

# Construction Management





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The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Construction Management Program of Study. The academic standards in this document are theoretical and performance-based. The standards contain content from Colorado, Maryland, Tennessee, and Texas and were validated by D.C. business and industry partners. All content is used with permission.

In addition to academic standards, OSSE 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.

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



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## Course Descriptions: Construction Management

Course Level	Course Information	Description
Level I	<b>Principles of Construction</b> <b>OSSEID:</b> 17002G1.0014 <b>Grades:</b> 9-12 <b>Prerequisite:</b> None <b>Credit:</b> 1	Principles of Construction is intended to provide an introduction and lay a solid foundation for those students entering the construction or craft skilled areas. The course provides a strong knowledge of construction safety, construction mathematics, and common hand and power tools. For safety and liability considerations, limiting course enrollment to 15 students is recommended. This course also provides communication and occupation skills to assist the student in obtaining and maintaining employment.
Level II	<b>Construction Management I</b> <b>OSSEID:</b> 17016G1.0024 <b>Grades:</b> 10-12 <b>Prerequisite:</b> Principles of Construction <b>Credit:</b> 1	In Construction Management I, students will gain the knowledge and skills needed to enter the workforce as apprentice carpenters or building maintenance supervisors' assistants or to build a foundation toward a postsecondary degree in architecture, construction science, drafting, or engineering. Construction Management I includes the knowledge of design techniques and tools related to the management of architectural and engineering projects.
Level III	<b>Construction Management II</b> <b>OSSEID:</b> 17016G1.0034 <b>Grades:</b> 11-12 <b>Prerequisite:</b> Construction Technology I <b>Credit:</b> 1	In Construction Management II, students will gain the knowledge and skills needed to enter the workforce as apprentice carpenters or building maintenance supervisors' assistants or to build a foundation toward a postsecondary degree in architecture, construction science, drafting, or engineering. Construction Management II includes knowledge of the design, techniques, and tools related to the management of architectural and engineering projects.
Level IV	<b>Practicum in Architectural Design</b> <b>OSSEID:</b> 17951G1.0044 <b>Grades:</b> 12 <b>Prerequisite:</b> Construction Technology II <b>Credit:</b> 1	Practicum in Construction Technology, students will be challenged with the application of knowledge and skills gained in previous construction-related coursework. In many cases, students will be allowed to work at a job (paid or unpaid) outside of school or be involved in local projects the school has approved for this class.

## Industry Certifications

OSHA 10  
 NCCER (National Center for Construction Education and Research) Construction Site Safety Technician (CSST)  
 USGBC LEED Green Associate  
 National Green Infrastructure Certification



## Work-Based Learning Examples and Resources

Level I Course	Level II Course	Level III Course	Level IV Course
<b>Career Exploration</b> Industry Visits Guest Speakers Participate in a CTSO	<b>Career Awareness</b> <i>All of Level I, plus:</i> Postsecondary Visits Program-Specific Site Tours Mock Interviews	<b>Career Preparation</b> <i>All of Level I and II, plus:</i> Job Shadow Paid/Unpaid Internships	<b>Career Preparation</b> Paid/Unpaid Internships Apprenticeships

Several resources are available to help instructors meet the Level I and Level II WBL requirements, including:

**Career Coach DC** (<http://careercoachdc.emsicc.com>). Online site designed to help students find and connect to a career pathway by providing the most current local data on wages, employment, job postings, and associated education and training. The resource includes a Career Assessment for students.

**Nepris** (<https://dc.nepris.com/>). Connects educators and learners with a network of industry professionals virtually, bringing real-world relevance and career exposure to all students. Nepris also provides a skills-based volunteering platform for business and industry professionals to extend their educational outreach.

**Virtual Job Shadow** (<https://virtualjobshadow.com>). Provides interactive tools which empower students to discover, plan, and pursue their dreams. Rich video library presents a “day in the life of” view for thousands of occupations.

## Labor Market Information Definitions and Data

Career and Technical Education programs of study in the District of Columbia must meet at least one of the High Wage, High Skill, and In-Demand definitions below to be considered appropriate for our students and the regional labor market. These definitions were created in collaboration with Career and Technical Education leaders from District of Columbia LEAs, the University of the District of Columbia Community College, and national guidance from Research Triangle International (RTI) and Education Northwest. Additionally, previous work was consulted by researchers at MIT’s Labor Wage Index Project and the DC CTE Task Force’s 2012 Strategic Plan for the District of Columbia.

Indicator	Definition	Data for the Construction Management Program of Study (source: EMSI, August 2022)
<b>High Wage</b>	Those occupations that have a 25 <sup>th</sup> percentile wage equal to or greater than the most recent MIT Living Wage Index for one adult in the District of Columbia, and/or leads to a position that pays at least the median hourly or annual wage for the Washington, DC, metropolitan statistical area.  <i>Note: A 25<sup>th</sup> percentile hourly wage of \$23.13 or greater is required to meet this definition.</i>	<b>Standard Occupational Code (SOC):</b> 11-9021.00 Construction Managers  <b>Hourly Wages</b> <b>25<sup>th</sup> Percentile:</b> \$40.55 <b>50<sup>th</sup> Percentile:</b> \$51.62 <b>75<sup>th</sup> Percentile:</b> \$68.29



<p><b>High Skill</b></p>	<p>Those occupations located within the Washington, DC, metropolitan statistical area with the following education or training requirements: completion of an apprenticeship program; completion of an industry-recognized certification or credential; associate’s degree, or higher.</p>	<p><b>Typical Entry-Level Education:</b> Bachelor’s Degree</p>
<p><b>In-Demand</b></p>	<p>Those occupations in the Washington, DC, metropolitan statistical area having more than the median number of total <b>(growth plus replacement)</b> annual openings over a five-year period.</p> <p><i>Note: An occupation is required to have an annual growth plus replacement rate of 105 openings, or greater, between 2021-2026 to meet this definition.</i></p>	<p><b>Annual Openings:</b> 1,066</p>



## Model Six-Year Plan: Construction Management

**College:** University of the District of Columbia Community College

**Program/CIP:**

**Plan:**

**Entity:** Office of the State Superintendent of Education

**Career Cluster:** Architecture and Construction

**Program of Study:** Construction Management

Subject	High School				College			
	9 <sup>th</sup> Grade	10 <sup>th</sup> Grade	11 <sup>th</sup> Grade	12 <sup>th</sup> Grade	Semester I	Semester II	Semester III	Semester IV
<b>English (4)</b>	English I	English II	English III	English IV				
<b>Math (4)</b>	Algebra I	Geometry	Algebra II	Math				
<b>Science (4)</b>	Biology	Lab Science	Lab Science	Science				
<b>Social Studies (4)</b>	World History and Geography I: Middle Ages	World History and Geography II: Modern World	U.S. History	U.S. Government (.5) and D.C. History (.5)				
<b>Health (.5) and Physical Ed (1)</b>	Health (.5) Physical Ed (.5)	Physical Ed (.5)						
<b>World Languages (2)</b>			World Language I	World Language II				
<b>Art (.5)</b>		Art (.5)						
<b>Music (.5)</b>		Music (.5)						
<b>Elective / Major Courses</b>	Principles of Construction	Construction Management I	Construction Management II	Practicum in Construction Technology				
<b>Total possible college credits completed in high school: XX</b>					<b>Credit hours required to complete the AAS program: XX</b>			



## Course Standards

### Principles of Construction

1. **General requirements.** This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
  - A. Career and technical education instruction provides students with industry-aligned content, challenging academic standards, and relevant technical knowledge to further their education and succeed in current or emerging professions.
  - B. The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.
  - C. Principles of Construction is intended to provide an introduction and lay a solid foundation for those students entering the construction or craft skilled areas. The course provides a strong knowledge of construction safety, construction mathematics, and common hand and power tools. For safety and liability considerations, limiting course enrollment to 15 students is recommended. This course also provides communication and occupation skills to assist the student in obtaining and maintaining employment.
  - D. Students will participate in at least two Career Exploration Work-Based Learning experiences in this course, which might include guest speakers and workplace tours relevant to the program of study.
  - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
  - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
    1. explain the role of an employee in the construction industry;
    2. demonstrate critical-thinking skills;
    3. demonstrate the ability to solve problems using critical-thinking skills;
    4. demonstrate knowledge of basic computer systems;
    5. explain common uses for computers in the construction industry;
    6. define effective relationship skills;
    7. recognize workplace issues such as sexual harassment, stress, and substance abuse;
    8. explain the Occupational Safety and Health Administration (OSHA) General Duty Clause; and
    9. explain OSHA 1926 CFR Subpart C.
  - B. **The student understands that safe working standards are imperative in the classroom and in the field. The student is expected to:**
    1. explain the idea of a safety culture;
    2. explain the importance of a safety culture in the construction crafts;
    3. explain the role of the OSHA in job-site safety;





