Maryland
STATE DEPARTMENT OF EDUCATION

Program of Study Guide: Architectural Design and Drafting - DRAFT

Comprehensive guidelines and course standards for the Architecture Design and Drafting pathway

Office of College and Career Pathways

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MARYLAND STATE DEPARTMENT OF EDUCATION

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Purpose

The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Architectural Design and Drafting Program of Study. The academic standards in this document are theoretical and performance based. The standards contain content from multiple state departments of education, industry related resources and have been reviewed and vetted by members of the Maryland business and industry community.

In addition to academic standards, the Maryland State Department of Education (MSDE) has incorporated into this document Labor Market Information (LMI) definitions and explanations for the Program of Study; program aligned Industry Recognized Credentials; and Work-Based Learning resources and requirements by course level.

Standards Sources

The following sources collectively support a progression of standards from foundational to advanced design concepts in a high school context, preparing students for industry-aligned certifications like AutoDesk Revit Certified User and LEED Green Associate, providing them with the necessary knowledge and skills for career readiness in architectural design fields.

1. **MSDE's OCCP Construction and Development eCommunity**
   A. **Description:** This curriculum is curated by CTE affiliates to support Architecture and Construction Management courses.
   B. **Use:** These courses could be used to support instruction across this program.
   C. **Source:** Access can be attained through the MSDE Canvas site.

2. **ASCENT's Autodesk Revit Architecture Fundamentals**
   A. **Description**: Official Autodesk Authorized Publisher providing structured learning materials developed in collaboration with Autodesk.
   B. **Use**: Directly aligns with standards in course 1 and course 2, providing systematic instruction for Revit certification preparation.
   C. **Source**: Available through ASCENT's education portal (ascented.com) or authorized Autodesk resellers.

3. **Architecture: Form, Space, and Order by Francis D.K. Ching**
   A. **Description**: Foundational architectural design textbook used in professional architecture programs worldwide.
   B. **Use**: Supports standards in course 1, providing fundamental understanding of architectural principles, sketching, and visualization.
   C. **Source**: Available through major educational publishers and book retailers (Wiley Publishing).

4. **USGBC Learning Hub**
   A. **Description**: Educational platform from the U.S. Green Building Council offering sustainable design curriculum.
   B. **Use**: Supports standards in course 2, providing real-world applications of sustainable design principles and energy analysis.
   C. **Source**: Accessible through learning.usgbc.org with educational institution membership.

5. **Autodesk Certified User Official Exam Prep**
   A. **Description**: Official certification preparation materials from Certiport/Autodesk.
   B. **Use**: Directly supports course 2 standards, providing practice exams and learning materials aligned with certification requirements.
   C. **Source**: Available through Certiport's academic portal (certiport.com).

6. **Project Lead The Way (PLTW) Civil Engineering and Architecture**
   A. Description: Comprehensive high school engineering curriculum with hands-on projects.
   B. Use: Supports both courses' standards through integrated projects that combine architectural design, BIM, and sustainable practices.
   C. Source: Available through PLTW partnership program (pltw.org).

7. **SkillsUSA Architectural Drafting Resources**
   A. **Description**: Competition-based curriculum materials aligned with industry standards.
   B. **Use**: Supports advanced documentation and presentation standards in all courses through real-world project scenarios.
   C. **Source**: Accessible through SkillsUSA professional membership (skillsusa.org).

This document is intended for use by educational administrators and practitioners. A similar document is available for each state-approved CTE Program of Study.

Course Descriptions

Course Level	Course Information	Description
Required Core: Course 1	Architectural Design Principles SCED: <XX> Grades: 9-12 Prerequisite: None Credit: 1	This course introduces students to fundamental architectural principles and basic drafting techniques. Students learn to use traditional drafting tools and begin working with computer-aided design software while studying architectural history and basic building systems. Through hands-on projects, students develop basic model-making skills and learn shop safety while beginning to explore sustainable design concepts. The course emphasizes development of spatial thinking and basic visualization skills through both hand sketching and digital tools.
Required Core: Course 2	Architectural Design I SCED: <XX> Grades: 10-12 Prerequisite: Architectural Design Principles Credit: 1	This course 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.
Optional Flex: Course 1	Architectural Design II SCED: <XX> Grades: 11-12 Prerequisite: Architectural Design I Credit: 1	This course 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.

