

SCHOOL DISTRICT OF THE CHATHAMS

Architectural Design

Grades 10 - 12

Full Year

Course Overview

The Architectural Design course engages students in an intensive study of architecture, its relationship to design, and the implementation of the Design Process in the design and construction of residential and commercial structures. Students are challenged to develop and design architectural drawings, floorplans, and models following industry standards. Students will learn to use architectural CAD software, such as AutoDesk Revit Sketch-Up and architectural rendering software, which are all used in the architectural and design industries. Students will be able to experience what it is like to be an architect. Main topics include, residential design considerations, floor plans and working in scale, CAD modeling and architectural drawings, and architectural modeling techniques.

New Jersey Student Learning Standards

The New Jersey Student Learning Standards (NJSLS) can be located at www.nj.gov/education/cccs/2020/.

Engineering Design

8.2.12.ED.1: Use research to 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 modifications 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.

Technology Standards

9.4.12.DC.6: Select information to post online that positively impacts personal image and future college and career opportunities.

21st Century Integration | NJSLS 9

9.3.12.AC.1 Use vocabulary, symbols and formulas common to architecture and construction.

9.3.12.AC.6 Read, interpret and use technical drawings, documents and specifications to plan a project.

9.3.12.AC-CST.9 Safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.

9.3.12.AC-DES.1 Justify design solutions through the use of research documentation and analysis of data.

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.

9.3.12.AC-DES.6 Apply the techniques and skills of modern drafting, design, engineering and construction to projects.

9.3.12.AC-DES.7 Employ appropriate representational media to communicate concepts and project design.

9.4.12.CI.1: Demonstrate the ability to reflect, analyze and use creative skills and ideas.

9.4.12.CI.2: Identify career pathways that highlight personal talents, skills and abilities.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.

Career Ready Practices

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

CRP6. Demonstrate creativity and innovation

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

CRP11. Use technology to enhance productivity.

Interdisciplinary Connections

Science

- HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Units of Study

Unit 1: Safety (*integrated throughout the year/units*)

- Why is it important to comply with the rules, regulations, and procedures in a lab environment?
- Why is it important to pass tool and machine safety exams (both written and hands-on) with a score of 100%?

Unit 2: Introduction to Architectural Concepts (*~40 days*)

- What real world examples can you find that uses or is improved by an architectural based CAD program?
- How can the use of a CAD program improve the design and creation of a residential floor plan?
- What kind of 3D printing technology can be used to model and create architectural designs?

Unit 3: Residential Architectural Floor Plan Design & Working in Scale (*~40 days*)

- How is an architect scale used?
- What is the purpose of a scaled drawing?
- How can we clearly convey a design to someone unfamiliar with the idea?
- How is an architectural drawing similar to and different from an artistic drawing or an engineering drawing?
- What are the pros and cons for each type of architectural drawing (floorplans, elevations, detailed section drawings)?
- When would I use each type of architectural drawing (floorplans, elevations, detailed section drawings)?
- What makes a structure residential?
- How can you design a residential structure to include a comfortable balance between social, private, and utility space (sleeping, living, & service areas)?
- How does room placement affect traffic flow?
- Why, where, and how do we utilize the layout and organization of each type of basic house design to meet our design needs?

Unit 4: Architectural CAD Techniques & Modeling (*~40 days*)

- How can the use of a CAD program (AutoDesk Revit) improve the understanding of developing and reading floor plans?
- How can the use of a CAD program improve the visualization and planning of a floor plan?

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- How can the use of CAD programs help in generating multiple formats of floor plans to be displayed by?

Unit 5: Architectural Models (~40 days)

- What is the role of models in the architectural design process and how would we determine which type of model, mediums, and techniques are most appropriate for our goals/design?
- What are the essential skills and methods needed to develop an architectural model?

<h3>Learning Objectives/Discipline Standards of Practice</h3>

Learning Objectives:

- Safe use of all machines, tools, and safety equipment in the Design & Technology labs.
- Communicate through the use of architectural drawings and models.
- Identify and define architectural vocabulary and terminology.
- Analyze and critique floor plans and elevations of existing homes and home plans.
- Review basic software commands in CAD.
- Complete a series of exercises designed to introduce students to the technical aspects of architecture.
- Choose a piece of property from a plan and draw the house that they have designed on the property including all exterior details.
- Design and draw a complete set of floor plans for a residential structure using CAD compete with windows, doors, appliances, and cabinetry.
- Write schedules for all windows, doors, appliances, and cabinetry.
- Model architectural concepts through various mediums to proper scale.
- Utilize CAD software to develop professional drawings that adhere to architectural principles, standards, and design formats.

Discipline Standards of Practice:

- Computing Systems
 - People interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form.
- Networks and the Internet
 - Computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world.
- Impacts of Computing
 - Computing affects many aspects of the world in both positive and negative ways at local, national, and global levels. Individuals and communities influence computing through their behaviors and cultural and social interactions, and, in turn, computing influences new cultural practices.
- Data & Analysis
 - Computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions.

- Algorithms & Programming
 - An algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are translated into programs, or code, to provide instructions for computing devices. Algorithms and programming control all computing systems, empowering people to communicate with the world in new ways and solve compelling problems.
- Engineering Design
 - People design for enjoyment and to solve problems, extend human capabilities, satisfy needs and wants, and improve the human condition. Engineering Design, a systematic approach to creating solutions to technological problems and finding ways to meet people's needs and desires, allows for the effective and efficient development of products and systems.
- Interaction of Technology and Humans
 - Societies influence technological development. Societies are characterized by common elements such as shared values, differentiated roles, and cultural norms, as well as by entities such as community institutions, organizations, and businesses. Interaction of Technology and Humans concerns the ways society drives the improvement and creation of new technologies, and how technologies both serve and change society.
- Nature of Technology
 - Human population, patterns and movement focus on the size, composition, distribution, and movement of human populations and how they are fundamental and active features on Earth's surface. This includes understanding that the expansion and redistribution of the human population affects patterns of settlement, environmental changes, and resource use. Patterns and movements of population also relate to physical phenomena including climate variability, landforms, and locations of various natural hazards and their effects on population size, composition, and distribution.
- Effects of Technology on the Natural World
 - Many of engineering and technology's impacts on society and the environment are widely regarded as desirable. However, other impacts are regarded as less desirable. Effects of Technology on the Natural World concerns the positive and negative ways that technologies affect the natural world.
- Ethics & Culture
 - Ethics and Culture concerns the profound effects that technologies have on people, how those effects can widen or narrow disparities, and the responsibility that people have for the societal consequences of their technological decisions.

Instructional Resources and Materials

Whole class resources have been identified with an asterisk.

Resources

- Safety Resources & Exams
- Computer Aided Design Software (AutoDesk Suite)
- Adobe Creative Cloud Suite

Materials

- Teacher created design briefs and rubrics

Assessment Strategies

Assessment is designed to measure a student's mastery of a course standard and learning objective. Assessment can be used for both instructional purposes (formative assessment) and for evaluative purposes (summative assessment).

The following is a general list of the many forms assessment may take in learning.

- Individual challenge problems
- Tests
- Engineering projects
 - Design and rationale
 - Performance
 - Rubrics
- Digital Portfolio