4. explain fall protection, ladder safety, stair safety, and scaffold safety procedures;
  5. demonstrate the use and care of appropriate personal protective equipment, including safety goggles and glasses, hard hats, gloves, safety harnesses, and safety shoes;
  6. define safe work procedures around electrical hazards; and
  7. explain the importance of Safety Data Sheets (SDS).
- C. The student understands the importance of recognizing potential hazards and preventing accidents in the classroom and in the field. The student is expected to:**
1. identify causes of accidents;
  2. identify impacts of accident costs;
  3. define hazard recognition;
  4. identify struck-by hazards;
  5. identify caught-in-between hazards;
  6. identify other construction hazards on the jobsite, including hazardous material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires; and
  7. explain the importance of hazard communication (HazCom).
- D. The student understands basic construction mathematics. The student is expected to:**
1. add, subtract, multiply, and divide whole numbers with and without a calculator;
  2. add, subtract, multiply, and divide fractions;
  3. add, subtract, multiply, and divide decimals with and without a calculator;
  4. convert decimals to percentages and percentages to decimals; and
  5. convert fractions to decimals and decimals to fractions.
- E. The student demonstrates basic measuring practices. The student is expected to:**
1. use a standard ruler, a metric ruler, a measuring tape, and an architectural/engineering scale to measure;
  2. explain what the metric system is and how it is important in the construction trade;
  3. recognize and use metric units of length, weight, volume, and temperature; and
  4. recognize some of the basic shapes used in the construction industry and apply basic geometric principles to measure them.
- F. The student acquires knowledge about care and identification of hand tools. The student is expected to:**
1. recognize and identify the basic hand tools and their purposes for the construction trades;
  2. inspect basic hand tools visually to determine if they are safe for use; and
  3. use the basic construction hand tools safely and properly.
- G. The student acquires knowledge about care and identification of powered hand tools. The student is expected to:**
1. identify powered hand tools commonly used in the construction trades;
  2. practice safe and proper application of powered hand tools commonly used in the construction trades; and
  3. explain how to properly maintain and clean powered hand tools commonly used in construction trades.
- H. The student develops the basics of construction drawing. The student is expected to:**
1. interpret and use drawing dimensions;
  2. recognize and identify basic construction terms;



3. recognize and identify basic drawing components;
  4. recognize and identify commonly used drawing symbols;
  5. relate information on construction drawings to actual locations on the print; and
  6. recognize different classifications of construction drawings.
- I. **The student reads technical drawings and documents to plan a project. The student is expected to:**
1. interpret blueprints and drawings to assist with project planning;
  2. recognize elements and symbols of blueprints and drawings;
  3. relate information on blueprints to actual locations on the print;
  4. recognize different classifications of drawings; and
  5. interpret and use drawing dimensions.
- J. **The student interprets and presents information used in workplace situations. The student is expected to:**
1. interpret information and instructions presented in written form;
  2. interpret information and instructions presented in verbal form;
  3. communicate effectively using verbal and writing skills; and
  4. communicate effectively on the job using electronic communication devices.
- K. **The student identifies ergonomic tools and procedures as well as safe material handling standards. The student is expected to:**
1. define a load;
  2. establish a pre-task plan prior to moving a load;
  3. apply proper material-handling techniques;
  4. choose appropriate material-handling equipment for the task; and
  5. recognize hazards and follow safety procedures required for material handling.
- L. **The student develops technology skills. The student is expected to:**
1. Use technology as a tool to research, organize, evaluate, and communicate information;
  2. Use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage, integrate, evaluate, and create information to successfully function in a knowledge economy;
  3. Demonstrate using current and new technologies specific to the program of study, course, and/or industry; and
  4. Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



## Construction Management I

1. **General requirements.** This course is recommended for students in Grades 10-12. Prerequisite: Principles of Construction. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
  - A. Career and technical education 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 Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.
  - C. In Construction Management I, students will gain knowledge and skills needed to enter the workforce as apprentice carpenters or building maintenance supervisors' assistants or to build a foundation toward a postsecondary degree in architecture, construction science, drafting, or engineering. Construction Management I includes the knowledge of design techniques and tools related to the management of architectural and engineering projects.
  - D. Students will participate in at least two Career Awareness Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
  - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
  - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
    1. identify employment opportunities, including entrepreneurship and career preparation requirements, in the field of construction management;
    2. demonstrate an understanding of group participation and leadership related to career preparation;
    3. identify employers' expectations, including appropriate work habits;
    4. apply the competencies related to resource technology in appropriate settings; and
    5. demonstrate knowledge of the concepts and skills related to health and safety in the workplace, as specified by appropriate governmental regulations.
  - B. **The student applies academic skills to the requirements of construction management. The student is expected to:**
    1. demonstrate effective verbal and written communication skills with individuals from varied cultures, including fellow workers, managers, and customers;
    2. complete work orders and related paperwork;
    3. estimate jobs, schedules, and industry standards related to legal restrictions;
    4. read and interpret appropriate architectural symbols, schematics, blueprints, work drawings, manuals, and bulletins; and
    5. apply descriptive geometry related to auxiliary views, revolutions, intersections, and piping drawings.