Course Level	Course Information	Description
Optional Flex: Course 2	Career Connected Learning I SCED: <XX> Grades: 11-12 Prerequisite: Architectural Design I Credit: 1	This flexible, work-based learning course introduces students to real-world applications of classroom knowledge and technical skills through on-the-job experiences and reflective practice. Students engage in career exploration, skill development, and professional networking by participating in youth apprenticeships, registered apprenticeships, pre-apprenticeships, internships, capstone projects, or other approved career-connected opportunities. Variable credit (1–3) accommodates the required on-the-job training hours and related instruction. By integrating industry standards, employability skills, and personalized learning goals, Career Connected Learning I equips students to make informed career decisions, develop a professional portfolio, and build a strong foundation for success in postsecondary education, training, or the workforce.
Optional Flex: Course 3	Career Connected Learning II SCED: <XX> Grades: 11-12 Prerequisite: Career Connected Learning I Credit: 1	Building on the foundational experiences of Career Connected Learning I, this advanced work-based learning course provides students with deeper on-the-job practice, leadership opportunities, and refined career exploration. Students continue to enhance their technical and professional skills, expanding their industry networks and aligning personal goals with evolving career interests. Variable credit (1–3) remains aligned with the required training hours and related instruction. Through elevated responsibilities and skill application, Career Connected Learning II prepares students to confidently transition into higher-level postsecondary programs, apprenticeships, or the workforce.

Dual Enrollment and Career Connected Learning Experiences Must be Aligned to the CTE Core.

Industry-Recognized Credentials and Work-Based Learning

Industry-Recognized Credentials
By the end of Architectural Design I: AutoDesk Certified User: Revit **Optional Credentials (via the Flex Course options):** preparing for LEED Green Associate Credential

Work-Based Learning Examples and Resources		
Architectural Design Principles: Career Awareness	**Architectural Design I: Career Preparation**	**Flex Courses: Career Preparation**
• Industry Visits • Guest Speakers • Participation in Career and Technical Student Organizations • Postsecondary Visits – Program Specific Site Tours • Mock Interviews	• All of Career Awareness plus the following: • Job Shadow • Paid and Unpaid Internships	• Paid and Unpaid Internships • Apprenticeships

Labor Market Information: Definitions and Data

Labor market information (LMI) plays a crucial role in shaping Career and Technical Education (CTE) programs by providing insights into industry demands, employment trends, and skills gaps. This data helps education leaders assess the viability of existing programs and identify opportunities for new offerings. By aligning CTE programs with real-time labor market needs, schools can better prepare students for in-demand careers and ensure that resources are effectively utilized to support pathways that lead to high-quality, sustainable employment.

Standard Occupational Code (SOC) and Aligned Industry:

Indicator	Definition	Pathway Labor Market Data
High Wage[1]	Those occupations that have a 25th percentile wage equal to or greater than the most recent MIT Living Wage Index for one adult in the state of Maryland, and/or leads to a position that pays at least the median hourly or annual wage for the DC-VA-MD-WV Metropolitan Statistical Area (MSA). *Note: A 25th percentile hourly wage of $24.74 or greater is required to meet this definition.*	**Standard Occupational Code:** 17-1011: Architects, Except Landscape and Naval 17-3011: Architectural and Civil Drafters 17-3019: Drafters (All Other) **Hourly Wage/Annual Salary:** 25th Percentile: $31.65/$65,839.43 50th Percentile: $37.26/$77,504.39 75th Percentile: $49.06/$102,041.75
High Skill	Those occupations located within the DC-VA-MD-WV Metropolitan Statistical Area (MSA) with the following education or training requirements: completion of an apprenticeship program; completion of an industry-recognized certification or credential; associate's degree, bachelor's degree, or higher.	**Typical Entry-Level Education:** Associate's degree
In-Demand	Annual growth plus replacement, across all Maryland occupations, is 405 openings between 2024-2029.	**Annual Openings** 254

[1] Living Wage Calculator: https://livingwage.mit.edu/states/24

Labor Market Information Data Source

Lightcast Q4 2024 Data Set. Lightcast occupation employment data are based on final Lightcast industry data and final Lightcast staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Lightcast earnings by industry. Foundational data for the state of Maryland is collected and reported by the Maryland Department of Labor.

