

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT



Architectural Engineering

Board Approval Date: January 18, 2024	Course Length: 2 Semesters
Grading: A-F	Credits: 5 Credits per Semester
Proposed Grade Level(s): 11, 12	Subject Area: Elective Elective Area (if applicable): Career Technical Education
Prerequisite(s): None	Corequisite(s):
CTE Sector/Pathway: Engineering and Architecture / Architectural Design	
Intent to Pursue ‘A-G’ College Prep Status: Yes	
A-G Course Identifier: (g) College-preparatory elective	
Graduation Requirement: No	
Course Intent: District Course Program (if applicable): CTE	
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COURSE DESCRIPTION:

This course introduces students to important aspects of building, site design, and development. They apply math, science, and standard engineering practices to design both residential and commercial projects and document their work using 3D architectural design software. Students will develop skills in engineering calculations, technical representation and documentation of design solutions according to accepted technical standards. Students will also learn the use of current 3D architectural design and modeling software to represent and communicate solutions. Through both individual and collaborative team activities, projects, and problems, students will solve problems as they practice common design and development protocols such as project management and peer review.

DETAILED UNITS OF INSTRUCTION:

Unit Number/Title	Unit Essential Questions	Examples of Formative Assessments	Examples of Summative Assessment
1. Overview of Civil Engineering and Architecture	How have historical accomplishments in civil engineering and architecture shaped the structures and infrastructure we use today, and what lessons can we learn from these achievements? What are the primary duties and responsibilities of civil engineers, architects, and related specialty disciplines, and how do they collaborate to create sustainable and innovative designs in the field of construction and development? What educational and accreditation requirements are necessary for individuals pursuing careers in civil engineering and architecture, and how do these requirements contribute to maintaining the standards of professionalism in these fields?	*Students are assessed on various aspects of engineering and architecture through quizzes, tests, and projects *Presentations and foam model of various architectural styles and research on various careers within these fields *Students build skills with CAD software with low stakes assessment projects scaffolding for future growth	*Formal research project on a current/historical engineering or architecture project *They must demonstrate mastery of drafting and CAD design for the various systems and components covered by the formative assessments in this project
2. Residential Design	How can sustainable design practices and universal design features be	*Students are assessed on various components and systems within a residence	*Students are assessed in a cumulative project in designing an affordable

	integrated into the design of a small single-family home, and what are the environmental and social benefits of such an approach? What role do building codes play in shaping the design of single-family homes, and how do they impact factors like safety, accessibility, and energy efficiency in residential construction? How do the choice of construction materials and practices influence the cost of construction and the long-term energy efficiency of a small, affordable home, and what strategies can be employed to create cost-effective and energy-efficient designs for single-family homes?	*These could include quizzes or models on vocabulary and function of construction, wood joinery, mechanical systems, framing, building, architectural design and cost estimation	house for a client *They must demonstrate mastery of drafting and CAD design for the various systems and components covered by the formative assessments in this project
3. Commercial Applications	How do site considerations, such as location, topography, and environmental factors, impact the design and functionality of commercial facilities, and what sustainable design principles can be applied to address these site-specific challenges? What are the key components of building envelopes, including walls and roofs, and how do these components contribute to energy efficiency, structural integrity, and overall building performance in commercial facilities? How are utilities and services, such as power,	*Students are assessed on various components and systems within a commercial project *These could include quizzes or models on vocabulary and function of construction, mechanical, loads, framing, building, architectural design and cost estimation	*Students are assessed in a cumulative project in designing a commercial space (store, library, school building, etc.) within a set of given constraints *Demonstrate mastery of drafting and CAD design for the various systems and components covered by the formative assessments in this project

	water, and communication, integrated into the design of commercial facilities, and how can innovative technology and design approaches enhance the efficiency and sustainability of these systems within a building?		
4. Commercial Building Systems	How can students effectively collaborate within a project design team to identify community needs, select an appropriate site, and develop a preliminary design for a small commercial facility that addresses those needs while considering factors like aesthetics, functionality, and sustainability? Develop a design concept to present to industry professionals, enhancing students' understanding of the real-world application of their design skills, and how can their experiences with critique and feedback contribute to their growth as designers and future professionals in the field?	*Autodesk Revit Certification test *Students have the ability to retake the certification test and build towards a higher-level certification with their skill base	*Students work individually and with a group towards a capstone project showcasing their skills acquired through the year *They must incorporate all their knowledge into a large project (multi-family, mixed use development, etc.) and present to a panel of industry experts

ESSENTIAL STANDARDS:

A1.0 Understand how history shaped architecture and know significant events in the history of architectural design.

A1.1 Know significant historical architectural projects and their effects on society.

A1.2 Understand the development of architectural systems in relation to aesthetics, efficiency, and safety.

A2.0 Compare the theoretical, practical, and contextual issues that influence design.

