Maryland CTE Programs of Study

Architectural Design I (2025)

GENERAL REQUIREMENTS. This course is recommended for students in Grades 9-12. 1

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INTRODUCTION 2

A Career and Technical Education (CTE) instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions. 2.A

B The Construction Career Cluster prepares students for careers in designing, planning, and building sustainable infrastructure. This field includes architects, engineers, construction managers, and skilled trades professionals. 2.B

C The Architecture Design and Drafting program prepares students for careers in architecture, engineering, and construction management through a comprehensive four-year sequence. Students develop skills in both traditional and digital drafting techniques, building design, sustainable practices, and professional documentation. Starting with fundamental drawing and design principles, students' progress to advanced Building Information Modeling (BIM) using industry-standard software like AutoCAD and Revit. The program emphasizes sustainable design practices and culminates in opportunities to earn both Autodesk Revit Certified User and LEED Green Associate certifications. Through hands-on projects, students learn to use professional tools and equipment including drafting tools, 3D printers, laser cutters, and environmental testing equipment while developing a professional portfolio. 2.C

D Architectural Design I builds upon basic skills to develop proficiency in Building Information Modeling using Autodesk Revit. Students create detailed digital building models, produce construction documentation, and learn about building codes and cost estimation. The course includes advanced model-making using digital fabrication tools and prepares students for the Autodesk Revit Certified User exam. Students develop technical proficiency while learning to coordinate building systems and create professional documentation. 2.D

E Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational nterviews or job shadowing relevant to the program of study. 2.E

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F **Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs). CTSOs are a cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland.** 2.F

KNOWLEDGE AND SKILLS 3

A **The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:** 3.A

1. Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work. 3.A.1
2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn. 3.A.2
3. Employ effective reading, writing, and technical documentation skills. 3.A.3
4. Solve problems using critical thinking techniques and structured troubleshooting methodologies. 3.A.4
5. Demonstrate leadership skills and collaborate effectively as a team member. 3.A.5
6. Implement safety procedures, including proper handling of tools, equipment and hardware and following appropriate safety measures in the lab/shop environment. 3.A.6
7. Exhibit an understanding of legal and ethical responsibilities in the architectural field, following accessibility laws and best practices for design. 3.A.7
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting. 3.A.8

B **The student identifies various career pathways in the Architectural Design and Drafting field. The student is expected to:** 3.B

1. Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles in architectural design. 3.B.1
2. Create a professional resume and portfolio that reflect skills, projects, certifications, and recommendations. 3.B.2
3. Demonstrate effective interview skills for roles in drafting and architectural design. 3.B.3

C **The student develops technology and digital literacy skills. The student is expected to:** 3.C

1. Use technology as a tool for research, organization, communication, and problem-solving. 3.C.1
2. Use digital tools, including computers, mobile devices, collaboration platforms, and cloud services, to access, manage, and create information. 3.C.2

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3 Demonstrate proficiency in using emerging and industry-standard technologies, including virtualization tools, design software, and related equipment. School systems, based on feedback from their business partners, could consider software such as TinkerCAD, AutoCAD, Revit, and Onshape, for scaffolded classroom implementation, and ultimately industry recognized certification. 3.C.3

4 Understand ethical and legal considerations for technology use, including the principles of data protection, copyright, and responsible technology use. 3.C.4

D The student integrates core academic skills into architectural design practices. The student is expected to: 3.D

1 Demonstrate the use of clear communication techniques, both written and verbal, that are consistent with industry standards. 3.D.1

2 Utilize intermediate mathematical concepts including trigonometric functions for roof and stair calculations, coordinate geometry for 3D modeling, statistical analysis for cost estimation, and complex geometric relationships in building component design. 3.D.2

3 Apply scientific principles including structural forces in building systems, material properties and strengths, fundamentals of building acoustics, and basic thermodynamic concepts in building envelope design. 3.D.3

E The student demonstrates intermediate level understanding of Building Information Modeling concepts and techniques. The student is expected to: 3.E

1 Create building models, using architectural modeling software, that include fundamental residential/commercial components. 3.E.1

2 Construct multi-room floor plans by placing and modifying architectural elements (walls, doors, windows, and components) and applying constraints to control relationships between elements. 3.E.2

3 Apply advanced modification tools, including align, trim/extend, mirror, array, and split, to edit and refine building models. 3.E.3

4 Organize and manage multiple view types, including plans, sections, elevations, and callouts, within the project workspace. 3.E.4

5 Develop annotated drawings using dimensions, tags, symbols, and generate schedules to document elements such as doors and windows. 3.E.5

6 Edit and assign materials to model elements, and differentiate between model components and detail components. 3.E.6

7 Utilize and manage families or component libraries, including loading additional or custom content into a project. 3.E.7

8 Collaborate by linking external files or using built-in sharing tools to work as part of a team in architectural design software. 3.E.8

9 Compose comprehensive construction documentation sets using sheets, project metadata, title blocks, and sheet lists. 3.E.9

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0 Implement view templates and control graphic display settings to present design intent professionally in printed or exported formats. 3.E.10

11 Export and share views or documentation in common digital file formats and print layouts as required for professional workflows. 3.E.11

12 Manage building information across various systems by creating custom families and scheduling building components accurately. 3.E.12

13 Calculate material quantities from BIM models by creating accurate material takeoffs and area calculations. 3.E.13

14 Estimate preliminary construction costs using current cost data and appropriate contingencies. 3.E.14

F The student understands building codes and standards. The student is expected to: 3.F

1 Demonstrate knowledge of building codes and safety regulations, and why they exist. 3.F.1

2 Calculate basic occupant loads and egress requirements for different space types using appropriate code tables and formulas. 3.F.2

3 Apply relevant building codes to architectural designs including, but not limited to, required fire mitigation systems, egress paths, and accessibility requirements. 3.F.3

4 Evaluate designs for code compliance at an introductory level. 3.F.4

G The student develops understanding of cost estimation. The student is expected to: 3.G

1 Calculate material quantities from BIM models by creating accurate material takeoffs and area calculations. 3.G.1

2 Estimate preliminary construction costs using current cost data and appropriate contingencies. 3.G.2

3 Compare different material and system options through cost-benefit analyses that consider initial and life-cycle costs. 3.G.3

H The student demonstrates intermediate level tool and equipment operation. The student is expected to: 3.H

1 Operate power and hand tools safely and effectively. 3.H.1

2 Create 3D models using rapid prototyping technologies. 3.H.2

3 Maintain tools and equipment through regular cleaning, calibration, and basic repairs. 3.H.3

4 Select appropriate tools and processes for specific modeling and prototyping tasks. 3.H.4

I The student develops a professional portfolio. The student is expected to: 3.I

1 Organize digital and physical work products to demonstrate growing technical proficiency. 3.I.1

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Write technical descriptions explaining modeling and documentation strategies used in projects. 3.I.2

3 Present portfolio work demonstrating intermediate levels of mastery of digital architectural design tools and architectural documentation. 3.I.3