- C. **The student gains knowledge about building materials used in the construction industry, including lumber, sheet materials, engineered wood products, structural concrete, structural steel, fasteners, and adhesives used in construction settings. The student is expected to:**
1. identify various types of construction materials and methods;
  2. describe the uses of various types of hardwoods and softwoods;
  3. identify the grades and markings of wood building materials;
  4. describe the proper method of storing and handling building materials;
  5. describe the uses of various types of engineered lumber;
  6. calculate quantities of lumber and wood products using industry-standard methods; and
  7. describe the fasteners, anchors, and adhesives used in construction work.
- D. **The student describes how a systems model can be used to describe construction activities, including mechanical, fluid, electrical, and thermal systems. The student is expected to:**
1. apply the universal systems model to construction activities;
  2. identify the inputs, processes, outputs, and feedback associated with construction systems;
  3. describe the subsystems used in construction; and
  4. describe how technological systems interact to achieve common goals.
- E. **The student selects and uses the proper construction technology to meet practical objectives. The student is expected to:**
1. distinguish between architectural and civil construction systems;
  2. apply construction technology to individual or community problems;
  3. describe the factors that affect the purchase and use of constructed items; and
  4. identify and describe the roles of construction.
- F. **The student designs an item for construction using appropriate design processes and techniques. The student is expected to:**
1. describe the design processes and techniques used in construction
  2. develop or improve a building or structure that meets specified needs; and
  3. identify areas where quality, reliability, and safety can be designed into a building or structure.
- G. **The student investigates emerging and innovative construction technologies. The student is expected to:**
1. report on emerging and innovative construction technologies; and
  2. conduct research and experimentation in construction technology.
- H. **The student describes quality and how it is measured in construction. The student is expected to:**
1. describe different quality control applications in construction; and
  2. apply continuous quality improvement techniques to the construction of a building or structure.
- I. **The student builds buildings or structures using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:**
1. describe the chemical, mechanical, and physical properties of construction materials;
  2. describe the processes used in construction; and
  3. construct buildings or structures using a variety of tools, equipment, and machines.



- J. **The student works safely with construction tools, equipment, machines, and materials. The student is expected to:**
1. master relevant safety tests;
  2. follow safety manuals, instructions, and requirements;
  3. identify and classify hazardous materials and wastes; and
  4. dispose of hazardous materials and wastes appropriately.
- K. **The student describes the importance of maintenance in construction. The student is expected to:**
1. maintain tools and materials correctly;
  2. perform manufacturers' maintenance procedures on selected tools, equipment, and machines; and
  3. describe the results of negligent or improper maintenance.
- L. **The student manages a construction project. The student is expected to:**
1. develop a plan for completing a construction project; and
  2. participate in the organization and operation of a real or simulated construction project using project management processes, including initiating, planning, executing, monitoring and controlling, and closing a project.
- M. **The student applies the appropriate codes, laws, standards, or regulations related to construction technology. The student is expected to:**
1. explain the importance of codes, laws, standards, or regulations related to construction technology;
  2. identify areas where codes, laws, standards, or regulations related to construction technology may be required; and
  3. comply with appropriate codes, laws, standards, or regulations.
- N. **The student describes the intended and unintended effects of technological solutions. The student is expected to:**
1. apply an assessment strategy to determine the risks and benefits of technological developments in construction;
  2. describe how technology has affected individuals, societies, cultures, economies, and environments;
  3. discuss the international effects of construction technology; and
  4. describe the issues related to regional and community planning.
- O. **The student identifies the factors that influence the evolution of construction technology. The student is expected to:**
1. describe how changes in construction technology affect business and industry; and
  2. describe how the evolution of construction technology has been influenced by past events.
- P. **The student solves problems, thinks critically, and makes decisions related to construction technology. The student is expected to:**
1. develop or improve a building or structure by following a problem-solving strategy; and
  2. apply critical-thinking strategies to analyze and evaluate proposed technological solutions.



