

Pre Calculus 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 Pre Calculus 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: 140 Mathematics, 140 Construction; Total 280

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. Defend and demonstrate material conservation
13. Identify and describe standard architectural and electrical symbols
14. Demonstrate proper blueprint reading skills
15. Calculate material cost for a project
16. Demonstrate use of construction level for elevation mapping and layout.
17. Apply Trig functions for mapping
18. Demonstrate fundamentals of concrete construction.
19. Apply Trig formulas for truss construction and demonstrate truss layout and construction
20. Apply quadratic equations to analyze performance of catapult
21. Demonstrate application of Trig functions and geometric principles in construction of geodesic dome.

- 22. Apply quadratic equations in analysis of structural loads.
- 23. Demonstrate fundamentals of cabinet construction
- 24. Analyze and use painting and finishing methods using brush, roller,
- 25. Describe proper disposal and clean-up procedures for paint and finish related materials

Instructional Units:

Unit 1	Introduction	Class Hrs.	6	Lab Hrs.	
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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	Machine Safety & Operation	Class Hrs.	4	Lab Hrs.	
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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 3	Building Codes and Standards	Class Hrs.	6	Lab Hrs.	
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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 4	Introduction to Blueprints	Class Hrs.	12	Lab Hrs.	
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Description:

Students will show understanding of residential plans. Material cut lists will be produced from these drawings. Model house 1/6 scale will be built

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 5	Construction Level	Class Hrs.	12	Lab Hrs.	
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Description:

Students will be introduced to the use of Construction level for finding grades and elevations and use as a transit for mapping.

Anchor Standards: 7.2, 8.2, 10.1, 10.2, 10.3

Pathway Standards: D6.7

Unit 6	Catapult	Class Hrs.	14	Lab Hrs.	
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Description:

Students will build catapult or trebuchet to provide data for discovering quadratic equations derived from experimental data, and answer questions involved in the engineering of the catapult.

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.	
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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	Truss and Rafter Construction	Class Hrs.	24	Lab Hrs.	
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Description:

Students will identify roof framing components and use the parts to frame a roof. Students will demonstrate rafter and truss construction using trigonometry for layout.

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.	10	Lab Hrs.	
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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	Geodesic Dome	Class Hrs.	30	Lab Hrs.	
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Description:

Students will apply geometric and trigonometric principle to construct geodesic dome from PVC pipe and investigate the principles of structural engineering involved.

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 Cabinetry	Class Hrs.	10	Lab Hrs.	
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Description:

Students will construct a simple cabinet, bookcase or closet to become acquainted with fundamentals of cabinetry

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,
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	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 3: 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 4: 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 5: Upon completion of this unit, the student is able to:

1	Set up Construction level and find elevation
2	Locate house boundaries in lot
3	Use level as transit for mapping.

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

1	Use experimental data to determine quadratic equation and predict outcomes
2	Address engineering problems and answer question “how to build a better catapult

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	Use roof pitch and house span to construct common rafter
2	Apply trigonometric principles to layout and construct trusses
3	Identify different types of roofs trusses and rafters

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	Measure, cut and fit, ABS pipe
2	Apply Trigonometry and Geometry to determine size of parts of geodesic domes
3	Use PVC pipe for Geodesic dome construction

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

1	Use Table saw
2	Identify different types of woods used for cabinet construction
3	Construct cabinet

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 portion of this class is articulated at Diablo Valley College. Students that pass the Construction Technology portion of the class with a C or better and pass the college course final exam with 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.