Geometry in Construction

CTE Industry Sector: Building and Construction Trades

Career Pathway: Residential and Commercial Construction

Career Pathway Entry-Level Job Titles:

- Apprentice carpenter, apprentice plumber, apprentice electrician

CBEDS Code(s): 5501

Course Description: The General goal of the Geometry in Construction course is to introduce students to entry level skills in the occupational areas of carpentry, electrical, and plumbing and demonstrate the practical application of mathematics to these fields thereby improving the student's performance in mathematics.

Course Hours: 360

Date Reviewed and Approved by Advisory Committee: November 10, 2016

Course Goals: Students will learn:

1. Review industry standards and career opportunities
2. Review the course competencies
3. Review teacher and student expectations
4. Read and understand material safety data sheets (MSDS)
5. Describe and demonstrate general safety procedures
6. Identify and demonstrate personal safety procedures
7. Defend and demonstrate tool and machine safety procedures
8. Identify and describe proper accident and emergency procedures
9. Support and demonstrate proper fire safety
10. Demonstrate safe and proper operation of hand and power tools
11. Identify and describe the proper care, maintenance, storage and transportation of hand and power tools
12. Calculate the area of geometric shapes
13. Describe and demonstrate linear measurement
14. Defend and demonstrate material conservation
15. Identify and describe standard architectural and electrical symbols
16. Demonstrate proper blueprint reading skills
17. Compare and classify materials such as woods, composition materials, drywall, roofing materials, flooring materials
18. Demonstrate safe cutting techniques for the materials listed
19. Calculate material cost for a project
20. Demonstrate use of construction level for elevation and layout
21. Demonstrate fundamentals of concrete construction.
22. Demonstrate floor, wall and roof framing for residential construction

23. Demonstrate understanding of basic electrical theory
24. Compare and contrast types of finish and paint preparation
25. Identify proper masking techniques
26. Analyze and use painting and finishing methods using brush, roller
27. Describe proper disposal and clean-up procedures for paint and finish related materials
28. Demonstrate fundamentals of pipe fitting using PVC
29. Demonstrate passive solar hot water heating

Instructional Units:

Unit 1	**Introduction**	Class Hrs.	6	Lab Hrs.	

Description:

The students will receive training in the basis of the construction industry. Students will learn machine and tool safety as well as many facets of the building trade. Students will learn how to enter the workforce, build a foundation, frame walls, roofs. The students will also be introduced to electrical and plumbing basics.

In the end of the course, the students will receive a competency certificate to help them in gaining employment in the industry.

Anchor Standards: 1.0

Unit 2	**Measuring**	Class Hrs.	4	Lab Hrs.	

Description:

This unit will address how measurement is used. How to measure using tape measures, architect rulers and carpenter squares and the units of measurement.

Pathway Standards: A1.1, A1.3, A4.1, D2.1

Unit 3	**Machine Safety & Operation**	Class Hrs.	6	Lab Hrs.	

Description:

This unit will consist of safety lessons created by teachers in the field. Each lesson will explain the safe and proper use of the machine or tool. Safety lesson plans on: Band saw, Portable router, Jointer, Portable circular saw, Belt Sander, Hand tools, Jig Saw, Miter (compound "chop saw"), & Lathe.

Anchor Standards: 6.1, 6.2, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.11, 6.12, 8.2
Pathway Standards: A4.3, A4.4, A4.5, A4.6, A4.7, A6.1, D10.1

Unit 4	**Construction Building Materials**	Class Hrs.	8	Lab Hrs.	

Description:

Various types of building materials will be introduced to the students. Framing materials, fasteners, and roofing materials will be stressed.

Pathway Standards: A1.1, A5.1, A5.2, A5.3, A5.4, A5.5, A5.7, A5.8, A5.9, A5.10, A5.11, A5.12, A5.13, A6.2, A6.3, A6.4, A6.5, A6.8, A11.1, C5.2, C8.1

Unit 5	**Building Codes and Standards**	Class Hrs.	4	Lab Hrs.	

Description:

Students will be introduced to nailing patterns, Simpson connectors, and strong building practices. Students will be introduced to Building code books and what codes are the required standards for construction of residential and commercial buildings.

