

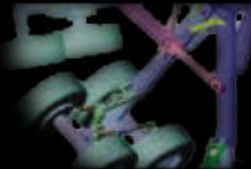
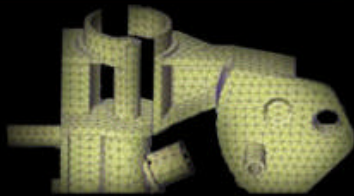


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International User Conference and Exposition

2001



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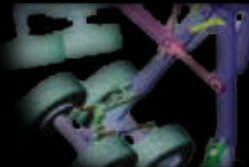
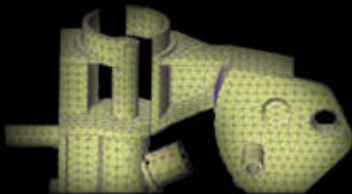
Dr. Richard Jerz

**“What Can Solids Modeling
Eliminate from
Engineering Graphics Education?”**

February 12, 2001

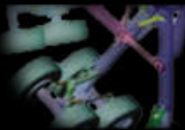
International User Conference and Exposition

2001



Personal Background

- Traditional education
 - High school drafting
 - 2 semesters college engineering graphics
- Practical experience
 - CAD at John Deere
 - Manager of Engineering in Ohio
- 8 years college professor
- 2 years teaching engineering graphics

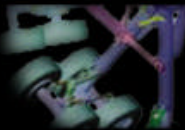


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Engineering Graphics at St. Ambrose University

- Industrial Engineering Program (ABET accredited)
- One semester engineering graphics
- Up to 1998
 - Traditional approach
 - No CAD
- Student focus group results
 - Need CAD Experience

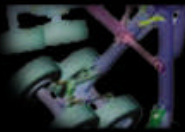


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1998 Engineering Graphics Changes

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

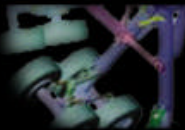



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Books and Supplies

- Engineering Graphics, Giesecke, F.E, Mitchel, A., et.al., 6th ed. 1998.
- Designing Parts With Solid Works, Wysack, R., 1998.
- Solidworks98 training manuals, Volume I and Volume II (Detailing and Assembly)
- Syllabus: <http://web.sau.edu/rjerz/Ambrose/IE110/ie110.htm>.

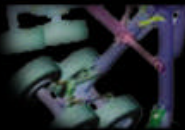


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Implementation

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

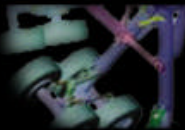



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Criteria for Elimination of Components

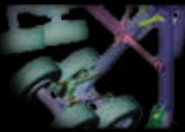
- Outdated
- Not applicable with CAD
- Too much effort
- Too much time
- Costs too much



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Educational Components to Eliminate

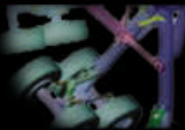


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Establishing a Need for CAD

- Educational debate
 - Fundamentals
 - Sketching
- No industry debate
- Solids modelers



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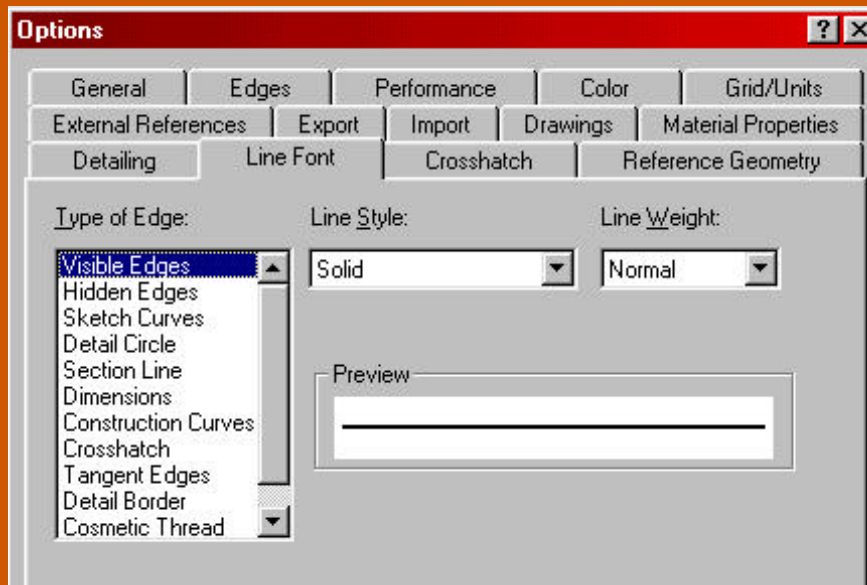


Instrument Drawing

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

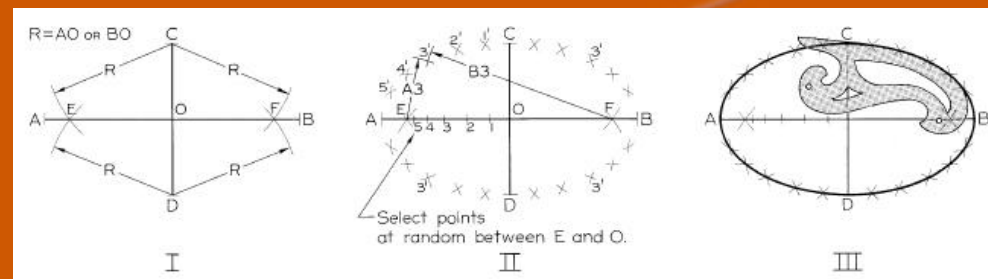
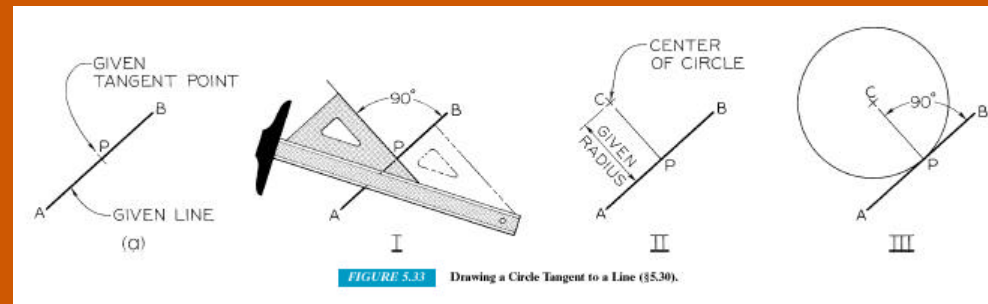
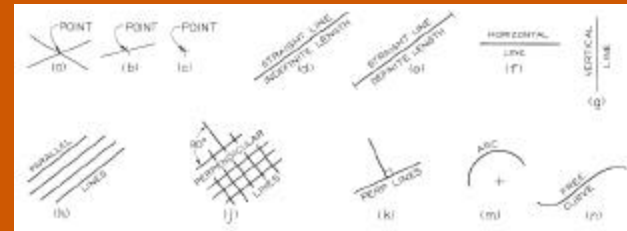


CAD Instruments

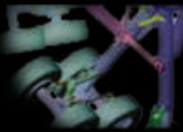
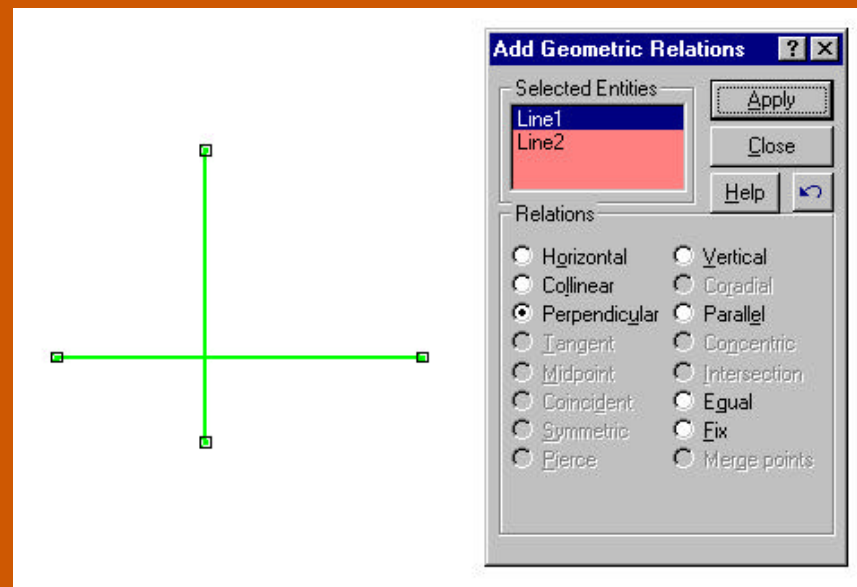


Geometric Constructions

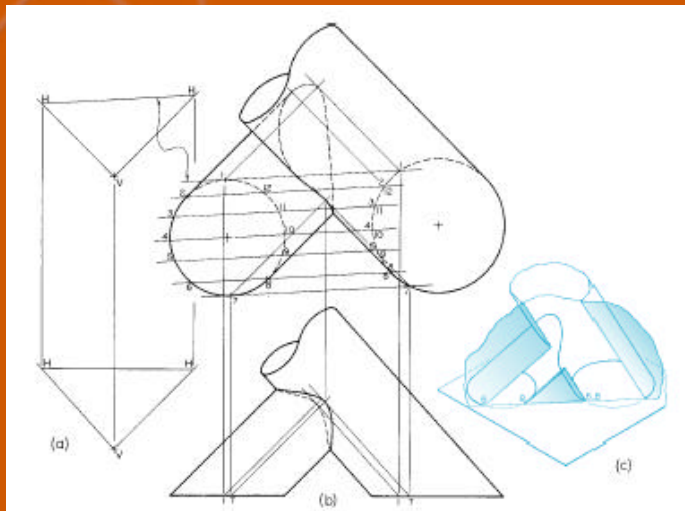
- Parallel and perpendicular lines
- Finding the center of a circle
- Drawing tangent circles, arcs, and lines