- Q. **The student identifies the factors that influence the cost of goods and services in construction projects. The student is expected to:**
1. develop a budget for a construction project; and
  2. determine the most effective strategies to minimize costs.
- R. **The student knows the concepts and skills that form the technical knowledge of building carpentry. The student is expected to:**
1. identify the uses of carpentry hardware and fasteners; and
  2. demonstrate knowledge of fire ratings of construction materials.
- S. **The student knows the function and application of the tools, equipment, technologies, and materials used in construction carpentry. The student is expected to:**
1. use hand tools, power tools, and equipment commonly employed in carpentry in a safe manner;
  2. handle and dispose of environmentally hazardous materials used in carpentry in the proper manner;
  3. use the different types of scaffolding employed in building carpentry in a safe manner; and
  4. demonstrate knowledge of new and emerging technologies that may affect construction carpentry.
- T. **The student applies the concepts and skills of the construction industry to simulated or actual work situations. The student is expected to:**
1. square, measure, and cut materials to specified dimensions;
  2. handle different types of loads;
  3. use framing techniques for walls, floors, ceilings, rafters, structural timbers, stairs, trusses, and fireproof metal-studs;
  4. demonstrate the proper principles of drywall application; and
  5. install doors, windows, interior and exterior wall covering, and trim.
- U. **The student knows the proper and safe use of hand and power tools. The student is expected to:**
1. identify the hand tools commonly used by carpenters and describe their uses;
  2. use hand tools safely;
  3. state the general safety rules for operating all power tools, regardless of type;
  4. identify the portable power tools commonly used by carpenters and describe their uses; and
  5. use portable power tools safely.
- V. **The student learns how to interpret architectural and engineering working drawings and specifications. The student will become familiar with the symbols and nomenclature specific to the construction industry. The student is expected to:**
1. describe the types of drawings usually included in a set of plans;
  2. identify the different types of lines used on construction drawings;
  3. identify selected architectural symbols commonly used to represent materials on plans;
  4. identify selected electrical, mechanical, and plumbing symbols commonly used on plans;
  5. identify selected abbreviations commonly used on plans;
  6. read and interpret plans, elevations, schedules, sections, and details contained in basic construction drawings
  7. state the purpose of written specifications; and
  8. demonstrate or describe how to perform a quantity takeoff for materials.



- W. The student gains knowledge about the basics of wood framing, including layout and construction of wood-framed floor systems using common and engineered lumber. The student is expected to:**
1. identify the different types of framing systems;
  2. interpret drawings with specifications to determine floor system requirements;
  3. identify framing and support members as it refers to flooring;
  4. name the methods used to fasten sills to the foundation;
  5. given specific floor load and span data, select the proper girder and beam size from a list of available girders and beams;
  6. list and recognize different types of bridging;
  7. list and recognize different types of flooring materials;
  8. explain the purposes of subflooring and underlayment;
  9. select the appropriate fasteners to be used in various floor-framing systems;
  10. estimate the amount of material needed to frame a floor assembly; and
  11. demonstrate the ability to lay out and construct a floor assembly, including installing bridging; installing joists for a cantilever-floor; installing a subfloor using butt-joint plywood or oriented strand board panels; and installing a single floor system using tongue-and-groove plywood or oriented strand board panels.
- X. The student understands how to lay out and frame walls and ceilings, rough-in door and window openings, construct corners and partition tee-bracing walls and ceilings, and apply sheathing. The student is expected to:**
1. identify the components of a wall and ceiling layout;
  2. describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partition Ts, bracing, and fire stops;
  3. describe the correct procedure for assembling and erecting an exterior wall;
  4. identify the common materials and methods for installing sheathing on walls;
  5. describe or demonstrate how to lay out, assemble, erect, and brace exterior walls for a frame building;
  6. describe wall-framing techniques used in masonry construction;
  7. explain the use of metal studs in wall framing;
  8. explain how to cut and install ceiling joists on a wood frame building; and
  9. estimate the materials required for frame walls and ceilings.
- Y. The student investigates various types of framed roofs. The student is expected to:**
1. demonstrate an understanding of the terms associated with roof framing;
  2. identify the roof-framing members used in gable and hip roofs;
  3. identify the methods used to calculate the length of a rafter
  4. identify the various types of trusses used in roof framing;
  5. use a framing square, speed square, and calculator in laying out a roof;
  6. identify various types of sheathing used in roof construction;
  7. frame or describe how to frame a gable roof with vent openings;
  8. erect, or describe how to erect, a gable roof using trusses;
  9. frame, or describe how to frame, a roof opening; and
  10. estimate the materials used for framing and sheathing a roof.



