

# Carpentry



*Updated August 21, 2022*



**Office of the State Superintendent of Education  
Postsecondary and Career Education Division  
Career and Technical Education Department**

**Christina Grant, Ed.D.  
State Superintendent of Education**

**Antoinette Mitchell, Ph.D.  
Assistant Superintendent, Postsecondary and Career Education**

**Kilin Boardman-Schroyer  
Deputy Assistant Superintendent, Postsecondary and Career Education**

**Richard W. Kincaid  
State Director, Career and Technical Education**

The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Carpentry 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.



## Table of Contents

|  |                                     |
|--|-------------------------------------|
| <b>Carpentry Program of Study</b>                      | <b>4</b>                            |
| <b>Industry Certifications</b>                         | <b>4</b>                            |
| <b>Work-Based Learning Examples and Resources</b>      | <b>5</b>                            |
| <b>Labor Market Information Definitions and Data</b>   | <b>5</b>                            |
| <b>Model Six-Year Plan: Carpentry Program of Study</b> | <b>Error! Bookmark not defined.</b> |
| <b>Course Standards</b>                                | <b>8</b>                            |
| <b>Principles of Construction</b>                      | <b>8</b>                            |
| <b>Construction Technology I</b>                       | <b>11</b>                           |
| <b>Construction Technology II</b>                      | <b>16</b>                           |
| <b>Practicum in Construction Technology</b>            | <b>20</b>                           |
| <b>Equipment List: Carpentry</b>                       | <b>22</b>                           |



## Course Descriptions: Carpentry Program of Study

| Course Level | Course Information  | Description   |
|--------------|---|---|
| Level I      | <b>Principles of Construction</b><br><b>OSSEID:</b> 17002G1.0014<br><b>Grades:</b> 9-12<br><b>Prerequisite:</b> None                            | 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 Technology I</b><br><b>OSSEID:</b> 17016G1.0024<br><b>Grades:</b> 10-12<br><b>Prerequisite:</b> Principles of Construction      | In Construction Technology I, students will gain the knowledge and skills needed to enter the workforce as carpenters or building maintenance supervisors or to prepare for a postsecondary degree in construction management, architecture, or engineering. Students will acquire knowledge and skills in safety, tool usage, building materials, codes, and framing.  |
| Level III    | <b>Construction Technology II</b><br><b>OSSEID:</b> 17016G1.0034<br><b>Grades:</b> 11-12<br><b>Prerequisite:</b> Construction Technology I      | In Construction Technology II, students will gain advanced knowledge and skills needed to enter the workforce as carpenters, building maintenance technicians, or supervisors or to prepare for a postsecondary degree in construction management, architecture, or engineering. Students will build on the knowledge base from Construction Technology I and are introduced to exterior and interior finish out skills.  |
| Level IV     | <b>Practicum in Architectural Design</b><br><b>OSSEID:</b> 17951G1.0044<br><b>Grades:</b> 12<br><b>Prerequisite:</b> Construction Technology II | 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><br>Industry Visits<br>Guest Speakers<br>Participate in a CTSO | <b>Career Awareness</b><br><i>All of Level I, plus:</i><br>Postsecondary Visits Program-Specific Site Tours<br>Mock Interviews | <b>Career Preparation</b><br><i>All of Level I and II, plus:</i><br>Job Shadow<br>Paid/Unpaid Internships | <b>Career Preparation</b><br>Paid/Unpaid Internships<br>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 from 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 Carpentry Program of Study<br>(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.<br><br><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><br>47-2031.00 Carpenters<br><br><b>Hourly Wages</b><br><b>25<sup>th</sup> Percentile:</b> \$21.53<br><b>50<sup>th</sup> Percentile:</b> \$26.00<br><b>75<sup>th</sup> Percentile:</b> \$30.04 |



|                          |  |  |
|--------------------------|--|--|
| <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><br/>High School Diploma or Equivalent</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: 2,274</b></p>   |