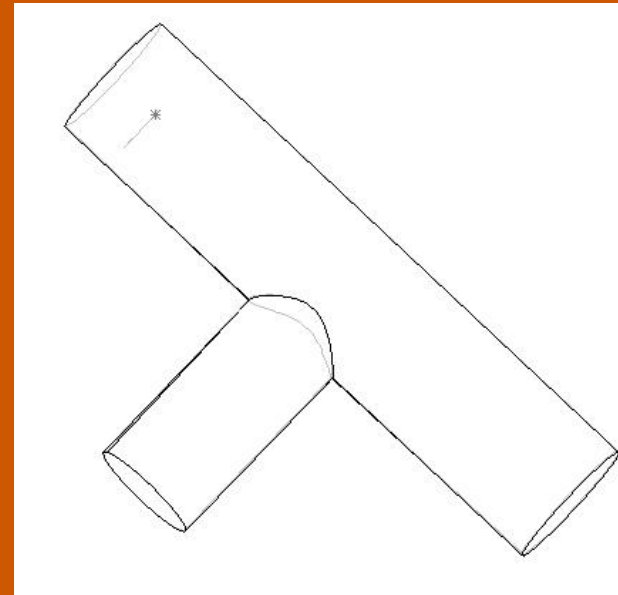
Parallelism and Perpendicularity



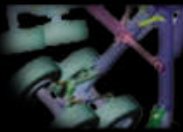
Intersections



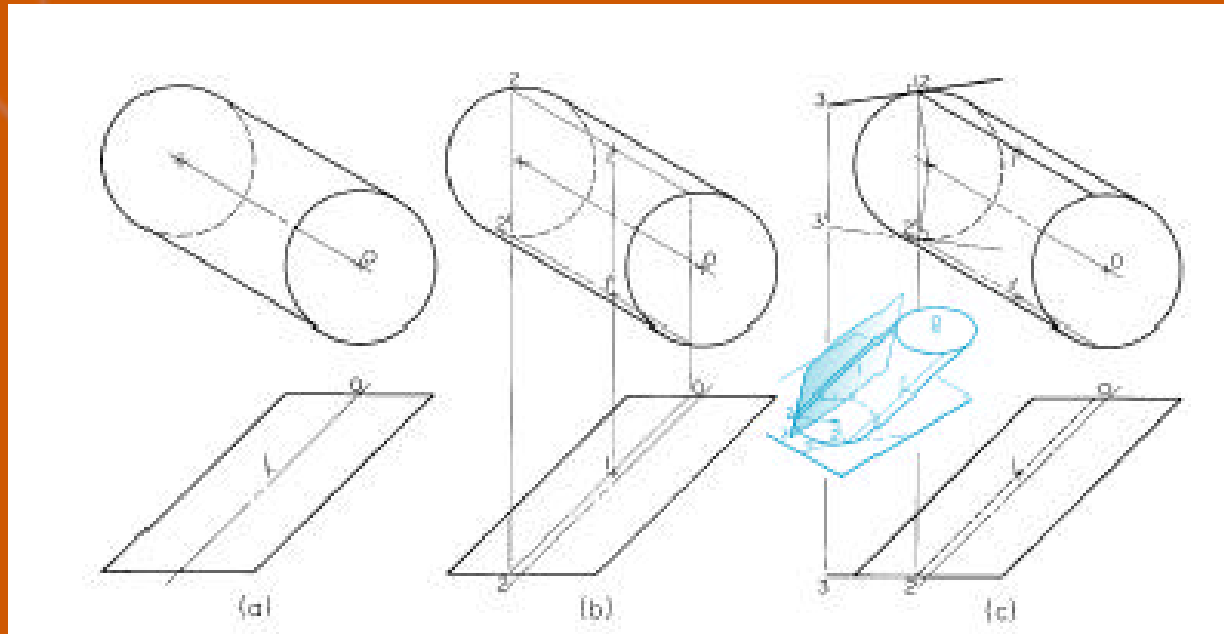
Manual



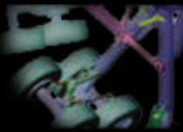
Solidworks



Tangencies



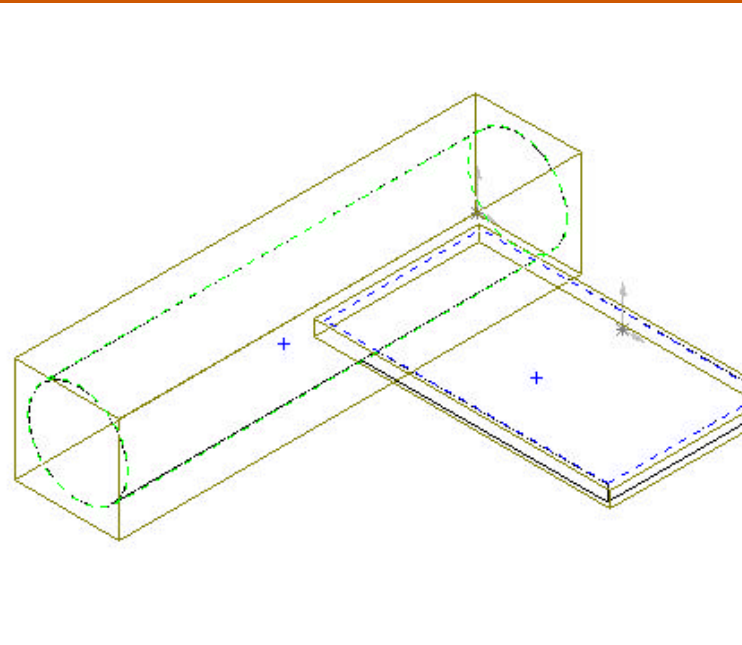
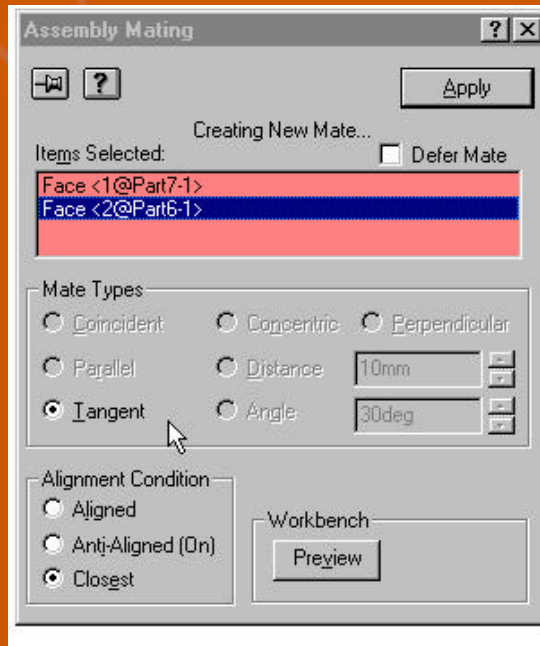
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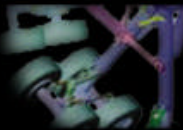
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Tangencies