- Z. The student describes various types of windows, skylights, and exterior doors. The student is expected to:**
1. identify various types of fixed, sliding, and swinging windows;
  2. identify the parts of a window installation;
  3. state the requirements for proper window installation;
  4. explain how to install a pre-hung window;
  5. identify the common types of exterior doors and explain how they are constructed;
  6. identify the parts of a door installation;
  7. identify types of thresholds used with exterior doors;
  8. install, or explain the procedure to install, a pre-hung exterior door;
  9. identify the various types of locksets used on exterior doors and explain how the locksets are installed;
  10. install a lockset; and
  11. identify and explain the use and installation of various other door and window hardware, including security hinges, keepers, deadbolts, and peep holes.
- AA. The student describes various types of stairs and the common building code requirements related to stairs. The student is expected to:**
1. identify the various types of stairs;
  2. identify the various parts of stairs;
  3. identify the materials used in the construction of stairs;
  4. interpret construction drawings of stairs; and
  5. calculate the total rise, number and size of risers, and the number and size of treads required for a given stairway.
- BB. The student describes basic product marketing processes and techniques used in construction. The student is expected to prepare a marketing plan for an idea, product, or service.**
- CC. The student investigates career opportunities, requirements, and expectations in construction technology. The student is expected to:**
1. describe an area of interest in construction and investigate its entry-level requirements and advancement opportunity requirements and its growth potential; and
  2. identify the careers available in construction technology.
- DD. The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:**
1. describe how teams function;
  2. describe the use of teamwork to solve problems;
  3. distinguish between the roles of team leaders and team members;
  4. identify characteristics of good leaders;
  5. identify employers' expectations and appropriate work habits;
  6. define discrimination, harassment, and inequality; and
  7. describe the use of time-management techniques to develop and maintain work schedules and meet deadlines.





**EE. The student develops technology skills. The student is expected to:**

1. Use technology as a tool to research, organize, evaluate, and communicate information.
2. Use digital technologies (computers, PDAs, media players, GPSs, etc.), communication/networking tools, and social networks appropriately to access, manage, integrate, evaluate, and create information to successfully function in a knowledge economy.
3. Demonstrate utilizing current and new technologies specific to the program of study, course, and/or industry.
4. Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



## Construction Management II

1. **General requirements.** This course is recommended for students in Grades 11 and 12. Prerequisite: Construction Management I. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
  - A. Career and technical education 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 Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.
  - C. In Construction Management II, students will gain knowledge and skills needed to enter the workforce as apprentice carpenters or building maintenance supervisors' assistants or to build a foundation toward a postsecondary degree in architecture, construction science, drafting, or engineering. Construction Management II includes knowledge of the design, techniques, and tools related to the management of architectural and engineering projects.
  - D. Students will participate in a Career Preparation Work-Based Learning experience in this course, which might include paid or unpaid internship experiences relevant to the program of study.
  - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
  - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
    1. apply construction technology to individual or local problems;
    2. identify the appropriate resources needed to solve problems; and
    3. describe the factors that affect the purchase and use of buildings.
  - B. **The student designs or modifies a structure using designated design processes and techniques. The student is expected to:**
    1. develop or improve a building design that meets a specified need; and
    2. develop and communicate ideas using specified design processes.
  - C. **The student investigates emerging construction technologies. The student is expected to:**
    1. report on emerging construction technologies; and
    2. conduct research in construction technology to determine its effectiveness.
  - D. **The student describes quality and how it is measured in construction. The student is expected to:**
    1. construct items that meet a specified level of quality;
    2. recommend how the quality of a building can be improved; and
    3. explain the factors that affect the quality of buildings.



- E. **The student constructs buildings or scaled models using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:**
1. describe the chemical, mechanical, and physical properties and standard units of measure of architectural construction materials such as concrete, masonry, and metals;
  2. describe the processes used in construction; and
  3. construct a building or a model of a building using a variety of tools, equipment, and machines.
- F. **The student works safely with construction technology. The student is expected to:**
1. master relevant safety tests;
  2. follow safety manuals, instructions, and requirements;
  3. identify and classify hazardous materials and wastes correctly;
  4. dispose of hazardous materials and waste appropriately; and
  5. recommend improvements in safety procedures.
- G. **The student performs basic maintenance on selected construction equipment and machines. The student is expected to:**
1. maintain tools and materials correctly;
  2. perform manufacturers' maintenance procedures on selected tools, equipment, and machines; and
  3. develop a maintenance plan for selected machines and equipment.
- H. **The student manages construction technology projects. The student is expected to:**
1. initiate a construction technology project;
  2. plan a construction technology project, including developing a project schedule and describing use of resources needed;
  3. execute a construction technology project;
  4. monitor and control a construction technology project; and
  5. close a construction technology project.
- I. **The student follows the appropriate codes, laws, standards, or regulations related to architectural construction technology. The student is expected to:**
1. identify areas where codes, laws, standards, or regulations may be required;
  2. locate the appropriate codes, laws, standards, or regulations; and
  3. comply with the appropriate codes, laws, standards, or regulations.
- J. **The student solves problems, thinks critically, and makes decisions related to architectural construction. The student is expected to:**
1. develop or improve a building or structure by following a problem-solving strategy;
  2. apply critical-thinking strategies to the analysis and evaluation of proposed technological solutions; and
  3. apply decision-making techniques to the selection of technological solutions.
- K. **The student determines the cost of constructing a building. The student is expected to:**
1. develop a budget for a construction project; and
  2. determine the most effective strategies to minimize costs.



