

**ESSENTIAL CURRICULUM**

**CONSTRUCTION TECHNOLOGY I**

**HOWARD COUNTY MARYLAND**

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## INTRODUCTION

In the study of Construction Management, students gain knowledge and skills in the application, design, production, and assessment of products, services, and management systems. Knowledge and skills in these areas prepare students for success in the modern world. The study of technology allows students to reinforce, apply, and transfer their academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. In addition to their general academic and technical knowledge and skills, students gain an understanding of available career opportunities and the requirements to enter those careers.

### Career Pathways

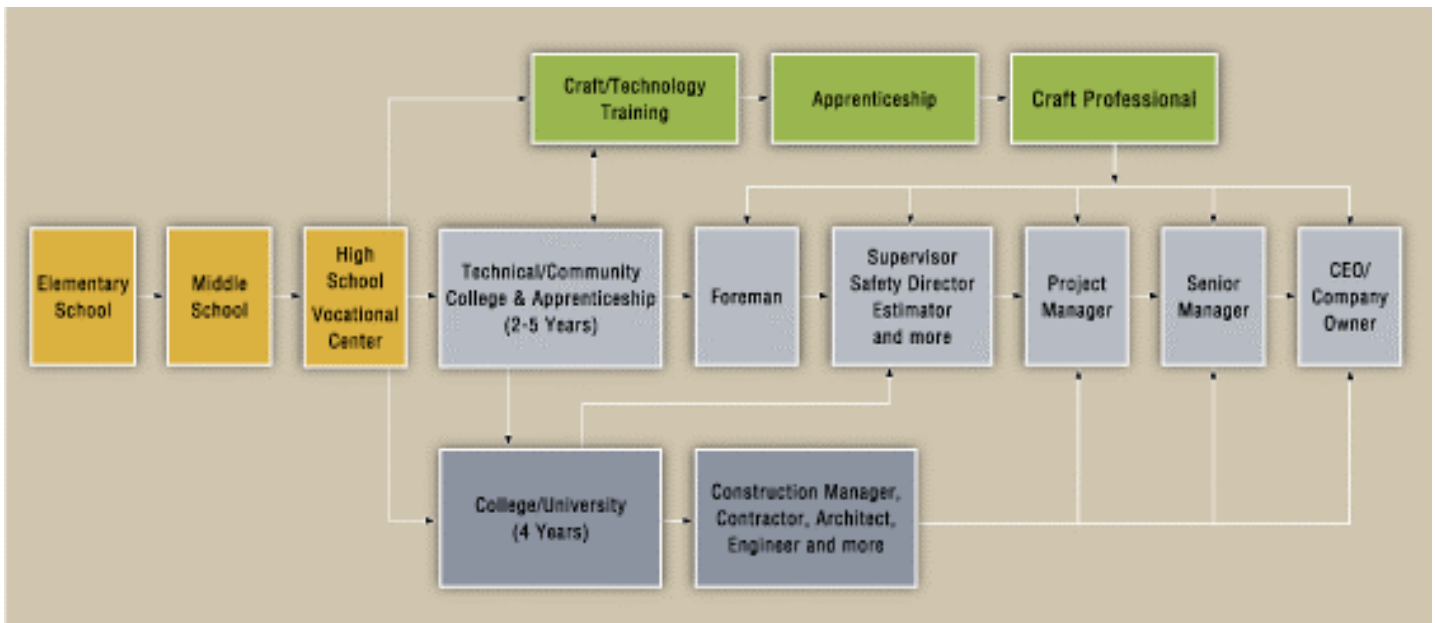


Chart Reference Page 6 - <http://www.prenhall.com/crafttraining/Catalog.pdf>

## PROGRAM DESCRIPTION

### **Construction Management Systems, Technology, and Applications**

Students study and use common and advanced construction tools, machines, materials, and processes. Experiences in design, planning and construction systems and projects allow students to explore the organizational structures and management strategies in Construction. Student activities include the use of CAD (Computer Assisted Design) in designing a residential structure and the actual construction of that design.

### **The 11<sup>th</sup>. Grade Capstone Project**

Eleventh Grade students, in compliance with local building codes, are responsible for the design, material estimation, project scheduling and construction of a one story dwelling as part of their final exam. Within a two to three month construction time frame, students experience a wide range of subjects including practical geometry, project delivery techniques, and project coordination. This practical application of the technical knowledge gained earlier in the program allows students to experience a genuine appreciation for good team building skills and the importance of communication skills within the construction industry.

### **Online Resources**

Construction Management students will have exclusive access to “**Contren Connect Online**” an interactive training site complete with lectures, slides, and self testing capability. All tests are graded electronically, with individual student reports available to the instructor and students.

