



monarch

Curriculum Catalog

Career and Technical Education Series

Construction Careers

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Construction Careers Course Overview

This course in Construction Technology introduces students to the basics of construction, building systems, engineering principles, urban planning, and sustainability. Students will learn the key techniques in building all types of buildings, as well as the key individuals involved in each step of the process. Many lessons present information on green building techniques and concepts that are becoming a standard part of the construction industry. Safety practices are emphasized in several lessons because construction is one of the most dangerous industries; students will learn that there is no way to be successful in construction without taking such issues seriously. Toward this end, the lessons also explore regulatory agencies and guidelines established for the purpose of protecting not only construction workers but also the occupants of a building.

The evolution of building types and materials informs a discussion on modern techniques and materials, as the technology developed through the field of building science makes advances allowing buildings to be more efficient, more comfortable, and more impervious to natural disasters. We consider traditional and sustainable building materials, which are sometimes one and the same. This includes lumber, masonry, glass, steel, tar, and asphalt. Concrete deserves special mention as the world's most common building material and its importance in a building's foundation. In terms of engineering concepts, we study how buildings and structures handle forces of compression, tension, and shear. Building processes include shell and core construction, curtain walls, heavy timber frame construction, light frame construction, different types of foundations, and different truss systems for roofs.

Highlighted careers include hands-on construction positions such as carpenter, ironworker, mason, and plumber, but also those involved in the design of a building, such as architects and engineers, and those involved in the regulatory aspects of the built environment, including urban planners and building inspectors. Toward that end, the development and adoption of model building codes are discussed, along with the work of the Occupational Safety and Health Administration (OSHA), which is the primary regulatory agency devoted to workplace safety. Mechanical engineers, civil engineers, historical preservationists, developers, and general contractors are some of the other professionals that influence the design and construction of buildings.

To better understand how a building impacts the environment, we study the formal process of life-cycle assessment, which considers how resources are created, maintained, used, and disposed of throughout the life of a building. The cradle-to-grave process of a building is discussed. How a foundation is laid, then how shell and core construction works, then the installation of systems—HVAC, electric, plumbing—including a roof, curtain walls, and cladding. We discuss how buildings are designed for efficient operation for the bulk of their life cycle, and finally how they are demolished. We discuss how a proper building envelope functions and how different cladding systems help prevent thermal transfer while allowing a building to breathe.

Urban planning and land use are increasingly part of the dialogue in which builders, developers, and construction workers are engaged. Every building is bound by zoning ordinances and building codes, which is an element all construction workers must understand in order to have sufficient insight into their jobs.

Two specialty construction fields that are becoming increasingly mainstream are green construction and historical preservation, driven by the U.S. Green Building Council's LEED rating system and the National Historical Preservation Act, respectively. We discuss the rise of green building systems, including solar roofs, green roofs, and grey-water systems, and the processes integral to historical preservation, which include lead and asbestos abatement, renovation, and adaptive reuse. These are growth areas for those interested in construction, and each offers individuals many options for specialization in cutting-edge techniques or in historical preservation techniques, both of which are highly valued in today's construction climate.

Objectives

- Describe the career opportunities available in construction and construction technology and the educational path for each profession or trade.
- Chart how a construction project proceeds from beginning to end, naming the stakeholders and workers necessary at each stage of the process.
- Explain the concept of life-cycle assessment and its role in sustainable construction.
- Compare the different techniques and materials involved in building a residence with those involved in building a commercial structure or civil engineering project.
- Evaluate and explain various laws, regulations, and professions designed to make construction sites safe for workers and buildings safe for their inhabitants.
- Summarize shell and core construction, beginning with an explanation of various types of foundations and by examining wood-frame construction versus steel-frame construction.
- Explain how a building functions as a system by describing the purpose of a building’s envelope, roof, and cladding materials.
- Identify trends in sustainable construction, urban planning, and historical preservation.

This class has no prerequisites, but students should be interested in the built environment and skilled jobs that are very hands-on. Experience conducting online research is a plus, and having access to a digital camera of some sort is important for completing several of the lesson projects. Students will need a computer and reliable access to the Internet, as well as a dedicated notebook for use as a journal.

A couple of projects involve going out into the community and conducting interviews. Thus, good communication skills and a sense of professionalism are a plus. Knowledge of or experience with power tools, carpentry, or any skilled trades is useful but not necessary.

