



# CAD Mechanical Design II

## EXAM INFORMATION

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**Items**

38

**Points**

59

**Prerequisites**

CAD MECHANICAL DESIGN I

**Grade Level**

10-12

**Course Length**

ONE SEMESTER

**Career Cluster**ARCHITECTURE AND CONSTRUCTION  
MANUFACTURING  
SCIENCE, TECHNOLOGY, ENGINEERING  
AND MATHEMATICS**Performance Standards**

INCLUDED

**Certificate Available**

YES

## DESCRIPTION

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The second in a sequence of courses that prepares individuals with an emphasis in developing technical knowledge and skills to develop 3D models in support of mechanical and industrial engineers, and related professionals. This includes instruction in the use of 3D Computer-Aided Design (CAD) software, model creation, and technical communication.

## EXAM BLUEPRINT

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**STANDARD****PERCENTAGE OF EXAM**

1- Mathematics, Measuring Conventions & Scale	17%
2- 3D Part Model	24%
3- Line Types	20%
4- Sectional Views	12%
5- Tolerancing Techniques	7%
6- 3D Computer Software	20%



## STANDARD 1

STUDENTS WILL UNDERSTAND AND APPLY MATHEMATICS, MEASURING CONVENTIONS, AND SCALE.

Objective 1 Perform basic arithmetic functions using fractions and decimals.

1. Add
2. Subtract
3. Multiply
4. Divide

Objective 2 Accurately and efficiently convert between fractions and decimals.

1. Decimal/fraction equivalent chart.

Objective 3 Convert between metric and imperial measurements.

Objective 4 Demonstrate an ability to make and record basic measurements.

1. Use scales, micrometers, and calipers (dial and digital) to take measurements.
2. Understand and demonstrate the conversion of actual lengths to common technical drawing scales.
3. Accurately scale drawings using CAD techniques when drawing and plotting.
4. Record measurements using Cartesian and polar coordinates, as well as absolute and relative distances.

Standard 1 Performance Evaluation included below (Optional)

## STANDARD 2

STUDENTS WILL BE ABLE TO CREATE A 3D PART MODEL WITH THE CORRECT DIMENSIONAL AND GEOMETRIC SIZES AND CONSTRAINTS.

Objective 1 Demonstrate exactness and precision when producing drawing geometry.

1. Apply correct 3D geometric construction techniques.
2. Model elements accurately and to scale.
3. Create elements on the correct plane.

Objective 2 Be proficient in the use of terminology associated with 3D drafting and design.

1. Axis
2. Concentric
3. Dimensional constraint
4. Geometric constraint
5. Coordinate
6. Extrusion
7. Isometric view
8. Parallel
9. Perpendicular
10. Plane
11. Tangent
12. Vertical

Objective 3 Create proto-types of the model using a 3D printer.



Standard 2 Performance Evaluation included below (Optional)

## STANDARD 3

STUDENTS WILL BE ABLE TO UNDERSTAND AND DEMONSTRATE THE USE OF CORRECT LINE TYPES.

- Objective 1 Understand and use the recommended thickness of lines.
- Objective 2 Understand and correctly employ conventionally used line types.
1. Object lines
  2. Hidden lines
  3. Center lines
  4. Dimension lines
  5. Extension lines
  6. Leader lines
  7. Border lines
  8. Phantom lines
  9. Section lines
  10. Cutting Plane lines
  11. Construction lines

Standard 3 Performance Evaluation included below (Optional)

## STANDARD 4

STUDENTS WILL BE ABLE TO DEVELOP AND CORRECTLY PLACE SECTIONAL VIEWS.

- Objective 1 Be familiar with and appropriately use section views.
1. Full
  2. Half
- Objective 2 Section lines are evenly spaced and drawn at 45-degree angle unless a more appropriate angle is justified.
- Objective 3 Cutting plane lines, section lines, and break lines are drawn according to the alphabet of lines.
- Objective 4 Visible edges, hidden lines, and contours behind the cutting plane are correctly shown.

## STANDARD 5

STUDENTS WILL BE ABLE TO UNDERSTAND AND DEMONSTRATE ESSENTIAL TOLERANCING TECHNIQUES.

- Objective 1 Create limit dimensions.
- Objective 2 Describe the nominal size, tolerance, limits, and allowances of two mating parts.
- Objective 3 Identify a clearance fit, and transition fits.
- Objective 4 Describe and use the basic hole and the basic shaft systems.



- Objective 5 Dimension two mating parts using limit dimension, unilateral tolerances, and bilateral tolerances.
- Objective 6 Specify the classes of fits as required on exercises and drawings.

Standard 5 Performance Evaluation included below (Optional)

### STANDARD 6

STUDENTS WILL BE ABLE TO UNDERSTAND AND USE 3D COMPUTER SOFTWARE TO CREATE TECHNICAL DRAWINGS.

- Objective 1 Know how to save, open, rename, and move data files using common computer operating system software.
- Objective 2 Originate technical drawings using 3D CAD software features.
1. Create a new drawing setup to support both English and metric drawing standards.
  2. Create drawing setups for different sizes of drawing sheets.
  3. The top, front, and side views are used unless otherwise required using orthographic projection.
  4. All views are properly aligned and use third-angle projection.
  5. Appropriate lines and surfaces are located on each view.
- Objective 3 Add correct annotation to drawings.
1. Use the correct text height.
  2. Use Gothic letters and numerals.
  3. Understand the placement and use of general notes.
  4. Prepare and/or understand title blocks.
- Objective 4 Plot to scale and use correct plot specifications.
1. Plot drawings with correct line widths.

Standard 6 Performance Evaluation included below (Optional)



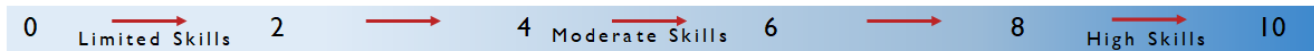
## CAD Mechanical Design II Performance Standards (Optional)

Performance assessments may be completed and evaluated at any time during the course. The following performance skills are to be used in connection with the associated standards and exam. To pass the performance standard the student must attain a performance standard average of **8 or higher** on the rating scale. Students may be encouraged to repeat the objectives until they average **8 or higher**.

Students Name \_\_\_\_\_

Class \_\_\_\_\_

### PERFORMANCE RATING SCALE



#### STANDARD 1 Mathematics, Measuring Conventions & Scale

Score:

- Student understands and applies mathematics, measuring conventions, and scale.

#### STANDARD 2 3D Part Model

Score:

- Student creates a 3D part model and develops orthographic views with the correct dimensional and geometric sizes and constraints.

#### STANDARD 3 Line Types

Score:

- Student understands and demonstrates the use the correct line types.

#### STANDARD 5 Tolerancing Techniques

Score:

- Student understands and demonstrates essential tolerancing techniques.

#### STANDARD 6 3D Computer Software

Score:

- Student understands and uses 3D computer software to create technical drawings.

### PERFORMANCE STANDARD AVERAGE SCORE: