Course Title:

Construction: A Tour through the Trades

Course Description:

The course aims to equip students with the comprehensive skills and knowledge required for success in the construction industry. This hands-on course introduces students to the fundamental skills and knowledge needed to work in five essential building trades: plumbing, electrical, HVAC-R, masonry, and several carpentry trades. In this course for beginners, students will learn tool safety and technical skills and engage in activities to prepare for further training or entry-level work in the trades. Additionally, units will include health and safety practices, technical drawing interpretation, and sustainable energy solutions. Additionally, students will enhance their problem-solving, teamwork, and communication skills and explore entrepreneurship opportunities within the construction field.

The **Carpentry** units will provide essential skills in woodworking, framing, structural construction, and technical drawing, along with required safety skills. The **Electrical** unit will focus on wiring basics, circuitry, and safe practices for handling electrical components. In the **Plumbing** unit, students will practice pipe installation, repair, and troubleshooting along with understanding water supply and drainage systems. During the **HVAC-R** unit, students will gain a foundational understanding of heating, cooling, and ventilation systems, including refrigerant handling and system maintenance. Additionally, the **Masonry**, **Drywalling**, and **Finishing** units will teach students techniques for constructing, repairing, and finishing walls, including proper use of materials and tools.

Virtual reality (VR) simulations will be incorporated alongside hands-on projects throughout the course to enhance the student learning experience. These simulations will provide practice in tasks such as troubleshooting electrical circuits, navigating HVAC systems, and performing complex carpentry cuts, enhancing hands-on skills in a safe and controlled environment.

In addition to classroom and workshop instruction, the course includes field trips to local job sites, guest speakers from the industry and post-secondary credential-granting institutions (Peterson School, Franklin Cummings Tech, North Bennett Street), and collaboration with the Brookline Building Department so that students will understand the regional trades labor market.

DESE Career Cluster: Construction

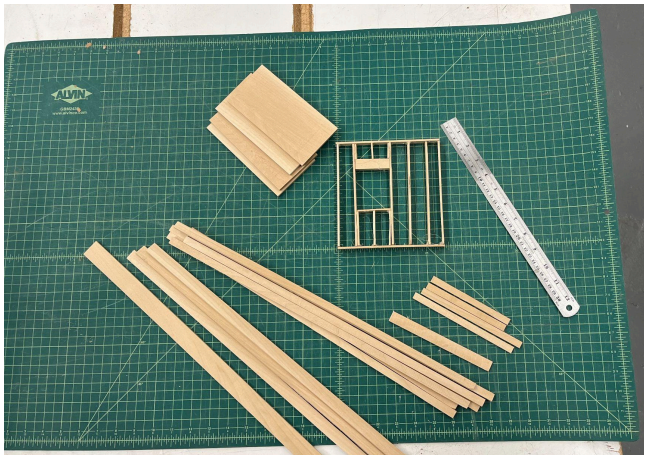
This course aligns with selected and merged DESE Career Cluster Standards from 7 of 8 strands (see links below). **Health & Safety Standards** emphasize the importance of creating safe and healthy environments through proper practices and awareness. This course incorporates **Technical and Integrated Academic Standards** by blending hands-on technical skills with foundational academic knowledge, ensuring students are prepared for real-world applications. **Employability Standards** are met by fostering critical skills such as

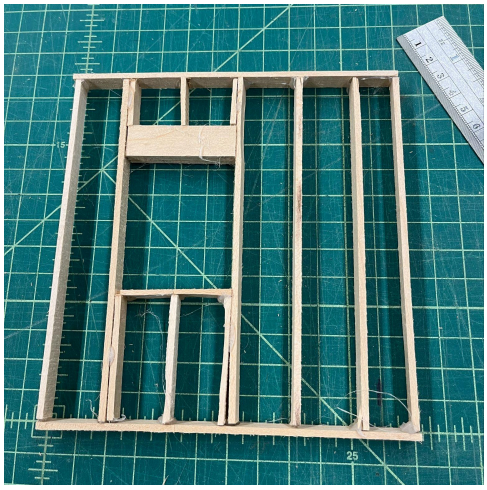
communication, teamwork, problem-solving, and professionalism, which are essential in any career. Additionally, the course integrates **Entrepreneurship Standards** by encouraging innovative thinking, business planning, and an understanding of market dynamics, empowering students to develop and pursue entrepreneurial opportunities.

- Carpentry (2024)
- Electricity (2024)
- Plumbing (2024)
- HVAC-R (2024)
- Construction Craft Laborer
- Facilities Maintenance Mgmt
- Mason and Tile Setting
- Painting and Design Technologies

Key Topics Covered:

- Tool identification and usage across all trades
- Scale model building of residential housing. In the pictures below, a single wall with a window opening was made with a hot glue gun, and the tools in the woodshop.