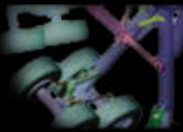
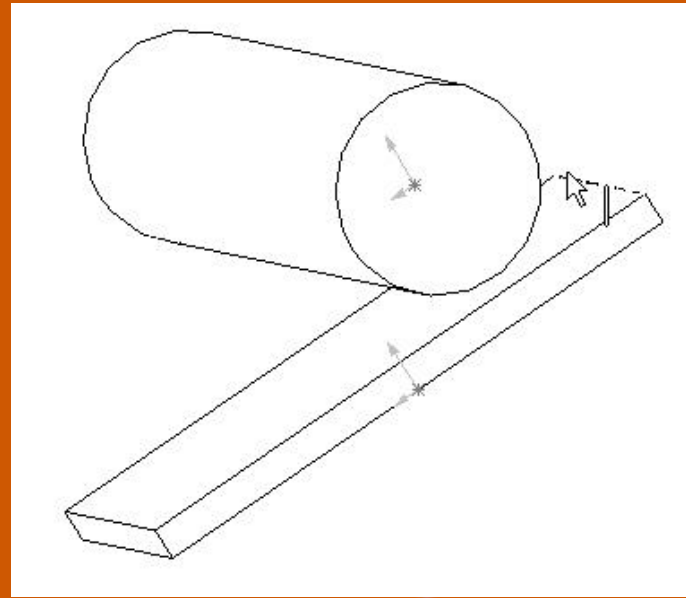
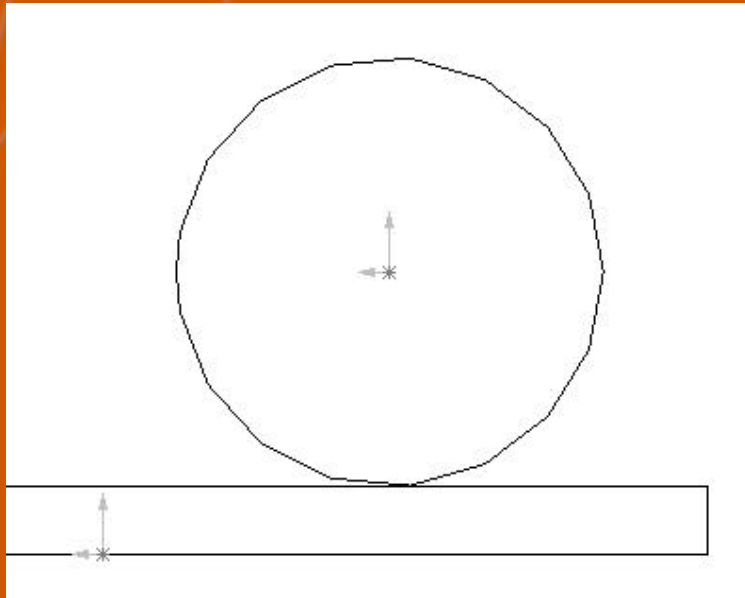
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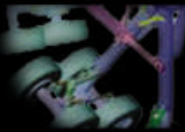