Unit 1: Introduction to Careers in Construction Technology	
Assignments	
Construction Careers	1. Course Overview
	2. Construction Technology: Past, Present, and Future
	3. Project: Site View, Elevation View, and Plan View of Your House
	4. The Civil Engineer: Construction, Function, and Assessment
	5. Project: Be a Structural Engineer
	6. Contractors, Managers, and Foremen: Coordinating a Building Project
	7. Quiz 1: From Plans to Permanence: How Buildings Get Made
	8. Excavators, Masons, and Ironworkers
9. Plumbers, Electricians, and HVAC Professionals	
10. Project: Create a Fact Sheet on Plumbing Tip: How to Fix a Running Toilet	
11. Carpenters, Glaziers, and Other Tradespeople	
12. Project: Using Carpentry Skills to Create a Corrugated Cardboard Shadow Box	
13. Quiz 2: Building Systems and the Evolution of the Trades	
14. Special Project*	
15. Test	
16. Course Project Part 1: Design and Build Your Dream House*	
17. Glossary and Credits	

Unit 2: Building Life-Cycle Assessment and Regulation	
Assignments	
Construction Careers	1. Life-Cycle Assessment: Materials Manufacturing
	2. Project: Analyze a Life-Cycle Assessment Case Study
	3. Life-Cycle Assessment and Construction Methods
	4. Life-Cycle Assessment: Demolition
	5. Project: Construction and Demolition Materials in Single-Family Homes: Analyze an EPA Report
	6. Quiz 1: Life-Cycle Assessment: from Cradle to Grave
	7. Job-Site Safety and OSHA
8. Building Codes and Inspection	
9. Project: Interview a Building Inspector	
10. Urban Planning and Zoning	
11. Project: Plan Your Own Town	
12. Quiz 2: Building Codes and Regulation	
13. Special Project*	
14. Test	
15. Course Project Part 2: Your Dream House: Site Plan and Foundation*	
16. Glossary and Credits	

Unit 3: Building Materials and Methods of Construction 1		
Assignments		
Construction Careers	1. Shell and Core Construction: Foundations	9. Light-Frame Construction
	2. Project: Foundation Investigation: What's Beneath These World Landmarks	10. The Business of Building
	3. Shell and Core Construction: Concrete and Masonry	11. Project: Seattle's SR 99: The Alaskan Way Viaduct Replacement Tunnel
	4. Project: How to Build a Concrete-Framed Building	12. Quiz 2: Heavy- and Light-Frame Construction
	5. Steel-Frame Construction	13. Special Project*
	6. Quiz 1: Foundations and Shell and Core Construction	14. Test
	7. Heavy Timber-Frame Construction	15. Course Project Part 3: Your Dream House and Sustainable Design: Materials*
	8. Project: Joinery with Soap and Foam Board	16. Glossary and Credits

Unit 4: Building Materials and Methods of Construction 2		
Assignments		
Construction Careers	1. Roof Structures and Styles	10. Building Science
	2. Roofing Trusses and Materials	11. Project: Hurricane Sandy and Building Science
	3. Project: The Triangle vs. The Rectangle	12. Quiz 2: The Envelope and External Finishes
	4. Green Roofs and Solar Roofs	13. Special Project*
	5. Project: Exploring Cool Roofs	14. Test
	6. Quiz 1: The Roof: Engineering Principles and Materials	15. Course Project Part 4: Your Dream House and Sustainable Design: Components of Green Building*
	7. The Building Envelope	16. Glossary and Credits
	8. Types of Building Cladding	
	9. Project: Do-It-Yourself Cladding	

Unit 5: Green Technology, Sustainability, and Preservation		
Assignments		
Construction Careers	1. Sustainable Construction and Green Construction Codes	9. Project: Adaptive Reuse in Your Community
	2. Project: Sustainable Shelter: The FEMA Trailer vs. the Katrina Cottage	10. Preservation Trades Education and Safety
	3. Green and Not-So-Green Building Materials	11. Project: Finding Work in the Field of Historic Preservation
	4. Green Construction Jobs	12. Quiz 2: Historical Preservation and Construction
	5. Project: Interview a Green Builder	13. Special Project*
	6. Quiz 1: Green Construction Technology	14. Test
	7. Historic Preservation	15. Course Project Part 5: Schedule Your Dream Home Build*
	8. Adaptive Reuse	16. Glossary and Credits

Unit 6: Course Review, and Exam		
Assignments		
CC	1. Course Project Part 6: Your Dream House: Putting It All Together*	2. Review
		3. Exam

(*) Indicates alternative assignment