Anchor Standards: 7.2, 8.2, 10.1, 10.2, 10.3
Pathway Standards: D6.7

Unit 6	**Introduction to Blueprints**	Class Hrs.	7	Lab Hrs.	

Description:

Students will show understanding of residential plans. Material cut lists will be produced from these drawings.

Anchor Standards: 5.3, 5.4, 8.2, 8.6, 8.7, 9.5, 10.1, 10.2
Pathway Standard: A1.7, A3.6, A4.1, C7.7, D2.1, D2.3, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7, D5.4

Unit 7	**Concrete**	Class Hrs.	12	Lab Hrs.	

Description:

Students will demonstrate ability to build forms, mix, pour and finish concrete. Students will identify piers, footings foundations and slabs

Anchor Standards: 5.3, 5.4, 8.2, 8.6, 8.7, 9.5, 10.1, 10.2
Pathway Standard: A1.7, A3.6, A4.1, C7.7, D2.1, D2.3, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7, D5.4

Unit 8	**Framing**	Class Hrs.	42	Lab Hrs.	

Description:

Students will identify floor framing components, and use the parts to build a floor. Students will identify wall framing components and use the parts to frame a wall, door opening, windows, trusses, and rafters. They will also learn the process of building a

house structure through a model (scale) house. Students will identify roof framing components and use the parts to frame a roof.

Anchor Standards: 5.2, 5.4, 8.1, 10.2, 10.3, 10.5, 11.2
Pathway Standards: A3.1, A3.6, A4.1, A4.2, A4.3, A5.1, A5.4, D2.3, D6.3, D6.5, D6.6, D6.7, D6.8, D6.10, D6.11, D6.12, D6.13, D6.14, D6.16

Unit 9	**Roof Finishing**	Class Hrs.	8	Lab Hrs.	

Description:

Students will learn the process used to apply flashings, tar paper and composition shingles to a roof.

Anchor Standards: 6.4,6.5,6.7,7.5,10.1,10.2,10.3,10.5
Pathway Standards: D6.1, D6.14, D6.15, D6.15

Unit 10	**Electrical Theory and Wiring Fundamentals**	Class Hrs.	12	Lab Hrs.	

Description:

Students will show understanding of electrical theory , circuitry and Ohm's law using appropriate vocabulary, and solve related mathematical problems. Students will demonstrate ability to wire simple switch and outlet assemblies.

Anchor Standards: 5.3, 5.4, 8.2, 8.6, 8.7, 9.5, 10.1, 10.2
Pathway Standard: A1.7, A3.6, A4.1, C7.7, D2.1, D2.3, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7, D5.4

Unit 11	**Introduction to Plumbing**	Class Hrs.	12	Lab Hrs.	

Description:

Students will demonstrate fundamentals of pipefitting by assembling PVC pipe systems, and building passive hot water heater.

Anchor Standards: 5.3, 5.4, 8.2, 8.6, 8.7, 9.5, 10.1, 10.2
Pathway Standard: A1.7, A3.6, A4.1, C7.7, D2.1, D2.3, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7, D5.4

Unit 12	**Construction Level**	Class Hrs.	4	Lab Hrs.	

Description:

Students will use construction level to find elevations and locate house within a lot.

Anchor Standards: 5.3, 5.4, 8.2, 8.6, 8.7, 9.5, 10.1, 10.2

Pathway Standard: A1.7, A3.6, A4.1, C7.7, D2.1, D2.3, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7, D5.4

Unit Objectives

Unit 1: Upon completion of this unit, the student is able to:

1	Identify the scope of practice for each position of the construction trades – carpentry, electrical, plumbing, drywall.
2	List the requirements for apprenticeship for each of the positions in the construction trades.

Unit 2: Upon completion of this unit, the student is able to:

1	Recognize scale and ratios of conversions between different units of measurements.
2	Read and use different types of measuring devices.

Unit 3: Upon completion of this unit, the student is able to:

1	Understand the safety procedures for different machine and hand tools.
2	Safely use machine and hand tools with moderate supervision.
3	Describe the different uses of each machine and hand tool.