Methodology for High Wage Calculations

To combine labor market data across multiple Standard Occupational Classifications (SOCs), a weighted average approach was used to ensure accurate representation of the marketplace. Median wages for each SOC were weighted based on their respective employment levels, reflecting the relative demand for each occupation. This method ensures that occupations with higher employment contribute proportionately to the overall wage calculation. Additionally, job openings from all relevant SOCs were summed to determine the total projected demand. For example, if Mechanical Engineers account for 67% of total employment and Electrical Engineers for 33%, their respective wages are weighted accordingly, and job openings are aggregated to provide a comprehensive view of labor market opportunities. This approach delivers a balanced and accurate representation of both wages and employment demand for the program.

Methodology for In-Demand Calculations

The baseline for annual job openings, taking into account new positions and replacement positions, was determined by taking the average of all annual job openings between 2024 and 2029 across all 797 career sectors at the 5-digit SOC code level. For the 2024-2029 period, average job openings (growth + replacement) is 405.

Course Standards: Architectural Design Principles

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

2. **INTRODUCTION**
   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.
   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.
   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.
   D. Architectural Design Principles introduces students to fundamental architectural principles and basic drafting techniques. Students learn to use traditional drafting tools and begin working with computer-aided design software while studying architectural history and basic building systems. Through hands-on projects, students develop basic model-making skills and learn shop safety while beginning to explore sustainable design concepts. The course emphasizes development of spatial thinking and basic visualization skills through both hand sketching and digital tools.
   E. Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
   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.

3. **KNOWLEDGE AND SKILLS**
   A. The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:
      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.
      2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn.
      3. Employ effective reading, writing, and technical documentation skills.
      4. Solve problems using critical thinking techniques and structured troubleshooting methodologies.

5. Demonstrate leadership skills and collaborate effectively as a team member.
6. Implement safety procedures, including proper handling of tools, equipment and hardware and following appropriate safety measures in the lab/shop environment.
7. Exhibit an understanding of legal and ethical responsibilities in the architectural field, following accessibility laws and best practices for design.
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting.

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

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

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

1. Use technology as a tool for research, organization, communication, and problem-solving.
2. Use digital tools, including computers, mobile devices, collaboration platforms, and cloud services, to access, manage, and create information.
3. Demonstrate proficiency in using emerging and industry-standard technologies, including virtualization tools, design software, and related equipment.
4. Understand ethical and legal considerations for technology use, including the principles of data protection, copyright, and responsible technology use.

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

1. Demonstrate the use of clear communication techniques, both written and verbal, that are consistent with industry standards.
2. Apply foundational mathematical concepts including scale and proportion calculations, geometric constructions, basic algebra for dimensional calculations, measurement conversions between imperial and metric systems, and area calculations for basic architectural spaces and building footprints.
3. Understand basic scientific principles including forces acting on simple structures, properties of common building materials, fundamentals of light and shadow in architectural spaces, and environmental factors affecting site planning and building orientation.

E. The student understands fundamental architectural design principles and elements. The student is expected to:

1. Define the basic elements and principles of architectural design including form, space, scale, and proportion by creating an illustrated glossary with examples from both historical and contemporary architecture.
2. Analyze historical architectural styles and their influence on modern design through written research papers and presentations that compare at least three major architectural movements.

3. Apply basic design principles in creating simple architectural sketches and drawings by producing a series of conceptual designs that demonstrate understanding of balance, rhythm, emphasis, and unity.
4. Explain the relationship between human factors and architectural design by documenting how different spaces accommodate human activities and movement through observation studies and diagrams.
5. Create basic architectural diagrams showing spatial relationships and circulation patterns through bubble diagrams and basic floor plan sketches.