## Model Six-Year Plan: Carpentry

**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:** Carpentry

| High School  |  |  |                            |  | College  |             |              |             |
|--|--|--|----------------------------|--|--|-------------|--------------|-------------|
| Subject  | 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 |
| English (4)  | English I                                  | English II                                   | English III                | English IV                                 |  |             |              |             |
| Math (4)   | Algebra I                                  | Geometry                                     | Algebra II                 | Math                                       |  |             |              |             |
| Science (4)  | Biology                                    | Lab Science                                  | Lab Science                | Science                                    |  |             |              |             |
| Social Studies (4)   | 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) |  |             |              |             |
| Health (.5) and Physical Ed (1)                                    | Health (.5)<br>Physical Ed (.5)            | Physical Ed (.5)                             |                            |  |  |             |              |             |
| World Languages (2)  |  |  | World Language I           | World Language II                          |  |             |              |             |
| Art (.5)   |  | Art (.5)                                     |                            |  |  |             |              |             |
| Music (.5)   |  | Music (.5)                                   |                            |  |  |             |              |             |
| Elective / Major Courses   | Principles of Construction                 | Construction Technology I                    | Construction Technology 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 Technology 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 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 Construction Technology I, students will gain the knowledge and skills needed to enter the workforce as carpenters or building maintenance supervisors or to prepare for a postsecondary degree in construction management, architecture, or engineering. Students will acquire knowledge and skills in safety, tool usage, building materials, codes, and framing. For safety and liability considerations, limiting course enrollment to 15 students is recommended.
  - 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. explain the role of an employee in the construction industry;
    2. apply 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; and
    7. recognize workplace issues such as sexual harassment, stress, and substance abuse.
  - 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 Occupational Safety and Health Administration (OSHA) in job-site safety;
    4. explain fall protection, ladder safety, stair safety, and scaffold safety procedures;
    5. explain the importance of hazard communication (HazCom);
    6. explain the importance of Safety Data Sheets (SDS);



7. explain OSHA's General Duty Clause;
  8. explain OSHA 1926 CFR Subpart C;
  9. identify causes of accidents;
  10. identify impacts of accident costs;
  11. identify struck-by hazards;
  12. identify caught-in-between hazards;
  13. identify other construction hazards on the jobsite, including hazardous material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires;
  14. define safe work procedures around electrical hazards;
  15. define hazard recognition;
  16. define risk assessment techniques; and
  17. demonstrate the use and care of appropriate personal protective equipment, including safety goggles and glasses, hard hats, gloves, safety harnesses, and safety shoes.
- C. **The student identifies various opportunities in the field of carpentry and the characteristics a carpenter should possess. The student is expected to:**
1. identify job opportunities and their accompanying job duties such as carpentry, building maintenance supervisor, architect, and engineer; and
  2. research careers along with the education, job skills, and experience required to achieve them.
- D. **The student gains knowledge about building materials used in the construction industry. The student is expected to:**
1. identify various types of building materials and their uses;
  2. state the uses of various types of hardwoods and softwoods;
  3. identify the different grades and markings of wood building materials;
  4. describe the proper method of storing and handling building materials;
  5. state the uses of various types of engineered lumber;
  6. calculate the quantities of lumber and wood products using industry-standard methods; and
  7. describe the fasteners, anchors, and adhesives used in construction work and explain their uses.
- E. **The student applies the proper and safe use of hand and power tools associated with carpentry. The student is expected to:**
1. identify the hand tools commonly used by carpenters and describe their uses;
  2. use hand tools in a safe and appropriate manner;
  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 in a safe and appropriate manner.
- F. **The student interprets architectural and engineering working drawings and specifications. The student is expected to:**
1. describe the types of drawings usually included in a set of plans and list the information found on each type;
  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;
  8. identify and describe the parts of a specification; and
  9. demonstrate or describe how to perform a quantity takeoff for materials.
- G. The student gains knowledge of wood framing and the 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. read and interpret drawings and specifications to determine floor system requirements;
  3. identify floor and sill framing and support members;
  4. name the methods used to fasten sills to the foundation;
  5. select the proper girder or beam size from a list of available girders or beams given specific floor load and span data;
  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;
  11. layout and construct a floor assembly;
  12. install bridging;
  13. install joists for a cantilever-floor;
  14. install a subfloor using butt-joint plywood or oriented strand board panels; and
  15. install a single floor system using tongue-and-groove (T&G) plywood or oriented strand board (OSB) panels.
- H. The student knows how to layout and frame walls and ceilings, rough-in door and window openings, construct corners and partition Ts, brace 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 the installation of plates, corner posts, door and window openings, partition Ts, bracings, and firestops;
  3. describe the correct procedure for assembling and erecting an exterior wall;
  4. identify the common materials and methods used for installing sheathing on walls;
  5. layout, 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. cut and install ceiling joists on a wood frame building; and
  9. estimate the materials required for frame walls and ceilings.
- I. The student gains knowledge of various types of framed roofs and how to frame these roofs using both stick-build and truss-build systems. 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 a gable roof with vent openings;
  8. erect a gable roof using trusses;
  9. frame a roof opening; and
  10. estimate the materials used for framing and sheathing a roof.
- J. **The student knows 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;
  4. identify types of concrete reinforcement materials and describe their uses;
  5. identify various types of footings and explain their uses;
  6. identify the parts of various types of concrete forms;
  7. explain the safety procedures associated with the construction and use of concrete forms; and
  8. erect, plumb, and brace a simple concrete form with reinforcement.
- K. **The student gains knowledge of 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. 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 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 door and window hardware, including security hinges, keepers, deadbolts, and peepholes.
- L. **The student is introduced to 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;
  5. calculate the total rise, number, and size of risers, and the number and size of treads required for a given stairway;
  6. layout and cut stringers, risers, and treads; and
  7. build a small stair unit with a temporary handrail.