A2.1 Describe the influence of community context and zoning requirements on architectural design.

A2.2 Understand the ways in which sociocultural conditions and issues influence architectural design.

A2.3 Compare the theoretical and practical effects of human and physical factors on the development of architectural designs.

A2.4 Analyze project design and compile a cost analysis.

A3.0 Understand the sketching processes used in concept development.

- A3.1 Apply sketching techniques to a variety of architectural models.
- A3.2 Produce proportional two- and three-dimensional sketches and designs.
- A3.3 Present conceptual ideas, analysis, and design concepts using freehand graphic communication techniques.
- A4.0 Understand the use of computer-aided drafting (CAD) in developing architectural designs.
 - A4.1 Develop a preliminary architectural proposal using CAD software.
 - A4.2 Analyze viability of a project as the design is developed using Building Information Modeling (BIM).
- A5.0 Compare the relationship between architecture and the external environment.
 - A5.1 Understand the significance of sustainable building design practices that incorporate beneficial energy and environmental design policies.
 - A5.2 Develop a site analysis that considers passive energy techniques, sustainability issues, and landscaping.
 - A5.3 Create a building design that incorporates passive and/or active energy-efficient technologies.
- A6.0 Understand methods used to analyze simple structures.
 - A6.1 Understand load transfer mechanisms.
 - A6.2 Understand stress-strain relationships of building structures.
 - A6.3 Interpret structural design considerations, including load-bearing relationships of shear walls, columns, and beams.
 - A6.4 Design a simple structure by using structural analysis principles.
- A7.0 Understand the properties of structural materials.
 - A7.1 Understand the integration of architectural factors, such as soil mechanics, foundation design, engineering materials, and structure design.
 - A7.2 Develop a stress analysis chart of typical structural components.
 - A7.3 Evaluate available building materials (e.g., steel, concrete, and wood) by considering their properties and their effect on building form.
 - A7.4 Develop a preliminary building plan using the appropriate materials.
- A8.0 Systematically complete an architectural project.
 - A8.1 Describe the various components of structures, including lighting; heating, ventilating, and air-conditioning (HVAC); mechanical; electrical; plumbing; communication; security; and vertical transportation systems.
 - A8.2 Develop a preliminary proposal for presentation of an architectural design.
 - A8.3 Read and interpret architectural and construction plans, drawings, diagrams, and specifications.
 - A8.4 Develop a complete set of architectural plans and drawings.
 - A8.5 Estimate the materials needed for a project by reading an architectural drawing.
 - A8.6 Plan a project using site and building restrictions imposed by various entities (e.g., Planning, Zoning, Building, and Homeowners Association [HOA]).
 - A8.7 Plan the sequence of events leading to an architectural project.
- A9.0 Using various methods create both written and digital portfolios to represent architectural renderings.
 - A9.1 Develop a binder or digital portfolio representative of completed work for presentation.
 - A9.2 Prepare an effective oral presentation of the portfolio content.

RELEVANT STANDARDS AND FRAMEWORKS, CONTENT/PROGRAM SPECIFIC STANDARDS:

Link to Common Core Standards (if applicable):

Educational standards describe what students should know and be able to do in each subject in each grade. In California, the State Board of Education decides on the standards for all students, from kindergarten through high school.

CCSS for ELA - Content Standards (CA Dept of Education)

Link to Framework (if applicable):

Curriculum frameworks provide guidance for implementing the content standards adopted by the State Board of Education (SBE). Frameworks are developed by the Instructional Quality Commission, formerly known as the Curriculum Development and Supplemental Materials Commission, which also reviews and recommends textbooks and other instructional materials to be adopted by the SBE.

Link to Subject Area Content Standards (if applicable):

Content standards were designed to encourage the highest achievement of every student, by defining the knowledge, concepts, and skills that students should acquire at each grade level.

Standards for Career Ready Practice Flyer - Standards and Framework (CA Dept of Education) CTE Model Curriculum Standards: Engineering and Arch - Standards and Framework (CA Dept of Education)

Link to Program Content Area Standards (if applicable):

Program Content Area Standards applies to programs such as International Baccalaureate, Advanced Placement, Career and Technical Education, etc.

CTE Model Curriculum Standards: Engineering and Arch - Standards and Framework (CA Dept of Education)

TEXTBOOKS AND RESOURCE MATERIALS:**Textbooks**

Board Approved	Pilot Completion Date (If applicable)	Textbook Title	Author(s)	Publisher	Edition	Date
		N/A				

Other Resource Materials

California Career Zone (online), California Career Resource Network (CDE), SkillsUSA Career Essentials, Job Hunting Handbook, Dahlstrom & Company, Inc., Instructor created materials, Various online source materials.

Supplemental Materials

Board approved supplemental materials (Including but not limited to: Film Clips, Digital Resources, Supplemental texts, DVDs, Programs (Pebble Creek, DBQ, etc.):

N/A