F. The student develops proficiency in basic drafting and visualization techniques. The student is expected to:

1. Demonstrate proper use of manual drafting tools and equipment by maintaining consistent line quality and text styles in hand-drafted plans and elevations.
2. Create basic architectural drawings including floor plans, elevations, and sections using manual drafting techniques with appropriate architectural scales and dimensions.
3. Utilize computer-aided design software to produce basic architectural drawings by creating simple building plans with correct layers, line weights, and architectural annotations.
4. Generate simple 3D models using digital tools by developing basic massing studies that demonstrate understanding of form and scale.
5. Construct physical architectural models using basic materials like cardboard and foam board while maintaining precise measurements and clean craftsmanship.

G. The student comprehends basic building systems and components. The student is expected to:

1. Identify primary building systems and their functions by creating diagrams that illustrate how structural, mechanical, electrical, and plumbing systems work together.
2. Describe basic structural systems and components through sketches and models that demonstrate understanding of loads, forces, and building stability.
3. Compare different construction materials and their properties by creating a materials reference guide with samples, properties, and appropriate applications.
4. Explain basic mechanical and electrical systems in buildings through schematic diagrams showing system components and relationships.

H. The student applies safe practices in the learning environment. The student is expected to:

1. Demonstrate proper safety procedures in tool and equipment operation by passing safety tests and consistently following protocols during lab activities.
2. Identify potential hazards in the architectural/engineering environment through safety audits and developing prevention strategies.
3. Maintain a safe and organized workspace by properly storing tools, maintaining clean work areas, and following cleanup procedures.

I. The student understands introductory sustainable design concepts. The student is expected to:

1. Define sustainable design and its importance in architecture by researching and presenting case studies of environmentally responsive buildings.
2. Identify basic principles of environmental design through analysis of building orientation, natural lighting, and passive ventilation strategies.

3. Explain how building orientation affects energy use by conducting solar studies using physical and digital models.
4. Create preliminary site analysis drawings that document environmental factors including sun paths, prevailing winds, and natural features.

J. The student develops a professional portfolio. The student is expected to:

1. Create a digital and physical organizational system for collecting and categorizing project work throughout the course.
2. Document the design process for each project through sketches, drawings, photographs, and written descriptions.
3. Select and present best work examples that demonstrate understanding of architectural design principles and technical skills.
4. Write project descriptions that clearly communicate design intent and process. The student is expected to:

Course Standards: Architectural Design I

1. **GENERAL REQUIREMENTS.** This course is recommended for students in Grades 10-12.

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

3. **KNOWLEDGE AND SKILLS**
   A. The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:
      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.
      2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn.
      3. Employ effective reading, writing, and technical documentation skills.
      4. Solve problems using critical thinking techniques and structured troubleshooting methodologies.
      5. Demonstrate leadership skills and collaborate effectively as a team member.

6. Implement safety procedures, including proper handling of tools, equipment and hardware and following appropriate safety measures in the lab/shop environment.
7. Exhibit an understanding of legal and ethical responsibilities in the architectural field, following accessibility laws and best practices for design.
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting.

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

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

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

1. Use technology as a tool for research, organization, communication, and problem-solving.
2. Use digital tools, including computers, mobile devices, collaboration platforms, and cloud services, to access, manage, and create information.
3. Demonstrate proficiency in using emerging and industry-standard technologies, including virtualization tools, design software, and related equipment.
4. Understand ethical and legal considerations for technology use, including the principles of data protection, copyright, and responsible technology use.

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

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

E. The student masters advanced Building Information Modeling concepts and techniques. The student is expected to:

1. Create complex building models using Revit by developing fully detailed architectural models including walls, doors, windows, stairs, and basic furniture layouts.
2. Generate detailed construction documentation by producing coordinated drawing sets including plans, elevations, sections, and key details with appropriate annotations and dimensions.
3. Manage building information across various systems by creating custom families and scheduling building components accurately.
4. Integrate multiple design disciplines within the BIM environment by coordinating architectural, structural, and MEP elements in a single model.

5. Create custom visualization graphics by developing rendered views, walkthrough animations, and presentation sheets that effectively communicate design intent.