**M. 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 Technology II

1. **General requirements.** This course is recommended for students in Grades 11 and 12. Prerequisite: Construction 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 Construction Technology II, students will gain advanced knowledge and skills needed to enter the workforce as carpenters, building maintenance technicians, or supervisors or to prepare for a postsecondary degree in construction management, architecture, or engineering. Students will build on the knowledge base from Construction Technology I and are introduced to exterior and interior finish out skills.
  - 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. 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; and
    7. recognize workplace issues such as sexual harassment, stress, and substance abuse.
  - B. **The student is provided with the knowledge to interpret various types of working drawings as they pertain to commercial construction. The student is expected to:**
    1. recognize the difference between commercial and residential construction drawings;
    2. identify the basic keys, abbreviations, and other references contained in a set of commercial drawings;
    3. accurately read a set of commercial drawings;
    4. identify and document specific items from a door and window schedule;
    5. explain basic construction details and concepts employed in commercial construction; and
    6. calculate the floor area of each room in a floor plan.





- C. **The student selects and installs common roofing materials for residential and light commercial projects. The student is expected to:**
1. identify the materials and methods used in roofing;
  2. explain the safety requirements for roof jobs;
  3. install fiberglass shingles on gable and hip roofs;
  4. close up a valley using fiberglass shingles;
  5. explain how to make various roof projections watertight when using fiberglass shingles;
  6. complete the proper cuts and install the main and hip ridge caps using fiberglass shingles;
  7. layout, cut, and install a cricket or saddle;
  8. install wood shingles and shakes on roofs;
  9. describe how to close up a valley using wood shingles and shakes;
  10. complete the cuts and install the main and hip ridge caps using wood shakes or shingles; and
  11. demonstrate the techniques for installing other selected types of roofing materials.
- D. **The student selects and installs various types of insulation in walls, floors, and attics. The student is expected to:**
1. describe the requirements for insulation;
  2. describe the characteristics of various types of insulation material;
  3. calculate the required amounts of insulation for a structure;
  4. install selected insulation materials;
  5. describe the requirements for moisture control and ventilation;
  6. install selected vapor barriers;
  7. describe various methods of waterproofing;
  8. describe air infiltration control requirements; and
  9. install selected building wraps.
- E. **The student learns the processes to install various exterior siding materials. The student is expected to:**
1. describe the purpose of wall insulation and flashing;
  2. install selected common cornices;
  3. demonstrate lap and panel siding estimating methods;
  4. describe the types and applications of common wood siding;
  5. describe fiber-cement siding and its uses;
  6. describe the types and styles of vinyl and metal siding;
  7. describe the types and applications of stucco and masonry veneer finishes; and
  8. install three types of siding commonly used in the local area.
- F. **The student knows the types and grades of steel framing materials and the process for installing metal framing for interior walls, exterior nonbearing walls, and partitions. The student is expected to:**
1. identify the components of a steel framing system;
  2. identify and select the tools and fasteners used in a steel framing system;
  3. identify applications for steel framing systems;
  4. demonstrate the ability to build back-to-back, box, and L-headers;
  5. layout and install a steel stud structural wall with openings to include bracing and blocking; and
  6. layout and install a steel-stud, non-structural wall with openings to include bracing and blocking.