- L. **The student applies communication, mathematical, and scientific knowledge and skills to construction activities. The student is expected to:**
1. write technical reports;
  2. make technical presentations to groups of individuals;
  3. use mathematical concepts in construction technology; and
  4. apply scientific principles used in construction technology.
- M. **The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:**
1. describe how teams function;
  2. use teamwork to solve problems;
  3. distinguish between the roles of team leaders and team members;
  4. identify characteristics of good leaders;
  5. identify employers' expectations for appropriate work habits;
  6. define discrimination, harassment, and inequality;
  7. use time-management techniques to develop work schedules, maintain work schedules, and meet work schedule deadlines; and
  8. complete work according to established criteria.
- N. **The student gains knowledge about the ingredients of concrete, various types of concrete, and methods to mix concrete. The student is expected to:**
1. identify the properties of cement;
  2. describe the composition of concrete;
  3. perform volume estimates for concrete quantity requirements;
  4. describe types of concrete reinforcement materials;
  5. describe various types of footings and explain their uses;
  6. identify the parts of various types of forms;
  7. explain the safety procedures associated with the construction of concrete forms; and
  8. explain how to erect, plumb, and brace a simple concrete form with reinforcement.
- O. **The student uses a systems approach to investigate mechanical, fluid, electrical, and thermal systems. The student is expected to:**
1. apply the universal systems model to technological activities; and
  2. identify the inputs, processes, outputs, and feedback associated with each of the systems.
- P. **The student works safely with mechanical, fluid, electrical, and thermal technology. The student is expected to:**
1. master relevant safety tests;
  2. follow safety manuals, instructions, and requirements;
  3. identify and classify hazardous materials and wastes; and
  4. dispose of hazardous materials and wastes appropriately.
- Q. **The student solves problems, thinks critically, and makes decisions related to construction. The student is expected to:**
1. apply problem-solving strategies;



2. apply critical-thinking strategies;
  3. apply decision-making techniques to the selection of technological solutions; and
  4. evaluate the impact of technology on scientific thought, society, and the environment.
- R. **The student applies communication, science, and mathematics knowledge and skills to construction activities. The student is expected to:**
1. prepare technical reports and presentations;
  2. solve algebraic equations;
  3. solve problems in U.S. standard and metric units; and
  4. perform unit conversions.
- S. **The student knows the laws governing motion. The student is expected to:**
1. analyze examples of uniform and accelerated motion, including linear, projectile, and circular motion;
  2. evaluate the effects of forces on the motion of objects;
  3. develop a free-body diagram for force analysis; and
  4. analyze motion relative to different frames of reference.
- T. **The student knows the concept of momentum. The student is expected to:**
1. identify linear and angular momentum; and
  2. relate the conservation of momentum to linear and angular motion.
- U. **The student knows the concept of waves and vibrations. The student is expected to:**
1. evaluate characteristics of wave motion; and
  2. demonstrate how waves transmit energy.
- V. **The student knows the concept of energy conversion. The student is expected to:**
1. evaluate the purpose of energy converters;
  2. identify converters that change one form of energy to another; and
  3. evaluate the efficiency of converting energy from one form to another.
- W. **The student knows the concept of energy transduction. The student is expected to:**
1. identify the function of a transducer;
  2. distinguish between an energy converter and a transducer; and
  3. identify transducers that change energy signals from one form to another.
- X. **The student knows the concept of radiant energy. The student is expected to:**
1. describe radiation;
  2. compare fission and fusion in terms of end products, energy, advantages, and availability; and
  3. compare and contrast different types of radioactive decay.
- Y. **The student knows the concept of light and optics. The student is expected to:**
1. identify characteristics of optical devices;
  2. analyze the characteristics of light, including reflection, refraction, and interference; and
  3. interpret the effects of wave characteristics in daily applications such as lasers and optics in industrial and medical technology.



