PRECISION EXAMS

CAD Mechanical Design I

EXAM INFORMATION

Exam Number
661
Items
58
Points
85
Prerequisites
NONE
Recommended Course Length
ONE SEMESTER

National Career Cluster
ARCHITECTURE & CONSTRUCTION
MANUFACTURING
SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS

Performance Standards
INCLUDED (OPTIONAL)

Certificate Available
YES

DESCRIPTION

The first in a sequence of courses that prepares individuals to develop technical knowledge and skills required to plan and prepare scale pictorial interpretations and technical documentation of engineering and design concepts. This includes instruction in the use of 2D Computer-Aided Design (CAD) software, sketching, drawing layout, geometric construction, orthographic projection, and dimensioning.

EXAM BLUEPRINT

STANDARD	PERCENTAGE OF EXAM
1- Career Opportunities	1%
2- Engineering Design Problem	6%
3- Document & Communicate	5%
4- Mathematics, Measuring Conventions & Scale	20%
5- Orthographic Views	21%
6- Line Types	15%
7- ANSI Y 14.5 Dimensioning	16%
8- 2D Computer Software	16%

STANDARD 1

STUDENTS WILL INVESTIGATE CAREER OPPORTUNITIES IN ENGINEERING AND ENGINEERING TECHNOLOGY.

Objective 1 Identify occupations related to engineering and engineering technology.

Objective 2 Differentiate among different engineering & engineering technology disciplines.

Objective 3 Investigate different forms of occupational training and educational opportunities for careers in engineering and engineering technology.

Standard 1 Performance Evaluation included below (Optional)

STANDARD 2

STUDENTS WILL UNDERSTAND THE ELEMENTS OF AN ORGANIZED APPROACH TO SOLVING AN ENGINEERING DESIGN PROBLEM.

Objective 1 Form a basic design process that can be used to solve an engineering problem.

1. Identify and define the design problem
2. Brainstorm solutions
3. Create models and build a prototype
4. Test the prototype
5. Redesign and optimize

Objective 2 In order to better comprehend the engineering design process, students should learn that:

1. Design problems are seldom present in a clearly defined form.
2. The design needs to be continually checked and critiqued, and the ideas of the design must be refined and improved.
3. Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other.
4. Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
5. The process of engineering design takes in to account a number of factors including safety, reliability, cost, quality control, the environment, manufacturability, maintenance and repair, and human factors.

Standard 2 Performance Evaluation included below (Optional)

STANDARD 3

STUDENTS WILL DOCUMENT THE DESIGN PROCESS AND COMMUNICATE THE RESULT OF THAT PROCESS USING APPROPRIATE TECHNIQUES.

Objective 1 Make accurately proportioned sketches using correct drawing conventions.

1. Understand and use accepted dimensioning practices for sketches.

2. Create freehand sketches using paper, pencil, and an eraser which is neat, clear, and smudge-free.
3. Views can be isometric, orthogonal, sections, or assemblies.
4. Understand and demonstrate the use of the alphabet of lines.
5. Use letters and numerals that conform to a Gothic style.
6. Notes are neat and legible.

Objective 2 Create and utilize an engineering notebook per established conventions.

1. Entries are sequential and chronological.
2. Accurate and complete reflection of the progress being recorded.
3. Sketches or pictures are included where appropriate.
4. No loose entries or pages.
5. Each page is dated and witnessed.
6. Unused spaces are identified, lined out, and initialed.
7. Errors are not erased or obliterated.
8. Test data and calculations are included.

Standard 3 Performance Evaluation included below (Optional)

STANDARD 4

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 4 Performance Evaluation included below (Optional)

STANDARD 5

STUDENTS WILL BE ABLE TO DEVELOP ORTHOGRAPHIC VIEWS OF A PART WITH THE CORRECT DIMENSIONS AND GEOMETRY.

Objective 1 Demonstrate exactness and precision when producing drawing geometry.