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

1. Apply relevant building codes to architectural designs by analyzing and documenting required fire separations, egress paths, and accessibility requirements.
2. Calculate occupant loads and egress requirements for different space types using appropriate code tables and formulas.
3. Evaluate designs for code compliance by creating code review sheets that document how design solutions meet specific code requirements.
4. Develop detailed life safety plans showing all required elements including exits, fire ratings, and emergency systems.

G. The student develops proficiency in cost estimation. The student is expected to:

1. Calculate material quantities from BIM models by creating accurate material takeoffs and area calculations.
2. Estimate preliminary construction costs using current cost data and appropriate contingencies.
3. Compare different material and system options through cost-benefit analyses that consider initial and life-cycle costs.
4. Create detailed cost spreadsheets that organize materials and systems by CSI divisions.

H. The student demonstrates advanced tool and equipment operation. The student is expected to:

1. Operate advanced power tools safely and effectively by completing increasingly complex architectural models.
2. Create precise architectural models using digital fabrication equipment including 3D printers and laser cutters.
3. Maintain tools and equipment through regular cleaning, calibration, and basic repairs.
4. Select appropriate tools and processes for specific modeling and prototyping tasks.

I. The student prepares for Revit certification. The student is expected to:

1. Master all required Revit tools and commands through structured practice exercises and assessments.
2. Complete practice certification exercises with increasing speed and accuracy.
3. Produce required documentation types according to certification standards.
4. Demonstrate proficiency in Revit workflow management through efficient file organization and work sharing.

J. The student develops a professional portfolio. The student is expected to:

1. Organize digital and physical work products to demonstrate growing technical proficiency.
2. Create detailed documentation of BIM projects including process work and final outputs.
3. Write technical descriptions explaining modeling and documentation strategies used in projects.
4. Present portfolio work demonstrating mastery of Revit tools and architectural documentation. The student is expected to:
5. Calculate material quantities from BIM models by creating accurate material takeoffs and area calculations.

6. Estimate preliminary construction costs using current cost data and appropriate contingencies.
7. Create detailed cost spreadsheets that organize materials and systems by CSI divisions.

Course Standards: Architectural Design II

1. **GENERAL REQUIREMENTS.** This course is recommended for students in Grades 10-12.

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

3. **KNOWLEDGE AND SKILLS**
   A. The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:
      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.
      2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn.
      3. Employ effective reading, writing, and technical documentation skills.
      4. Solve problems using critical thinking techniques and structured troubleshooting methodologies.
      5. Demonstrate leadership skills and collaborate effectively as a team member.

6. Implement safety procedures, including proper handling of tools, equipment and hardware and following appropriate safety measures in the lab/shop environment.
7. Exhibit an understanding of legal and ethical responsibilities in the architectural field, following accessibility laws and best practices for design.
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting.

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

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

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

1. Use technology as a tool for research, organization, communication, and problem-solving.
2. Use digital tools, including computers, mobile devices, collaboration platforms, and cloud services, to access, manage, and create information.
3. Demonstrate proficiency in using emerging and industry-standard technologies, including virtualization tools, design software, and related equipment.
4. Understand ethical and legal considerations for technology use, including the principles of data protection, copyright, and responsible technology use.

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

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

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

1. Evaluate building performance using energy modeling tools by conducting comparative analyses of different design options.
2. Design passive solar strategies by developing detailed wall sections and building orientations that maximize natural heating and cooling.
3. Integrate renewable energy systems into building designs through roof plans and equipment layouts that optimize system performance.
4. Create comprehensive energy conservation strategies by analyzing building envelope details and mechanical system efficiencies.
5. Calculate projected energy consumption through detailed energy models that consider occupancy patterns and climate data.

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

1. Design integrated mechanical systems by creating detailed HVAC layouts that coordinate with structural and architectural elements.
2. Develop plumbing and water management systems through detailed plans showing supply, waste, and stormwater management strategies.
3. Create electrical and lighting plans that optimize energy efficiency while meeting illumination requirements.
4. Generate systems coordination drawings using BIM clash detection to resolve conflicts between building systems.