### **The Senior Mentorship Program**

Twelfth grade students sharpen their skills and gain practical knowledge by working with professionals in a selected field of study. Construction Management students work with Civil Engineers, Architects, Commercial Builders, Residential Design-Build firms and Interior Design companies. Students selecting this option are responsible for their own transportation and report to class one day a week for further technical and life skills seminars. Students maintain daily logs related to their work experience and incorporate this information into their portfolio and final Senior Presentation.

Students choosing an in-school mentorship are provided with an advanced project focusing on skills, which simulate actual on-site experiences.

### **National Certification**

Successful completion of this program will qualify students for national certification through the **National Center for Construction Education and Research (NCCER)** which is a not-for-profit education foundation created to help address the critical workforce shortage facing the construction industry and to develop industry-driven standardized craft training programs with portable credentials.

**NATIONAL REGISTRY - NCCER** maintains a National Registry in order to provide students and craft professionals with industry-recognized credentials and assure national portability of skills. These credentials benefit students as they seek employment and build their careers.

## **STUDENT EXPECTATIONS**

Students are responsible for:

- Maintaining a portfolio of all class assignments, projects and homework
- Submitting all assignments on time
- Observing school policies related to classroom expectations and respect for others
- Replacing the cost of damaged hardware and software used
- Using internet sites appropriate for class
- Using only those computers assigned to you
- Recognizing that guest speakers are volunteering their time; show them the proper respect!

## **TEAM WORK / GROUP EXPECTATIONS**

Student teams are responsible for:

- Recognizing individual strengths within the group
- Capitalizing on individual strengths through division of work
- Recognize that a combination of individual parts make up the total project
- Demonstrating regard for the group in submitting your part on time
- Working cooperatively, your expected to ask others for input
- Maintaining notes on project specifications, and research items
- Understanding the project and your responsibility to the group
- Using time efficiently and respecting the time of others within the group
- Submitting all charts and materials in an organized manor

**MARYLAND  
SCHOOL PERFORMANCE  
PROGRAM**

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**HIGH SCHOOL  
CORE LEARNING GOALS**

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**SKILLS FOR SUCCESS CORE LEARNING GOAL LEDGER**

**Each of the objectives listed in the preceding curriculum outline is labeled to reference the core-learning goal it supports. The following ledger defines this labeling system.**

<b>LEARNING SKILLS [LS]</b>
<b>THINKING SKILLS [TS]</b>
<b>COMMUNICATION SKILLS [CS]</b>
<b>TECHNOLOGY SKILLS [TC]</b>
<b>INTERPERSONAL SKILLS [IS]</b>