- G. The student knows various types of gypsum drywall and their uses and the fastening devices and methods used to install them. The student is expected to:**
1. identify the different types of drywall and their uses;
  2. select the type and thickness of drywall required for specific installations;
  3. select fasteners for drywall installations;
  4. explain the fastener schedules for different types of drywall installations;
  5. perform single-layer and multi-layer drywall installations using different types of fastening systems, including nails, drywall screws, and adhesives;
  6. install gypsum drywall on steel studs;
  7. explain how soundproofing is achieved in drywall installations; and
  8. estimate material quantities for a drywall installation.
- H. The student knows the materials, tools, and methods used to finish and patch gypsum drywall. The student is expected to:**
1. state the differences between the six levels of finish established by industry standards and distinguish between finish levels by observation;
  2. identify the hand tools used in drywall finishing and demonstrate the ability to use these tools;
  3. identify the automatic tools used in drywall finishing;
  4. identify the materials used in drywall finishing and state the purpose and use of each type of material, including compounds, joint reinforcing tapes, trim materials, textures, and coatings;
  5. finish drywall using hand tools;
  6. recognize various types of problems that occur in drywall finishes and identify their causes;
  7. identify the correct methods for solving each type of problem that occurs in drywall finishes; and
  8. patch damaged drywall.
- I. The student installs metal doors and related hardware in steel-framed, wood-framed, and masonry walls. The student is expected to:**
1. identify various types of door jambs and frames;
  2. demonstrate the installation procedures for placing door jambs and frames in different types of interior partitions;
  3. identify different types of interior doors;
  4. identify different types of interior door hardware and demonstrate the installation procedures for them;
  5. list and identify items included on a typical door schedule; and
  6. demonstrate the procedure for placing and hanging a door.
- J. The student gains knowledge of the materials, layout, and installation of various types of suspended ceilings used in commercial construction, as well as ceiling tiles, drywall suspension systems, and pan-type ceilings. The student is expected to:**
1. establish a level line;
  2. explain the common terms related to sound waves and acoustical ceiling materials;
  3. identify the different types of suspended ceilings;
  4. interpret plans related to ceiling layout;
  5. sketch the ceiling layout for a basic suspended ceiling; and
  6. install selected suspended ceilings.



- K. The student knows the types of trim used in finished work. The student is expected to:**
1. identify the different types of standard moldings and describe their uses;
  2. make square and miter cuts using a miter box, or power miter saw;
  3. make coped joint cuts using a coping saw;
  4. select and use fasteners to install trim, including door trim, window trim, base trim, and ceiling trim; and
  5. estimate the quantities of different trim materials required for selected rooms.
- L. The student selects and installs base and wall cabinets and countertops. The student is expected to:**
1. state the classes and sizes of typical base and wall kitchen cabinets;
  2. identify cabinet components and hardware and describe their purposes;
  3. layout factory-made cabinets, countertops, and backsplashes;
  4. explain the installation of an island base;
  5. recognize the common types of woods used to make cabinets;
  6. identify and cut the various types of joints used in cabinetmaking;
  7. build a cabinet from a set of drawings; and
  8. install plastic laminate on a countertop core.
- M. 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.



## 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.



## Equipment List: Carpentry

| Equipment or Tool Name                    | Minimum Quantity |
|---|------------------|
| Planer with Grinder, 16"                  | 1                |
| Tilting Table Saw w/T-Square Fence, 10"   | 2                |
| Bench Grinder, 8"                         | 1                |
| Radial Arm Saw, 12" with Blades           | 2                |
| Compound Miter Saw, 10"                   | 2                |
| Jointer, 6"                               | 1                |
| Band Saw, 14"                             | 2                |
| Drill Press, 15"                          | 1                |
| Wood Shaper                               | 1                |
| Belt Sander, 37" (Recommended)            | 1                |
| Air Compressor                            | 1                |
| Air/electric, Nailer/Stapler              | 4                |
| Air Hose, 50'                             | 4                |
| Biscuit Joiner                            | 1                |
| Heavy Duty Portable Router                | 2                |
| Plunge Router                             | 2                |
| Heavy Duty Power Hand Plane               | 1                |
| Power Saw, 7-1/4" with Blades             | 2                |
| Heavy Duty Scroll Saw w/Blades            | 2                |
| Heavy Duty Reciprocating Saw              | 2                |
| Heavy Duty Saber Saw w/ Blades            | 2                |
| Portable Belt Sander                      | 2                |
| Orbital Sander or 1/2-sheet Finish Sander | 2                |
| Detail Sander                             | 2                |
| Pad Sander                                | 2                |
| Oscillating Edge Sander                   | 1                |
| Cordless Hand Drill, 12v min.             | 4                |
| Electric Hand Drill 3/8"                  | 2                |
| Electric Hand Drill, 1/2"                 | 1                |
| Carbide Masonry Drill bit Set             | 1                |
| Paint Brushes, Assorted                   | 1                |
| Vise, Wood, 12"                           | 6                |
| Heavy Duty Vice, 6"                       | 1                |
| Hammer, Claw, 16 oz.                      | 15               |



