“How CAD Forces Changes to Engineering Graphics Education”

Dr. Richard Jerz  
St. Ambrose University  
Davenport, Iowa

Presentation Outline

- Review our program & philosophy  
- Describe how we teach EG  
- Discuss experiences & future plans

How should Engineering Graphics be taught?

- Engineering curriculum?  
- How many semesters?  
- Content?  
- Manual drafting?  
- Computer-aided design (CAD)?

St. Ambrose University

- Industrial Engineering Program (ABET accredited)  
- Liberal Arts emphasis  
- 132 hour curriculum

What is Design?

- Concept Design  
- Modeling  
- Testing  
- Communications (customer, manufacturing, & others)

IE110 - History

- One semester engineering graphics  
- Up to 1998  
  - Traditional approach  
  - No CAD  
- Student focus group results  
  - Need CAD Experience
**CAD Technologies**

- Solids-modeling
- Parametric modelers
- Drawing creation
- Analysis

**1998 Engineering Graphics Changes**

- Changed instructors
- Drafting tables removed
- Maintained EG theory
- Added CAD component
- Adopted solids-modeling philosophy

**Books and Supplies**

- Solidworks98 training manuals, Volume I and Volume II (Detailing and Assembly)

**Implementation**

- Theory of engineering graphics
  - Lectures
- Hands-on CAD
  - Labs

**Results**

- CAD experience
- EG theory
- A little drawing creation
- A little assembly creation

**Results (continued)**
Current Observations

- Good CAD content
- EG book is obsolete
- Need to improve focus on drawing creation

Why is the EG Book Obsolete?

- Outdated material
- Not applicable with CAD
- Too much effort
- Too much time
- Costs too much

Educational Components to Eliminate

- Pencils
- Vertical & horizontal lines
- Circles
- Ellipses
- Angles
- Scales
- Templates

Instrument Drawing

- Parallel and perpendicular lines
- Finding the center of a circle
- Drawing tangent circles, arcs, and lines

Geometric Constructions

- Parallelism and perpendicularity

Parallelism and Perpendicularly
Intersections

Descriptive Geometry

- Science of graphical representation of spatial relationships of points, lines, and planes
- Geometry
- True length, size, angle
- Revolutions

CAD - Replaces Descriptive Geometry

In Solidworks, just point and measure!

Lettering

Creating Axonometric Drawings
Oblique Projection

- A faked projection (simulated isometric)
- Eliminates need to draw ellipses

Perspectives

Section Views

Overall Results

- Students like the course
- Students gain CAD experience
- Students get exposure to engineering graphics concepts
- An important engineering tool has been added to student’s toolkit
- Students are using CAD skills in succeeding courses

Future Ideas

- Increase link with manufacturing processes:
  - Drawing creation focus
- Dimensioning & Tolerancing
  - ANSI Standard Y14.5M-1994
- Design intent
- Auxiliary views
- Assembly drawings
  - Bill of materials
  - Tolerance analysis
- Analysis (FEA, kinematics & dynamic)