1. Apply correct 2D geometric construction techniques.
2. Drawing elements are accurate and drawn to scale.
3. Draw on the correct plane.
4. The top, front, and side views are used unless otherwise required using orthographic projection.
5. All views are properly aligned and use third-angle projection.
6. Appropriate lines and surfaces are located on each view.

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

1. Axis
2. Concentric
3. Diameter
4. Coordinate
5. Fillet
6. Horizontal
7. Orthographic view
8. Parallel
9. Perpendicular
10. Plane
11. Radius
12. Round
13. Sketch
14. Tangent
15. Third angle projection
16. Vertical

Standard 5 Performance Evaluation included below (Optional)

STANDARD 6

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. Center lines
3. Dimension lines
4. Extension lines
5. Leader lines
6. Border lines
7. Phantom lines
8. Section lines

9. Cutting Plane lines
10. Construction lines

Standard 6 Performance Evaluation included below (Optional)

STANDARD 7

STUDENTS WILL KNOW AND FOLLOW ANSI Y 14.5 DIMENSIONING STANDARDS AND APPLY THE APPROPRIATE DIMENSIONS TO DRAWINGS.

Objective 1 Understand and choose the best location for dimensions.

1. Locate dimensions on the profile view and between views.
2. Apply appropriate spacing between the object and the first dimension.
3. Apply uniform spacing between dimension lines.
4. Use correct dimension line terminators such as arrowheads ticks, and dots.

Objective 2 Understand and appropriately use baseline and chain dimensioning.

Objective 3 Demonstrate an ability to fully dimension a part.

Objective 4 Demonstrate the correct use of leaders and notes.

1. Understand and correctly form callouts for thru holes, countersinks, counterbores, and spot faces.
2. Demonstrate correct dimensioning for fillets, and rounds.
3. Understand and correctly form callouts for threaded holes.
4. Use appropriate angles for leaders.

Standard 7 Performance Evaluation included below (Optional)

STANDARD 8

STUDENTS WILL BE ABLE TO UNDERSTAND AND USE 2D 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 2D 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. Use and control accuracy enhancement tools.
    1. Using snap, grid, and positioning methods.
4. Analyze drawings using the software features.
    1. X,Y coordinates, area, distance, perimeter, etc.

Objective 3 Prepare and understand proper title blocks.

Objective 4 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.

Objective 5 Revise existing technical drawings using the software features.

Objective 6 Reproduce originals using different methods.

Objective 7 Plot to scale and use correct plot specs.

1. Plot drawings with correct line widths.

Standard 8 Performance Evaluation included below (Optional)

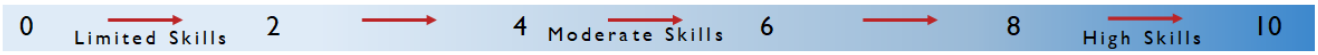
CAD Mechanical Design I Performance Standards (Optional)

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 Career Opportunities — Score:

- ☐ Student investigates career opportunities in engineering & engineering technology.

STANDARD 2 Engineering Design Problem — Score:

- ☐ Student understands the elements of an organized approach to solving an engineering design problem.

STANDARD 3 Document & Communicate — Score:

- ☐ A Student documents the design process and communicate the results of that process using appropriate techniques.

STANDARD 4 Mathematics, Measuring Conventions & Scale — Score:

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

STANDARD 5 Orthographic Views — Score:

- ☐ Student develops orthographic views of a part with the correct dimensions and geometry.

STANDARD 6 Line Types — Score:

- ☐ Student understands and demonstrates the sue the correct line types.

STANDARD 7 ANSI Y 14.5 Dimensioning — Score:

- ☐ Student knows and follows ANSI Y14.5 dimensioning standards and applies the appropriate dimensions to drawings.

STANDARD 8 2D Computer Software — Score:

- ☐ Student understands and used 2D computer software to create technical drawings.

PERFORMANCE STANDARD AVERAGE SCORE:

Evaluator Name _____

Evaluator Title _____

Evaluator Signature _____

Date _____