Design & Development
Grade(s) 11&12

Unit 1
Research and Design in Architecture, Engineering, and Construction

Essential Question
How does research and design shape the built environment?

Unit Summary
This unit explores the foundational concepts of research and design in architecture, construction, and engineering. Students will work with clients, analyze design requirements, and create models using industry-standard tools.

Guiding Questions
Content
- What are the key components of architectural, engineering, and construction research?
- How do industry standards impact design decisions?
- What role does environmental impact play in design?

Process
- How can we apply research methodologies to design problems?
- What tools and software are essential for creating working models?
- How can we effectively communicate design ideas to clients and stakeholders?

Reflective
- What challenges arise in the research and design process?
- How does design innovation contribute to sustainable development?
- What skills from this unit are applicable to real-world scenarios?

Priority Standards

- 1.1 - Work with a client to develop a client- driven product.
- 1.2 - Produce a working model (graphic or physical) using advanced software and/or equipment.
- 1.3 - Demonstrate ability to apply shading and rendering techniques to 3d surfaces and solid models.
- 1.4 - Demonstrate ability to access and utilize industry resources.
- 1.5 - Use appropriate grammar and word usage in the creation and implementation of a formal graphic presentation using current standards and technology.
- 1.6 - Apply principles of dimensioning/tolerances, fasteners/hardware, and power transmission.
- 1.7 - Apply basic principles of environmental impact to enhance project acceptance and quality.
- 1.8 - Demonstrate ability to apply design requirements for people needing special accommodations.
- 1.9 - Utilize effective management techniques to organize work flow.
- 1.10 - Use technology and resources to research licensing certification and credentialing in architecture and construction management.
- 1.11 - Conduct facility evaluations and critique their effectiveness.
- 1.12 - Research new technologies to meet future client needs.
- 1.13 - Demonstrate ability to access and utilize industry resources.
- 1.14 - Demonstrate abilities in design/planning, visual communication and problem solving in current architectural practices.
- 1.15 - Integrate alternative construction methods and materials in current architectural drawings.
- 1.16 - Demonstrate ability to use CSI – Construction Specifications Institute's Uniform Drawing System and Master Format.
- 1.17 - Research various methods for obtaining financing for building projects.
- 1.18 - Demonstrate ability to incorporate specific codes as given for a selected jurisdiction.
- 1.19 - Demonstrate ability to set and work within a defined budget.
- 1.20 - Research and use information for product development
- 1.21 - Manipulate materials and processes to meet client needs.
- 1.22 - Demonstrate ability to manage and set project goals and timelines

Supporting Standards

- 0.1 - Demonstrate an understanding of industry standards for personal safety including the safe use of tools, equipment, and hazardous materials.
- 0.2 - Demonstrate time management skills.
- 0.3 - Create and utilize employment documents including a resume and portfolio.
- 0.4 - Demonstrate job seeking and interview skills.
- 0.5 - Understand and respond to performance reviews.

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Unit 2
3-D in CAD

Essential Question
How does 3D modeling enhance the design and development process?

Unit Summary
This unit covers the use of 3D CAD software to create and manipulate models for construction and engineering projects. Students will learn shading, rendering, and material application techniques.

Guiding Questions
Content
- What are the core principles of 3D modeling?
- How does 3D CAD software assist in visualizing architectural and engineering designs?
- What rendering and shading techniques improve model realism?

Process
- How do we use parametric design to refine 3D models?
- What are the steps to converting 2D drawings into 3D models?
- How can models be adjusted to meet client specifications?

Reflective
- How has 3D modeling changed architectural and engineering workflows?
- What are the limitations of 3D CAD technology?
- How can 3D modeling be used beyond architecture and engineering?

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Unit 3
3-D Project

Essential Question
How can a 3D project be developed from concept to completion?

Unit Summary
This unit involves the application of 3D modeling and prototyping to a real-world project. Students will manage workflows, create final models, and present their designs.

Guiding Questions
Content
- What are the steps in developing a 3D project?
- How do material and design choices impact functionality?
- What industry standards must be considered in final designs?

Process
- How can we integrate research and design into the final product?
- What role does prototyping play in refining a design?
- How should projects be presented to stakeholders?

Reflective
- What challenges arise in bringing a 3D project to completion?
- How does feedback shape the design process?
- What skills from this unit can be applied in professional settings?

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Unit 4
Communication and Employability Skills

Essential Question
How can students prepare for careers in architecture, engineering, and construction?

Unit Summary
This unit focuses on career pathways, resume building, certifications, and job readiness. Students will explore educational requirements, industry credentials, and interview techniques.

Guiding Questions
Content
- What are the educational and certification requirements for careers in this field?
- How do job-seeking skills impact career success?
- What resources are available for professional development?

Process
- How do we create a strong resume and portfolio?
- What strategies help in job interviews and networking?
- How do we research licensing and certification opportunities?

Reflective
- How do soft skills influence career growth?
- What steps should be taken to achieve long-term career goals?
- How does continued education impact industry success?

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