Tangencies



Descriptive Geometry

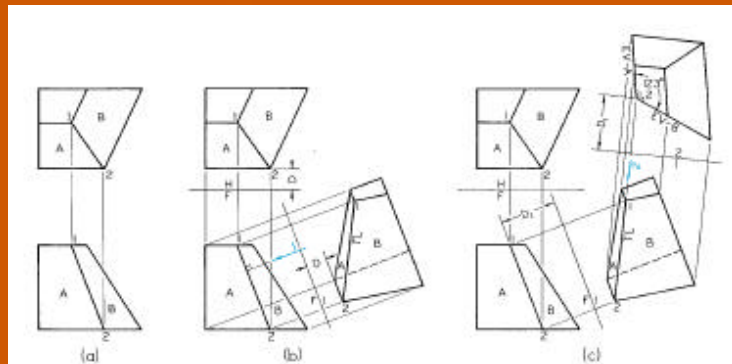
- Science of graphical representation of spatial relationships of points, lines, and planes
- Geometry
- True length, size, angle
- Revolutions



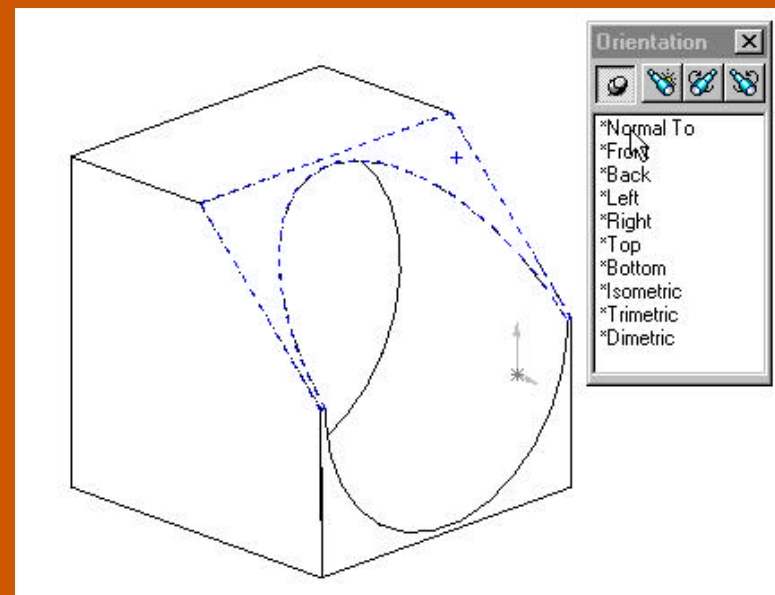
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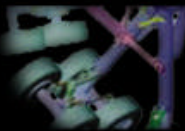
CAD - Replaces Descriptive Geometry