|                                  |    |
|----------------------------------|----|
| Hammer, Sledge, 8 lb.            | 2  |
| Screwdriver Set                  | 4  |
| Socket Set, 3/8"                 | 2  |
| Socket Set, 1/2"                 | 2  |
| Wrench, Open End Set             | 2  |
| Wrench, Box End Set              | 2  |
| Wrenches, Allen                  | 1  |
| Wrench, Adjustable, 8"           | 4  |
| Pliers, Combination, 8"          | 6  |
| Pliers, Grip, 7-1/2"             | 6  |
| Pliers, Needle Nose, 6"          | 6  |
| Pliers, Diagonal Cutting         | 6  |
| Nut Driver Set                   | 2  |
| End Snips                        | 2  |
| Wood Chisel Set                  | 2  |
| Punch Chisel, Line up Set        | 1  |
| Nail Set, 1/32" – 1/8"           | 4  |
| Countersink Bit Set              | 2  |
| Power Wood Boring Bit Set        | 2  |
| Expansion Bit, 7/8" – 3"         | 2  |
| Sweep Brace Bit, 10-1/2"         | 1  |
| Jack Plane                       | 1  |
| Block Plane                      | 1  |
| Wood Rasp, 10"                   | 4  |
| Half Round Bastard, 10"          | 4  |
| Crow Bar, Gooseneck              | 4  |
| Tin Snips, Straight, 12"         | 2  |
| Square, Steel Framing, 16"x24"   | 6  |
| Square, Combination              | 6  |
| Square, Speed                    | 12 |
| Safety Glasses                   | 26 |
| Oiler, One Pint                  | 1  |
| Clamps, Spring Hand, Asst. Sizes | 1  |
| Clamps, 24"                      | 6  |
| Clamps, 72"                      | 6  |
| C-Clamps, 12 in.                 | 6  |
| Clamps, Corner/Miter Set         | 4  |
| Level, 24"                       | 6  |



|  |    |
|--|----|
| Level, 48"   | 4  |
| Tape, Steel, 25'   | 15 |
| Tape Measure, Steel, 100'  | 1  |
| Chalk line Reel, 100'  | 2  |
| Extension Cord, 25'  | 2  |
| Extension Cord 100'  | 2  |
| Brass Plumb, 12 oz.  | 2  |
| Putty Knife  | 4  |
| Caulking Gun   | 2  |
| Drywall Screw Gun  | 2  |
| T-Square, 4'   | 1  |
| Drywall Hammer   | 4  |
| Drywall Hole Saw   | 2  |
| Drywall Handsaw  | 2  |
| Ladder, 8' Fiberglass Step   | 2  |
| Shop Vacuum  | 2  |
| Crosscut Saw, 8 pt., 26" Blade   | 2  |
| Coping Saw   | 2  |
| Keyhole Saw  | 2  |
| Back Saw, 15 pt., 10"  | 1  |
| Paint Spray Gun w/Cup  | 1  |
| Pneumatic Face Frame Assembly Clamp Table (Recommended)  |    |
| Pneumatic Cabinet Door Clamp Assembly Table (Recommended)  | 1  |
| Dust Collection (Recommended) 3@300.00 up to \$20,000.00   | 1  |
| MDF Raised Panel Door System to include:<br>Table, Fences, Routers, Bits, Dust Hood<br>(Recommended) | 1  |
| Router – CNC Programmable  | 1  |
| Safety Speed Panel Saw   | 1  |
| Boring Machine, 2 Head min.  | 1  |
| Production Pocket-Hole Cutter  | 1  |