



# ENLIGHTIUM ACADEMY

Ignitia™ Career and Technical Education  
Electives

Architecture & Construction

Enlightium Academy invites you to open the door to career and college readiness with Career and Technical Education (CTE) courses from Alpha Omega Publications - Ignitia™.

These rigorous, hands-on courses for grades 7-12 promote critical thinking, emphasize problem solving, and encourage students to take responsibility for their own learning. With 24 CTE courses divided into six clusters, these courses put students on practical paths to post-graduate success.

Should you have any questions about the curriculum, please contact [support@enlightiumacademy.com](mailto:support@enlightiumacademy.com) or call Enlightium Academy Customer Support at (866) 488-4818 ext. 2017.

If you have questions about technical support or product configuration, please see the information below for Alpha Omega Publications.

### **Alpha Omega Publications Technical Support**

Alpha Omega Publications' technical support is Ignitia™'s full-service technical support system. We exist to promote and preserve our customers' satisfaction. Our services include:

- Technical Support
- Product Configuration and Update Management

Please use the following information to contact Alpha Omega Publications' technical support:

**Online:**

Access our helpful Technical Support website simply by clicking on the life preserver located in the upper-right corner of any screen in our program!

**Telephone:**

Toll Free: 1-877-251-6662  
Monday –Friday 7 a.m. to 5 p.m. (CT)

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

UNIT 4: BUILDING MATERIALS AND METHODS OF CONSTRUCTION 2	
<b>CONSTRUCTION CAREERS</b>	<b>Assignment Titles</b>
	1. Roof Structures and Styles
	2. Roofing Trusses and Materials
	3. Project: The Triangle vs. The Rectangle
	4. Green Roofs and Solar Roofs
	5. Project: Exploring Cool Roofs
	6. Quiz 1: The Roof: Engineering Principles and Materials
	7. The Building Envelope
	8. Types of Building Cladding
	9. Project: Do-It-Yourself Cladding
	10. Building Science
	11. Project: Hurricane Sandy and Building Science
	12. Quiz 2: The Envelope and External Finishes
	13. Project: Special Project*
	14. Test
	15. Course Project Part 4: Your Dream House and Sustainable Design: Components of Green Building*
16. Glossary and Credits	

UNIT 5: GREEN TECHNOLOGY, SUSTAINABILITY, AND PRESERVATION	
<b>CONSTRUCTION CAREERS</b>	<b>Assignment Titles</b>
	1. Sustainable Construction and Green Construction Codes
	2. Project: Sustainable Shelter: The FEMA Trailer vs. the Katrina Cottage
	3. Green and Not-So-Green Building Materials
	4. Green Construction Jobs
	5. Project: Interview a Green Builder
	6. Quiz 1: Green Construction Technology
	7. Historic Preservation
	8. Adaptive Reuse
	9. Project: Adaptive Reuse in Your Community
	10. Preservation Trades Education and Safety
	11. Project: Finding Work in the Field of Historic Preservation
	12. Quiz 2: Historical Preservation and Construction
	13. Project: Special Project*
	14. Test
	15. Course Project Part 5: Schedule Your Dream Home Build*
16. Glossary and Credits	

UNIT 6: COURSE REVIEW, AND EXAM	
<b>CONSTRUCTION CAREERS</b>	<b>Assignment Titles</b>
	1. Course Project Part 6: Your Dream House: Putting It All Together*
	2. Review
	3. Exam

(\*) Indicates alternate assignment