJSLS - 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.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

ITEEA - Standard 1. Nature and Characteristics of Technology and Engineering
Standard 2. Core concepts of Technology and Engineering
Standard 3. Integration of knowledge, technology, and Practices
Standard 4. Impacts of technology.
Standard 5. Influence of Society on Technology and Engineering Education.
Standard 6. History of Technology

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

Fundamental Concepts / Big Ideas

- Every topic has multiple viewpoints and the decisions on how to proceed are often based upon a myriad of factors dependent upon the stakeholders involved.
- To become knowledgeable on a subject one must become familiar with the pros and cons of the topic as well as multiple viewpoints both in favor and opposed to the topic.
- Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Learning Objectives

Students will be able to…

- The student will demonstrate systems thinking through the development of a complex debate preparation on a set technological topic.
- The student will build skills in the area of debate through the collaborative research and preparation through engaging in a debate on a technical subject
- The student will demonstrate critical thinking through the development of unique and spirited ideas in the debate process.

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- When the unit activity is implemented as a group based assignment students will actively engage together in a collaborative manner allowing them to expand their knowledge through discussion and brainstorming activities as well as other forms of group based work.
- 1N. Explain how the world around them guides technological development and engineering design.
- 1O. Assess how similarities and differences among scientific, mathematics, engineering, and technological knowledge and skills contributed to the design of a product or system.
- 1Q. Conduct research to inform intentional inventions and innovations that address specific needs and wants.
- 2U. Diagnose a flawed system embedded within a larger technological, social, or environmental system.
- 2W. Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste while solving problems.
- 3H. Analyze how technology transfer occurs when a user applies an existing innovation developed for one function for a different purpose.
- 3I. Evaluate how technology enhances opportunities for new products and services through globalization.
- 4P. Evaluate ways that technology can impact individuals, society, and the environment.
- 4Q. Critique whether existing and proposed technologies use resources sustainably.
- 4R. Assess a technology that minimizes resource use and resulting waste to achieve a goal.
- 4S. Develop a solution to a technological problem that has the least negative environmental and social impact.
- 4T. Evaluate how technologies alter human health and capabilities.
- 5H. Evaluate a technological innovation that arose from a specific society's unique need or want.
- 5I. Evaluate a technological innovation that was met with societal resistance impacting its development.
- 8R. Interpret the results of technology assessment to guide policy development.

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Unit Name: 7

Advanced study in architecture or engineering based Drafting software
(optional advanced project or certification test)

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

Standards

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

Fundamental Concepts / Big Ideas

- Professional technical software can require advanced training or certifications in the field and students are able to pursue those advanced goals.
- Established design principles are used to evaluate existing design, to collect data, and to guide the design process. The principles include: flexibility, balance, function, and proportion.
- Engineering design and Architecture are influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- A prototype is a working model that is used to test a design concept by making actual observations and necessary adjustments.
- An engineer and architect must not only design a product that works—s/he must consider many other factors, such as safety, environmental concerns, ethical considerations, and risks and benefits.

Learning Objectives

Students will be able to…

- The student will demonstrate systems thinking through the development of an advanced study project or the completion of a certification exam for a professional software suite.
- The student will develop creativity in design thinking and application through the development and implementation of multiple design techniques and ideas throughout the unit which will be made evident through the development portions of the project documentation.
- The student will build skills in the area of an advanced study project or the completion of a certification exam for a professional software suite. :
- The student will demonstrate critical thinking through the development of unique and original design based ideas which will be further implemented to meet a set of design requirements that are presented to the student and further analyzed by them. :
- Students will work to generate creative and unique designs as they examine design requirements and are encouraged to think outside of the box in potential solutions.
- Students will engage in written documentation of their work via word processing applications where the design development and testing of student developed work.
- 1N. Explain how the world around them guides technological development and engineering design.
- 2T. Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.
- 2W. Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and

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waste while solving problems.

- 2Y. Implement quality control as a planned process to ensure that a product, service, or system meets established criteria.
- 2Z. Use management processes in planning, organizing, and controlling work.
- 4P. Evaluate ways that technology can impact individuals, society, and the environment.
- 4Q. Critique whether existing and proposed technologies use resources sustainably.
- 4R. Assess a technology that minimizes resource use and resulting waste to achieve a goal.
- 5J. Design an appropriate technology for use in a different culture.
- 7W. Determine the best approach by evaluating the purpose of the design.
- 7X. Document trade-offs in the technology and engineering design process to produce the optimal design.
- 7Y. Optimize a design by addressing desired qualities within criteria and constraints.
- 7Z. Apply principles of human-centered design.
- 7AA. Illustrate principles,elements and factors of design.
- 7BB. Implement the best possible solution to a design.
- 7CC. Apply a broad range of design skills to their design process.
- 8N. Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
- 8R. Interpret the results of technology assessment to guide policy development.

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Unit Name: 8
Portfolio Development

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

Standards

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

Fundamental Concepts / Big Ideas

- A portfolio of work is able to document acquired knowledge and skill as well as to demonstrate growth over time, and the importance of a portfolio as a documentation tool allowing one to look back at previous work can at times be indispensable.
- Established design principles are used to evaluate existing design, to collect data, and to guide the design process. The principles include: flexibility, balance, function, and proportion.
- Engineering design and Architecture are influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- An engineer and architect must not only design a product that works—s/he must consider many other factors, such as safety, environmental concerns, ethical considerations, and risks and benefits.

Learning Objectives

Students will be able to…

- The student will document systems thinking and previous work through the development and upkeep of a portfolio which highlights project work skill and knowledge development, as well as technical aspects of coursework.
- The student will develop creativity in design thinking and application through the development and implementation of multiple design techniques and ideas throughout the unit which will be made evident through the development portions of the project documentation.
- When the unit activity is implemented as a group based assignment students will actively engage together in a collaborative manner allowing them to expand their knowledge through discussion and brainstorming activities as well as other forms of group based work.
- Students will engage in written documentation of their work via word processing applications where the design development and testing of student developed work.
- 1P. Analyze the rate of technological development and predict future diffusion and adoption of new technologies.
- 1R. Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system.
- 2T. Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.
- 2U. Diagnose a flawed system embedded within a larger technological, social, or environmental system.
- 2V. Analyze the stability of a technological system and how it is influenced by all of the components in the system, especially those in the feedback loop.
- 2W. Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste while solving problems.

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- 2Z. Use management processes in planning, organizing, and controlling work.
- 4T. Evaluate how technologies alter human health and capabilities.
- 7Z. Apply principles of human-centered design.
- 7AA. Illustrate principles,elements and factors of design.
- 7BB. Implement the best possible solution to a design.
- 7CC. Apply a broad range of design skills to their design process.
- 7DD. Apply a broad range of making skills to their design process.
- 8N. Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.

Please contact the Content Supervisor for any questions.

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