- Z. The student knows the concept of time constants. The student is expected to:**
1. define a time constant; and
  2. distinguish between a linear and non-linear increase and decrease of a variable with time.
- AA. The student describes basic product marketing processes and techniques used in construction. The student is expected to:**
1. prepare a marketing plan for an idea, product, or service; and
  2. discuss the effect of customer satisfaction on the image of a product or company.
- BB. The student investigates career opportunities, requirements, and expectations in construction technology. The student is expected to:**
1. identify an area of interest in construction and investigate its entry-level and advancement requirements and its growth potential; and
  2. describe the careers available in construction.
- CC. The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:**
1. describe how teams function;
  2. use teamwork to solve problems;
  3. distinguish between the roles of team leaders and team members;
  4. identify characteristics of good leaders;
  5. identify employers' expectations and appropriate work habits;
  6. define discrimination, harassment, and inequality;
  7. use time-management techniques to develop and maintain work schedules and meet deadlines; and
  8. complete work according to established criteria.
- DD. The student develops technology skills. The student is expected to:**
1. Use technology as a tool to research, organize, evaluate, and communicate information.
  2. Use digital technologies (computers, PDAs, media players, GPSs, etc.), communication/networking tools, and social networks appropriately to access, manage, integrate, evaluate, and create information to successfully function in a knowledge economy.
  3. Demonstrate utilizing current and new technologies specific to the program of study, course, and/or industry.
  4. Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.



## Practicum in Construction Technology

1. **General requirements.** This course is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Architecture and Construction Career Cluster. Prerequisite: Construction Technology II, Building Maintenance Technology II; Electrical Technology II; Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology II; or Plumbing Technology I. Students shall be awarded one credit for successful completion of this course.
2. **Introduction.**
  - A. Career and technical education instruction provides students with industry-aligned content, challenging academic standards, and relevant technical knowledge to further their education and succeed in current or emerging professions.
  - B. The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.
  - C. In Practicum in Construction Technology, students will be challenged with the application of knowledge and skills gained in previous construction-related coursework. In many cases, students will be allowed to work at a job (paid or unpaid) outside of school or be involved in local projects the school has approved for this class.
  - D. Students will participate in a Career Preparation Work-Based Learning experience in this course, which includes paid or unpaid internship, pre-apprenticeship, or apprenticeship experiences relevant to the program of study.
  - E. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
3. **Knowledge and skills.**
  - A. **The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:**
    1. explain the role of an employee in the construction industry;
    2. demonstrate critical-thinking skills;
    3. demonstrate the ability to solve problems using critical-thinking skills;
    4. demonstrate knowledge of basic computer systems;
    5. explain common uses for computers in the construction industry;
    6. demonstrate effective relationship skills; and
    7. recognize workplace issues such as sexual harassment, stress, and substance abuse.
  - B. **The student develops a management plan for a project or an activity. The student is expected to:**
    1. identify and describe the steps required to complete a project using project management processes, including initiating, planning, executing, monitoring and controlling, and closing a project;
    2. determine and acquire the resources needed to complete a project; and
    3. develop a project schedule.



- C. **The student applies the appropriate codes, laws, standards, or regulations related to a research and development project. The student is expected to:**
1. identify areas where codes, laws, standards, or regulations may be required;
  2. locate the appropriate codes, laws, standards, or regulations; and
  3. interpret and comply with the appropriate codes, laws, standards, or regulations.
- D. **The student describes the expectations for each project using a flowchart. The student is expected to:**
1. use an assessment strategy to determine the task's needs;
  2. describe why each task needs to be in the order it has been assigned;
  3. assess the time frame for each task; and
  4. plot a completed project flowchart expectation.
- E. **The student solves problems, thinks critically, and makes decisions related to research, design, and development. The student is expected to:**
1. develop or improve the project by following a problem-solving strategy;
  2. apply critical-thinking strategies to the analysis and evaluation of proposed technological solutions; and
  3. apply decision-making techniques to the selection of technological solutions.
- F. **The student describes the costs associated with the project. The student is expected to:**
1. develop a bill of materials list for the complete project;
  2. develop a budget, including a cost list, for the complete project; and
  3. determine the most effective way to minimize project costs.
- G. **The student applies communication, mathematics, and science knowledge and skills to the construction activities. The student is expected to:**
1. write technical reports;
  2. deliver technical presentations to the instructor;
  3. identify and describe the mathematical concepts used in projects; and
  4. identify and describe the scientific concepts used in projects.
- H. **The student uses advanced tools, materials, processes, and procedures in the construction project. The student is expected to:**
1. determine and use the appropriate technology needed to solve a problem or complete a task;
  2. evaluate the use of technology in a given situation; and
  3. describe the factors that influence the use of technology in a variety of situations.
- I. **The student develops technology skills. The student is expected to:**
1. Use technology as a tool to research, organize, evaluate, and communicate information;
  2. Use digital technologies (computers, PDAs, media players, GPSs, etc.); communication/networking tools, and social networks appropriately to access, manage, integrate, evaluate, and create information to successfully function in a knowledge economy;
  3. Demonstrate using current and new technologies specific to the program of study, course, and/or industry; and
  4. Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.