Maryland CTE Programs of Study

Architectural Design II (2025)

GENERAL REQUIREMENTS. This course is recommended for students in Grades 10-12. 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 II focuses on environmentally responsive design strategies and integrated building systems. Students learn to use energy modeling software and environmental analysis tools to optimize building performance. The course includes study of mechanical, electrical, and plumbing systems while introducing LEED certification concepts. Students conduct site analyses, perform daylight studies, and develop sustainable design solutions through detailed technical 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 Apply advanced mathematical applications including energy performance calculations, statistical analysis of building systems, geometric optimization for solar design, and complex volumetric calculations for mechanical systems. 3.D.2

3 Demonstrate basic understanding of scientific principles including thermodynamics in building systems, fluid dynamics in HVAC design, solar geometry and physics, lighting physics, and environmental science concepts related to building performance. 3.D.3

E The student comprehends advanced sustainable design principles. The student is expected to: 3.E

1 Evaluate building performance using energy modeling tools by conducting comparative analyses of different design options. 3.E.1

2 Design passive solar strategies by developing detailed wall sections and building orientations that maximize natural heating and cooling. 3.E.2

3 Integrate renewable energy systems into building designs through roof plans and equipment layouts that optimize system performance. 3.E.3

4 Create comprehensive energy conservation strategies by analyzing building envelope details and mechanical system efficiencies. 3.E.4

5 Calculate projected energy consumption through detailed energy models that consider occupancy patterns and climate data. 3.E.5

F The student understands building systems integration. The student is expected to: 3.F

1 Understand impact of integrated mechanical systems including HVAC, water management, plumbing, electrical system layouts, etc. 3.F.1

2 Design and plan plumbing and water management systems that include site placement and environmental impact mitigation. 3.F.2

3 Create electrical and lighting plans that optimize energy efficiency while meeting illumination requirements. 3.F.3

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The student demonstrates advanced proficiency in architectural design software. The student is expected to: 3.G

1. Design complex, multi-story building models utilizing advanced tools such as curtain walls, stairs, ramps, railings, and custom roof/floor systems to meet specific programmatic requirements. 3.G.1
2. Develop and manage project templates, view templates, and office standards that streamline workflow and ensure consistency across multiple design projects. 3.G.2
3. Construct and modify custom parametric families or components, including nested or adaptive elements, to expand modeling capabilities beyond preloaded libraries. 3.G.3
4. Integrate imported data from other software (e.g., CAD, GIS, point clouds) and utilize interoperability features to coordinate interdisciplinary project files. 3.G.4
5. Visualize design intent by producing advanced renderings, walkthroughs, phasing animations, and presentation boards using the architectural design software's built-in and supported rendering tools. 3.G.5
6. Optimize project workflow by applying worksharing principles, including creating and managing worksets and using central/local file systems in a team environment. 3.G.6
7. Justify design decisions, including leveraging exported plans, 3D views, data-rich visualizations, and supporting documentation to communicate solutions to technical and non-technical audiences. 3.G.7

H The student shows an understanding of sustainable building and green design. The student is expected to: 3.H

1. Explain why buildings seek green certification and describe the main steps a project follows to get certified. 3.H.1
2. Describe what different team members do during the green building certification process and name the key stages along the way. 3.H.2
3. Describe what integrative design means and work with classmates on group activities that involve different perspectives in green building projects. 3.H.3
4. Discuss how choosing a location and ways to get around (like walking, biking, or taking the bus) can affect a building project. 3.H.4
5. Describe ways that site choices and designs can help the environment, such as capturing rainwater, reducing heat, lowering light pollution, and protecting green spaces. 3.H.5
6. Review strategies for using less water both inside and outside a building, including ways to measure water use and create water-saving landscapes. 3.H.6
7. Look at how buildings can use less energy, including using renewable energy sources, tracking energy use, and managing heating/cooling systems responsibly. 3.H.7
8. Compare different building materials and waste options and talk about how they help save resources and cut down on waste. 3.H.8
9. List and describe what makes a healthy indoor environment, like good air quality, safe materials, good lighting, quiet spaces, comfortable temperature, and natural daylight. 3.H.9

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10 Read and understand a LEED scorecard, including the main requirements, credit points, and types of green building rating systems. 3.H.10

11 Use basic green building math (like figuring out water or energy saved) for sample projects and activities. 3.H.11

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

1 Document sustainable design strategies through detailed analysis drawings and written narratives. 3.I.1

2 Create infographics that clearly communicate building performance data and environmental strategies. 3.I.2

3 Organize and present energy modeling results and system optimization studies. 3.I.3

4 Write case studies of sustainable design projects including metrics and performance data. The student is expected to: 3.I.4

5 Conduct comprehensive site analyses using digital tools to document solar exposure, wind patterns, and other environmental factors. 3.I.5

6 Perform daylight analysis studies using physical models and computer simulations to optimize window placement and shading devices. 3.I.6

7 Evaluate building envelope performance through detailed wall section analysis and thermal modeling. 3.I.7

8 Create water management strategies by developing site plans that incorporate bioswales, retention ponds, and permeable surfaces. 3.I.8