- Blueprint reading and basic layout skills
- Hands-on practice with pipe installation, wiring, HVAC system maintenance, and carpentry
- Safety protocols, including personal protective equipment (PPE) and safe handling of hazardous materials
- Introduction to building codes and regulatory standards
- Basic troubleshooting techniques for plumbing, electrical, and HVAC systems
- VR simulations for skill-building in real-world scenarios

Space Requirements: Possible locations for building project walls and classroom activities

- ☐ UA Basement hallway for interior and exterior wall construction
- ☐ UA16 for walls, floors and material storage
- ☐ UA Woodworking shops for classroom activities, individual workstations, model building, and tool management
- ☐ STEM 204 for occasional video screening

- ☐ Exterior space behind UA for small masonry projects

Learning Outcomes: By the end of this course, students will:

Standard		Unit	Duration
1	**Health and Safety Proficiency**: Demonstrate comprehensive health and safety practices, including the use of PPE, adherence to OSHA and EPA regulations, and effective hazard mitigation in shop and construction environments.	1. Safety Unit	1 week
2	**Hoisting and Rigging:** Assist with hoisting and rigging tasks by identifying the center of gravity, selecting appropriate equipment, and using effective communication.		
3	**Ladders and Scaffolding:** Demonstrate safe installation, use, and maintenance of ladders and scaffolding.		
4	**Technical Drawing Interpretation:** Identify, design, and interpret technical drawings and blueprints relevant to construction projects.	2. Models Unit	2-3 weeks
5	**Carpentry and Construction Math:** Apply carpentry principles and basic construction math to identify building materials and complete layouts to specifications.		
6	**Structural Building Skills:** Demonstrate industry-standard practices for constructing and installing floors, walls, ceilings, partitions, and roof framing.		
7	**Interior and Exterior Finishing:** Utilize techniques for finishing interior and exterior systems, including siding, trim, molding, and weatherization products.	3. Framing Unit	2 weeks
8	**Fastening and Tool Operation:** Safely install various fasteners and operate power tools per industry standards.		
9	**Tool and Equipment Management:** Operate, maintain, and store hand, power, and pneumatic tools safely and efficiently.		
10	**Electrical Theory and Circuit Building:** Explain AC/DC electrical theory, measure and build circuits, and install electrical components such as raceways, conductors, and overcurrent protection. Describe and evaluate grounding systems, including the use of electrodes, bonding jumpers, and grounding methods.	4. Electricity Unit	2-3 weeks
11	**Plumbing Skills:** Demonstrate techniques for measuring, cutting, joining, and installing plumbing pipes and drainage systems according to the Massachusetts State Plumbing Code.	5. Plumbing Unit	2-3 weeks
12	**HVAC-R Skills:** Apply HVAC-R guidelines for measuring, cutting, and joining pipe and ductwork per project specifications.	6. HVAC Unit	1-2 weeks
13	**Tile Setting:** Execute tile-setting procedures, including project preparation, pattern alignment, adhesion, and grouting.	7. Finish Unit	1-2 weeks

Standard		Unit	Duration
14	**Drywall Application:** Demonstrate the application and finishing of drywall to align with project specifications.		
15	**Masonry Skills:** Perform masonry tasks, including preparation, layout of brick bonds, paver base construction, and precision in masonry work.	8. Masonry Unit	1-2 weeks
16	**Energy Efficiency and Sustainability:** Design energy-efficient systems, identify compliant insulation materials, and use sustainable resources according to IECC guidelines.	9. Big Picture Unit	1 week
17	**Professional Skills:** Exhibit critical thinking, problem-solving, professionalism, teamwork, and collaboration.		
18	**Entrepreneurship in Construction:** Describe business opportunities and evaluate the benefits of entrepreneurship in the construction field.		
19	**Demolition:** During the last week, safely deconstruct the construction projects using proper techniques and concepts of leverage.	10. Demo Unit	Last week

Technology Use: Candidates will utilize tools associated with each trade: *This tool set supports various tasks across carpentry, electrical, plumbing, HVAC-R, masonry, and safety operations in the construction environment. Most equipment is currently in BHS inventory.*

General Hand Tools

1. Hammers (claw, sledge, mallet)
2. Screwdrivers (flathead, Phillips)
3. Pliers (needle-nose, locking, cutting)
4. Wrenches (adjustable, socket, pipe)
5. Tape measures and rulers
6. Levels and squares (spirit level, carpenter's square, speed square)
7. Utility knives and blades
8. Hand saws (crosscut, hacksaw)
9. Chisels

Power Tools

10. Drills (corded and cordless)
11. Fastening power tools (impact wrenches)
12. Circular saws
13. Jigsaws and Reciprocating saws
14. Power sanders (orbital, belt)
15. Nail guns (pneumatic or battery)
16. Table saws
17. Miter saws

Masonry Tools

18. Trowels (brick, pointing, margin)
19. Mason's hammers
20. Jointers
21. Mixing tools for mortar (rental)
22. Levels and lines (for masonry work)

Plumbing Tools

23. Pipe cutters (PVC, copper)
24. Pipe wrenches
25. Pipe threaders
26. Plumber's tape and sealants
27. Tube reamers
28. Crimping tools

Electrical Tools

29. Wire strippers and cutters
30. Multimeters and Circuit analyzers
31. Fish tape
32. Conduit benders

HVAC-R Tools

33. Duct cutters and crimpers
34. Sheet metal shears
35. Thermometers

Safety Equipment

36. Personal Protective Equipment (PPE) – helmets, gloves, safety goggles, ear protection
37. Harnesses for elevation work
38. Dust masks and respirators

Measurement and Layout Tools

39. Laser levels
40. Chalk lines
41. Measuring wheels
42. Plumb bobs
43. Tape measures (various lengths)

Specialized Construction Tools

44. Ladders (extension, step)
45. Scaffolding systems (rental)
46. Tile cutters
47. Drywall lifts
48. Drywall trowels and knives
49. Joint compound applicators
50. Hydraulic jacks

Demolition Tools

51. Sledgehammer
52. Jackhammer (rental)
53. Pry Bars, crowbars, wrecking bars
54. Reciprocating saw
55. Nail pullers

Summary: This course is ideal for 11th and 12th-grade students interested in exploring a career in the skilled trades or gaining foundational knowledge in building and repair techniques for personal use. No prior experience is required.