Unit 4: Upon completion of this unit, the student is able to:

1	Describe the different materials that are used in the construction field.
2	Use appropriate building materials for specific projects.
3	Identify the materials in a construction worksite.

Unit 5: Upon completion of this unit, the student is able to:

1	Tell difference between nailing patterns used in different projects.
2	Understand which types of Simpson & strong ties are needed for building projects.
3	Describe different codes needed for specific fields of construction.
4	Read building codes and understand where they apply to the construction project.

Unit 6: Upon completion of this unit, the student is able to:

1	Read scale on the blueprints and what that represents.
2	List materials needed from the blueprints.
3	Understand what specs are and what they represent.

Unit 7: Upon completion of this unit, the student is able to:

1	Understand the difference between footing, foundation, piers and slab.
2	Know how to form, mix concrete, pour and finish sidewalk slab.
3	Know how to calculate the volume of concrete needed for job.
4	Attach mudsill to foundation.

Unit 8: Upon completion of this unit, the student is able to:

1	Understand the difference between wall framing, roof framing and floor framing.
2	Know names of components on doors and windows (trimmers, headers, King Studs, sill).
3	Know what a rafter is and how to build.
4	Identify all components of framing.
5	Build walls with windows and doors, rafters, and flooring.

Unit 9: Upon completion of this unit, the student is able to:

1	Describe and install flashing, tar paper and shingles on a roof.
2	Understand staple and nailing patterns for flashing and tar paper.
3	Install composition shingles to state standards.

Unit 10: Upon completion of this unit, the student is able to:

1	Able to identify parallel and series circuits, and calculate voltage current and resistance using Ohm's Law
2	Able to determine power use.
3	Connect simple wiring schemes, outlets, switches and lights.
4	Use lathe to make lamp base and construct lamp.

Unit 11: Upon completion of this unit, the student is able to:

1	Measure fit, prime and glue ABS pipe.
2	Construct passive solar hot water heating system.
3	Use PVC pipe for Geodesic dome construction.

Unit 12: Upon completion of this unit, the student is able to

1	Use construction level to find elevations.
2	Use construction level to locate house in lot.

Instructional Strategies:

- Students will be instructed in large and small groups, additional information will be given to those with need.
- Written and oral assignments will be given.
- Guest speakers from different trades will come in to give additional information and assist in class projects.
- Projects will be given with emphasis on craftsmanship and good workmanship.

Textbooks:

- Carpentry & Building Construction by Mark Feirer
- Electrical Wiring Residential by Ray C Mullin and Phil Simmons
- Modern Plumbing by E. Keith Blankenbaker

Instructional Materials:

- Lumber (2x4, 2x6, 2x8, 1x4, 1x6)
- Nails, screws, glue and fasteners
- Tools (hammers, screwdrivers, speed squares, miter saws, jig saws, circular saws, table saws, etc.)
- Safety glasses
- PVC pipe
- Electrical materials (Romex wiring, wire cutters, wire strippers, caps, etc.)
- Lamp kit

Assessments:

- Grades will be based on evaluation of projects built. Craftsmanship, accuracy and overall build of project will be evaluated.
- Students are expected to complete all assignments within deadlines. Due dates on all assignments may vary depending on weather conditions, presentations by pop-in mentors and advisors from construction trades.
- Work ethic and safety will be assessed regularly and graded as defined by the syllabus.
- Grades will break down as follows:
    - Attendance: 10%
    - Work Ethic: 20%
    - Projects: 40%
    - Safety & clean up: 15%
    - Exams & quizzes: 15%
- Grading Scale

A	100-93
A-	92-90
B+	89-87
B	86-83
B-	80-82
C+	77-79
C	73-76
C-	70-72
D	60-69
F	0-59

Articulation Agreement(s):

The Construction Technology 1 portion of this class is articulated at Diablo Valley College. Students that pass the Construction Technology 1 portion of the class with a C or better and pass the college course final exam will an 80% or better can earn 4.0 units at Diablo Valley College for their CONST 135: Construction Processes: Residential course. This articulation is good during Fall 2016-Fall 2019.

UC/CSU A-G Status:
This math portion of this course meets the Area C: Mathematics requirement for the UC and CSU systems.