## Scope and Sequence

### Core Curriculum – 72.5 Hours

Unit I MODULE 00101-04 – BASIC SAFETY

Unit II MODULE 00102-04 – INTRODUCTION TO CONSTRUCTION MATH

Unit III MODULE 00103-04 – INTRODUCTION TO HAND TOOLS

Unit IV MODULE 00104-04 – INTRODUCTION TO POWER TOOLS

Unit V MODULE 00105-04 – INTRODUCTION TO BLUEPRINTS

Unit VI MODULE 00106-04 – BASIC RIGGING

Unit VII MODULE 00107-04 – BASIC COMMUNICATION SKILLS

Unit VIII MODULE 00108-04 – BASIC EMPLOYABILITY SKILLS

### Level I Residential Foundations & Framing – 182.5 Hours

Unit IX MODULE 27101-06 – ORIENTATION TO THE TRADE

Unit X MODULE 27102-06 – BUILDING MATERIALS, FASTENERS, AND ADHESIVES

Unit XI MODULE 27103-06 – HAND AND POWER TOOLS

Unit XII MODULE 27104-06 – READING PLANS AND ELEVATIONS

Unit XIII MODULE 27202-01 – *Level II* SITE LAYOUT 1: DISTANCE MEASUREMENT & LEVELING

Unit XIV MODULE 27108-06 – INTRODUCTION TO CONCRETE AND REINFORCING MATERIALS

Unit XV MODULE 27204-01 – *Level II* FOUNDATIONS AND FLATWORK

Unit XVI MODULE 27105-06 – FLOOR SYSTEMS

Unit XVII MODULE 27106-06 – WALL AND CEILING FRAMING

Unit XVIII MODULE 27107-06 – ROOF FRAMING

Unit XIX MODULE 27109-06 – WINDOWS AND EXTERIOR DOORS

Unit XX MODULE 27110-06 – BASIC STAIR LAYOUT



## OVERARCHING GOALS & OBJECTIVES

### CORE CURRICULUM

#### I. MODULE 00101-04 – BASIC SAFETY

##### Goal

Demonstrate an understanding of job-site safety practice regarding personal safety, tool & equipment safety and hazardous material.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Explain the role that safety plays in the construction crafts.
2. [TS] Describe the meaning of job-site safety.
3. [TS] Describe the characteristics of a competent person and a qualified person.
4. [TS] Explain the appropriate safety precautions to take around common job-site hazards.
5. [TC] Demonstrate the use and care of appropriate personal protective equipment (PPE).
6. [TC] Properly don and remove personal protective equipment (safety goggles, hard hat, and personal fall protection).
7. [TC] Follow the safety procedures required for lifting heavy objects.
8. [TS] Describe safe behavior on and around ladders and scaffolds.
9. [TS] Explain the importance of Hazard Communications (HazCom) and material safety data sheets (MSDSs).
10. [TS] Describe fire prevention and firefighting techniques.
11. [TS] Define safe work procedures to use around electrical hazards.

#### II. MODULE 00102-04 – INTRODUCTION TO CONSTRUCTION MATH

##### Goal

Demonstrate an understanding of material estimating and load calculations through the usage of fractions, estimating formulas, and practical geometry.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Add, subtract, multiply, and divide whole numbers, with and without a calculator.
2. [TS] Use a standard ruler and a metric ruler to measure.
3. [TS] Add, subtract, multiply, and divide fractions.
4. [TS] Add, subtract, multiply, and divide decimals, with and without a calculator.
5. [TS] Convert decimals to percentages and percentages to decimals.
6. [TS] Convert fractions to decimals and decimals to fractions.
7. [TS] Explain what the metric system is and how it is important in the construction trade.
8. [TS] Recognize and use metric units of length, weight, volume, and temperature.
9. [TS] Recognize some of the basic shapes used in the construction industry, and apply basic geometry to measure them.

#### III. MODULE 00103-04 – INTRODUCTION TO HAND TOOLS

##### Goal

Identify and demonstrate the safe use and care of hand tools used in construction.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Recognize and identify some of the basic hand tools used in the construction trade.
2. Use hand tools safely.
3. [TS] Describe the basic procedures for taking care of hand tools.

#### **IV. MODULE 00104-04 – INTRODUCTION TO POWER TOOLS**

##### **Goal**

Identify and demonstrate the safe use and care of power tools used in construction.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Identify power tools commonly used in the construction trades.
2. [TC] Use power tools safely.
3. [TS] Explain how to maintain power tools properly.

#### **V. MODULE 00105-04 – INTRODUCTION TO BLUEPRINTS**

##### **Goal**

Identify and interpret various terms, components, symbols and classifications associated with construction drawings.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Recognize and identify basic blueprint terms, components, and symbols.
2. [TS] Relate information on blueprints to actual locations on the print.
3. [TS] Recognize different classifications of drawings.
4. [TS] Interpret and use drawing dimensions.

#### **VI. MODULE 00106-04 – BASIC RIGGING**

##### **Goal**

Identify and describe sling usage, inspection techniques, hitch configurations, hand signals and safe loading practices applied in basic rigging.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Identify and describe the use of slings and common rigging hardware.
2. [TS] Describe basic inspection techniques and rejection criteria used for slings and hardware.
3. [TS] Describe basic hitch configurations and their proper connections.
4. [TS] Describe basic load-handling safety practices.
5. [TS] Demonstrate proper use of American National Standards Institute (ANSI) hand signals.

#### **VII. MODULE 00107-04 – BASIC COMMUNICATION SKILLS**

##### **Goal**

Demonstrate the ability to interpret verbal and written instruction and communicate the instructions to a construction team.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Demonstrate the ability to interpret information and instructions presented in both written and verbal form.
2. [IS] Demonstrate the ability to communicate effectively in on-the-job situations using written and verbal skills.

## VIII. MODULE 00108-04 – BASIC EMPLOYABILITY SKILLS

### Goal

Demonstrate an understanding of a professional work ethic, appropriate leadership skills, problem solving and effective workplace relationships and equity.

**Objectives:** After completing this activity, the student will be able to:

1. [IS] Explain the construction industry, the role of the companies that make up the industry, and the role of individual professionals in the industry.
2. [IS] Demonstrate critical thinking skills and the ability to solve problems using those skills.
3. [IS] Demonstrate knowledge of computer systems, and explain common uses for computers in the construction industry.
4. [IS] Demonstrate effective relationship skills with teammates and supervisors, the ability to work on a team, and appropriate leadership skills.
5. [IS] Be aware of workplace issues such as sexual harassment, stress, and substance abuse.