G. The student applies environmental analysis techniques. The student is expected to:

1. Conduct comprehensive site analyses using digital tools to document solar exposure, wind patterns, and other environmental factors.
2. Perform daylight analysis studies using physical models and computer simulations to optimize window placement and shading devices.
3. Evaluate building envelope performance through detailed wall section analysis and thermal modeling.
4. Create water management strategies by developing site plans that incorporate bioswales, retention ponds, and permeable surfaces.

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

1. Document sustainable design strategies through detailed analysis drawings and written narratives.
2. Create infographics that clearly communicate building performance data and environmental strategies.
3. Organize and present energy modeling results and system optimization studies.
4. Write case studies of sustainable design projects including metrics and performance data. The student is expected to:
5. Conduct comprehensive site analyses using digital tools to document solar exposure, wind patterns, and other environmental factors.
6. Perform daylight analysis studies using physical models and computer simulations to optimize window placement and shading devices.
7. Evaluate building envelope performance through detailed wall section analysis and thermal modeling.
8. Create water management strategies by developing site plans that incorporate bioswales, retention ponds, and permeable surfaces.

Course Standards: Career Connected Learning I and II

Career connected learning is an educational approach that integrates classroom instruction with real-world experiences, enabling high school students to explore potential careers and develop relevant skills before graduation. By participating in work-based learning opportunities—such as apprenticeships, internships, capstone projects, and school-based enterprises—students apply academic concepts in authentic settings, gain practical industry knowledge, and build professional networks. This hands-on engagement helps students connect their studies to future career paths, strengthens their problem-solving and communication skills, and supports a smoother transition into college, vocational programs, or the workforce.

All Career and Technical Education Programs of Study include aspects of work-based learning, and almost all of the programs include two Career Connected Learning (CCL) courses. Below are the course descriptions for CCL I and CCL II. The CCL standards can be found via this link:

Architectural Design and Drafting Program: Equipment List

Course:	Hardware	Software	Consumables	Safety
Architectural Design Principles	• Drafting tables with parallel bars • Drafting tools (T-squares, triangles, scales, compasses) • Basic hand tools (hammers, screwdrivers, measuring tools) • Basic power tools (drill press, scroll saw, band saw) • 3D printer • Computer workstations capable of running CAD software • Large format printer/plotter • Digital cameras • Material samples collection	• AutoCAD (Educational License) • Revit (Educational License) • SketchUp • Basic image editing software • PDF creation/editing software	• Drafting paper • Drafting vellum • Various drawing pencils and tools • Model-making materials • Basic lumber for projects • 3D printer filament • Plotting paper	• Safety glasses • Work gloves • First aid kit • Dust collection system • Eye wash station • Fire extinguishers

Course:	Hardware	Software	Consumables	Safety
Architectural Design I	• Advanced computer workstations • Multiple large format printers/plotters • 3D printer(s) • Laser cutter • CNC router • Advanced power tools • Digital fabrication tools • Material testing equipment • Document scanner • Digital presentation equipment	• Revit (Educational License) • AutoCAD (Educational License) • Revit add-ins for specialized functions • Rendering software • Cost estimation software • PDF markup software • BIM 360 or similar collaboration platform	• Various modeling materials • Specialty lumber and materials • Printing supplies • Digital fabrication materials • Testing materials • Documentation materials	• Advanced PPE • Machine guards • Emergency stops • Dust collection systems • First aid supplies • Fire suppression equipment

Course:	Hardware	Software	Consumables	Safety
Architectural Design II	• High-performance workstations • Environmental testing equipment • Light meters • Infrared cameras • Weather monitoring equipment • Energy monitoring tools • Air quality testing equipment • Acoustic testing equipment • Material testing apparatus • Thermal conductivity testers • Moisture meters • Air infiltration testing equipment • Solar pathfinder • Wind analysis tools • Data loggers • Environmental sensors • Energy consumption meters • Water flow meters • CO2 monitors	• Energy modeling software (Autodesk Insight, OpenStudio) • Environmental analysis tools • Climate Consultant • Lighting analysis software • HVAC load calculation software • Water management software • LEED tracking tools	• Various modeling materials • Specialty lumber and materials • Printing supplies • Digital fabrication materials • Testing materials • Documentation materials	• Advanced PPE • Machine guards • Emergency stops • Dust collection systems • First aid supplies • Fire suppression equipment