## IX. MODULE 27101-06 – ORIENTATION TO THE TRADE

### Goal

Become familiar with the history of construction, and the professional characteristics and responsibilities of a person working in the construction industry.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Describe the history of the carpentry trade.
2. [LS] Identify the aptitudes, behaviors, and skills needed to be a successful carpenter.
3. [LS] Identify the training opportunities within the carpentry trade.
4. [LS] Identify the career and entrepreneurial opportunities within the carpentry trade.
5. [LS] Identify the responsibilities of a person working in the construction industry.
6. [TS] State the personal characteristics of a professional.
7. [TS] Explain the importance of safety in the construction industry.

## X. MODULE 27102-06 – BUILDING MATERIALS, FASTENERS, AND ADHESIVES

### Goal

Identify types and usage of building materials, fasteners, and adhesives used in the construction industry.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Identify various types of building materials and their uses.
2. [TS] State the uses of various types of hardwoods and softwoods.
3. [LS] Identify the different grades and markings of wood building materials.
4. [LS] Identify the safety precautions associated with building materials.
5. [TS] Describe the proper method of storing and handling building materials.
6. [TS] State the uses of various types of engineered lumber.
7. [TS] Calculate the quantities of lumber and wood products using industry-standard methods.
8. [TS] Describe the fasteners, anchors, and adhesives used in construction work and explain their uses.

## XI. MODULE 27103-06 – HAND AND POWER TOOLS

### GOAL:

Demonstrate the safe usage of hand, power and stationary equipment used in construction.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Identify the hand tools commonly used by carpenters and describe their uses.
2. [TC] Use hand tools in a safe and appropriate manner.
3. [TS] State the general safety rules for operating all power tools, regardless of type.
4. [TS] State the general rules for properly maintaining all power tools, regardless of type.
5. [LS] Identify the portable power tools commonly used by carpenters and describe their uses.
6. [TC] Use portable power tools in a safe and appropriate manner.

## XII. MODULE 27104-06 – READING PLANS AND ELEVATIONS

### GOAL:

Identify and interpret various terms, components, symbols and classifications associated with construction drawings.

**Objectives:** After completing this activity, the student will be able to:

1. [TS] Describe the types of drawings usually included in a set of plans and list the information found.
2. [LS] Identify the different types of lines used on construction drawings.
3. [LS] Identify selected architectural symbols commonly used to represent materials on plans.
4. [LS] Identify selected electrical, mechanical, and plumbing symbols commonly used on plans.
5. [LS] Identify selected abbreviations commonly used on plans.
6. [TC] Read and interpret plans, elevations, schedules, sections, and details contained in basic drawings.

## XIII. MODULE 27202-01 – SITE LAYOUT ONE: DISTANCE MEASUREMENT AND

### GOAL:

Interpret a site plan, plot plan, and foundation plan and layout and construct a corresponding footing and foundation wall using a leveling transit.

**OBJECTIVES:** After completing this activity, the student will be able to:

1. [TS] Describe the major responsibilities of the carpenter relative to site layout.
2. [TC] Convert measurements stated in feet and inches to equivalent measurements stated in decimal feet.
3. [TC] Use and properly maintain tools and equipment associated with taping.
4. [TC] Use taping and/or chaining equipment and procedures to make distance measurements.
5. [TS] Determine approximate distances by pacing.
6. [TC] Recognize, use, and properly care for tools and equipment associated with differential leveling.
7. [TC] Use a builder's level or transit and differential leveling procedures to determine elevations.
8. [TC] Record site layout data and information in field notes using accepted practices.
9. [TC] Check and/or establish 90° angles using the 3/4/5 rule.

#### **XIV. MODULE 27108-06 – INTRODUCTION TO CONCRETE, REINFORCING MATERIALS,**

##### **GOAL:**

Identify cement types, usage, testing methods, reinforcement methods and estimating procedures.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Identify the properties of cement.
2. [TS] Describe the composition of concrete.
3. [TC] Perform volume estimates for concrete quantity requirements.
4. [LS] Identify types of concrete reinforcement materials and describe their uses.
5. [LS] Identify various types of footings and explain their uses.
6. [LS] Identify the parts of various types of forms.
7. [TS] Explain the safety procedures associated with the construction and use of concrete forms.
8. [TC] Erect, plumb, and brace a simple concrete form with reinforcement.

#### **XV. MODULE 27204-01 – FOUNDATIONS AND FLATWORK**

##### **GOAL:**

Demonstrate the ability to identify and construct various types of footing and pier forms.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Identify various kinds of footings, including:
2. [LS] Identify the parts of footing forms and explain their purpose.
3. [LS] Identify the parts of pier forms and explain their purpose.
4. [TC] Demonstrate the ability to lay out and construct selected footing forms, including:
5. [TC] Strip a pier footing form and prepare it for erection at another location.
6. [LS] Identify types of concrete structures that require the construction of edge forms:
7. [LS] Identify the parts of edge forms and explain their purpose.
8. [TC] Demonstrate the ability to construct and disassemble edge forms for:
9. [TS] Explain the purpose of a screed and identify the different types of screeds.
10. [TC] Demonstrate the ability to set screeds on grade.

#### **XVI. MODULE 27105-06 – FLOOR SYSTEMS**

##### **GOAL:**

Demonstrate the ability to identify and construct various types of concrete forms in a safe manner.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Identify the different types of framing systems.
2. [LS] Read and interpret drawings and specifications to determine floor system requirements.
3. [LS] Identify floor and sill framing and support members.
4. [TS] Name the methods used to fasten sills to the foundation.
5. [TS] Given specific floor load and span data, select the proper girder/beam size from a list of girders.
6. [TS] List and recognize different types of floor joists.
7. [TS] Given specific floor load and span data, select the proper joist size from a list of available joists.
8. [TS] List and recognize different types of bridging.
9. [TS] List and recognize different types of flooring materials.
10. [TS] Explain the purposes of sub flooring and underlayment.
11. [TS] Match selected fasteners used in floor framing to their correct uses.
12. [TC] Estimate the amount of material needed to frame a floor assembly.
13. [TC] Demonstrate the ability to layout and construct a floor with all components.

## **XVII. MODULE 27106-06 – WALL AND CEILING FRAMING**

### **GOAL:**

Calculate girder load and layout and construct a floor through interpretation of a working drawing.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Identify the components of a wall and ceiling layout.
2. [TS] 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. [TS] Describe the correct procedure for assembling and erecting an exterior wall.
4. [LS] Identify the common materials and methods used for installing sheathing on walls.
5. [TC] Lay out, assemble, erect, and brace exterior walls for a frame building.
6. [TS] Describe wall framing techniques used in masonry construction.
7. [TS] Explain the use of metal studs in wall framing.
8. [TS] Describe the correct procedure for laying out ceiling joists.
9. [TC] Cut and install ceiling joists on a wood frame building.
10. [TC] Estimate the materials required to frame walls and ceilings.

## **XVIII. MODULE 27107-06 – ROOF FRAMING**

### **GOAL:**

Interpret working drawings and construct walls and partitions with rough openings and special framing components.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Understand the terms associated with roof framing.
2. [LS] Identify the roof framing members used in gable and hip roofs.
3. [LS] Identify the methods used to calculate the length of a rafter.
4. [LS] Identify the various types of trusses used in roof framing.
5. [TC] Use a rafter framing square, speed square, and calculator in laying out a roof.
6. [LS] Identify various types of sheathing used in roof construction.
7. [TC] Frame a gable roof with vent openings.
8. [TC] Frame a roof opening.
9. [TC] Erect a gable roof using trusses.
10. [TS] Estimate the materials used in framing and sheathing a roof.

## **XIX. MODULE 27109-06 – WINDOWS AND EXTERIOR DOORS**

### **GOAL:**

Identify roofing terms and theoretical lengths of roof components and cut and frame a roof.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Identify various types of fixed, sliding, and swinging windows.
2. [LS] Identify the parts of a window installation.
3. [TS] State the requirements for a proper window installation.
4. [TC] Install a pre-hung window.
5. [LS] Identify the common types of exterior doors and explain how they are constructed.
6. [LS] Identify the parts of a door installation.
7. [LS] Identify the types of thresholds used with exterior doors.
8. [TC] Install a pre-hung exterior door.
9. [LS] Identify the various types of locksets used on exterior doors and explain how they are installed.
10. [TC] Install a lockset.

## **XX. MODULE 27110-06 – BASIC STAIR LAYOUT**

### **GOAL:**

Interpret window and door schedules and install window and door units.

**Objectives:** After completing this activity, the student will be able to:

1. [LS] Identify the various types of stairs.
2. [LS] Identify the various parts of stairs.
3. [LS] Identify the materials used in the construction of stairs.
4. [TC] Interpret construction drawings of stairs.
5. [TS] Calculate the total rise, number and size of risers, and number and size of treads required.
6. [TC] Lay out and cut stringers, risers, and treads.
7. [TC] Build a small stair unit with a temporary handrail.