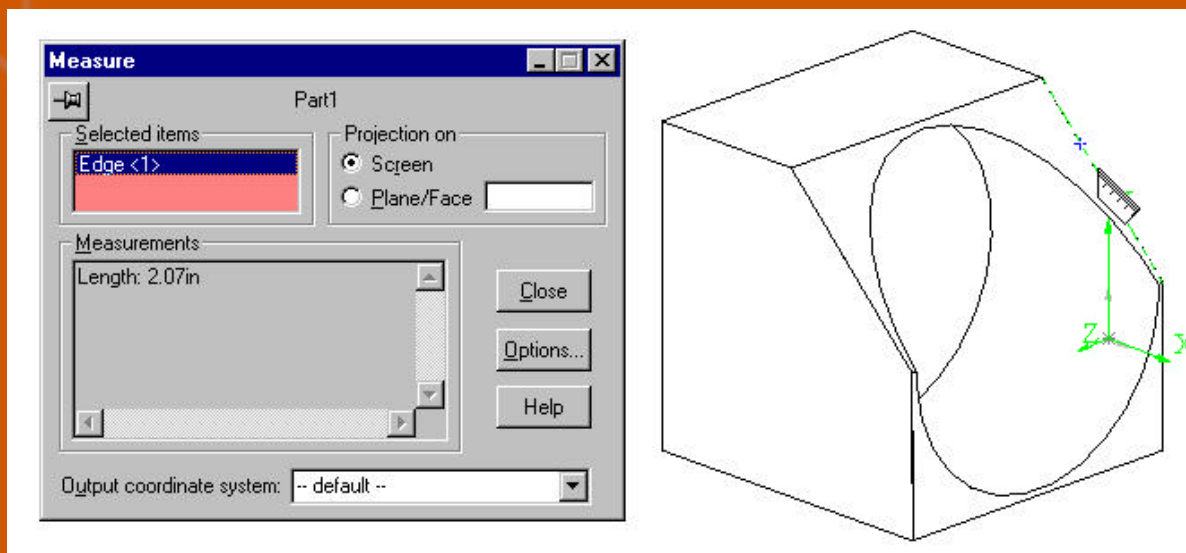
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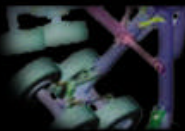
Solidworks



CAD - Replaces Descriptive Geometry



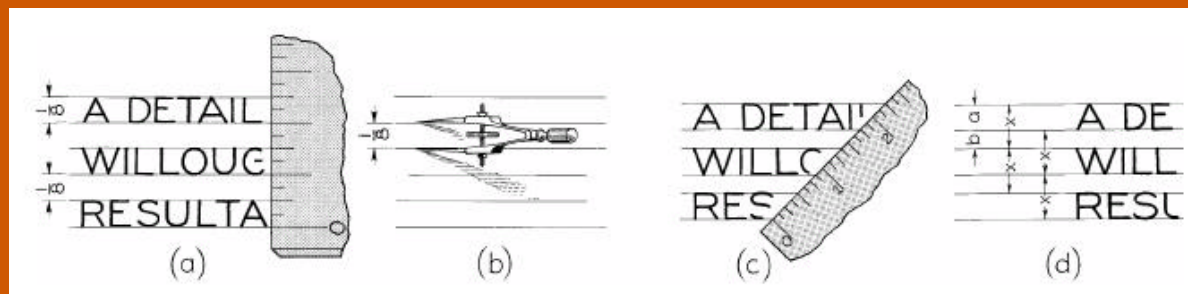
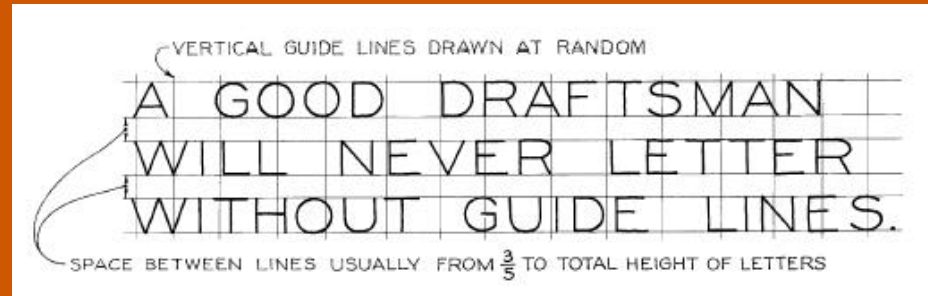
In Solidworks, just point and measure!



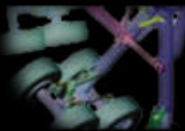
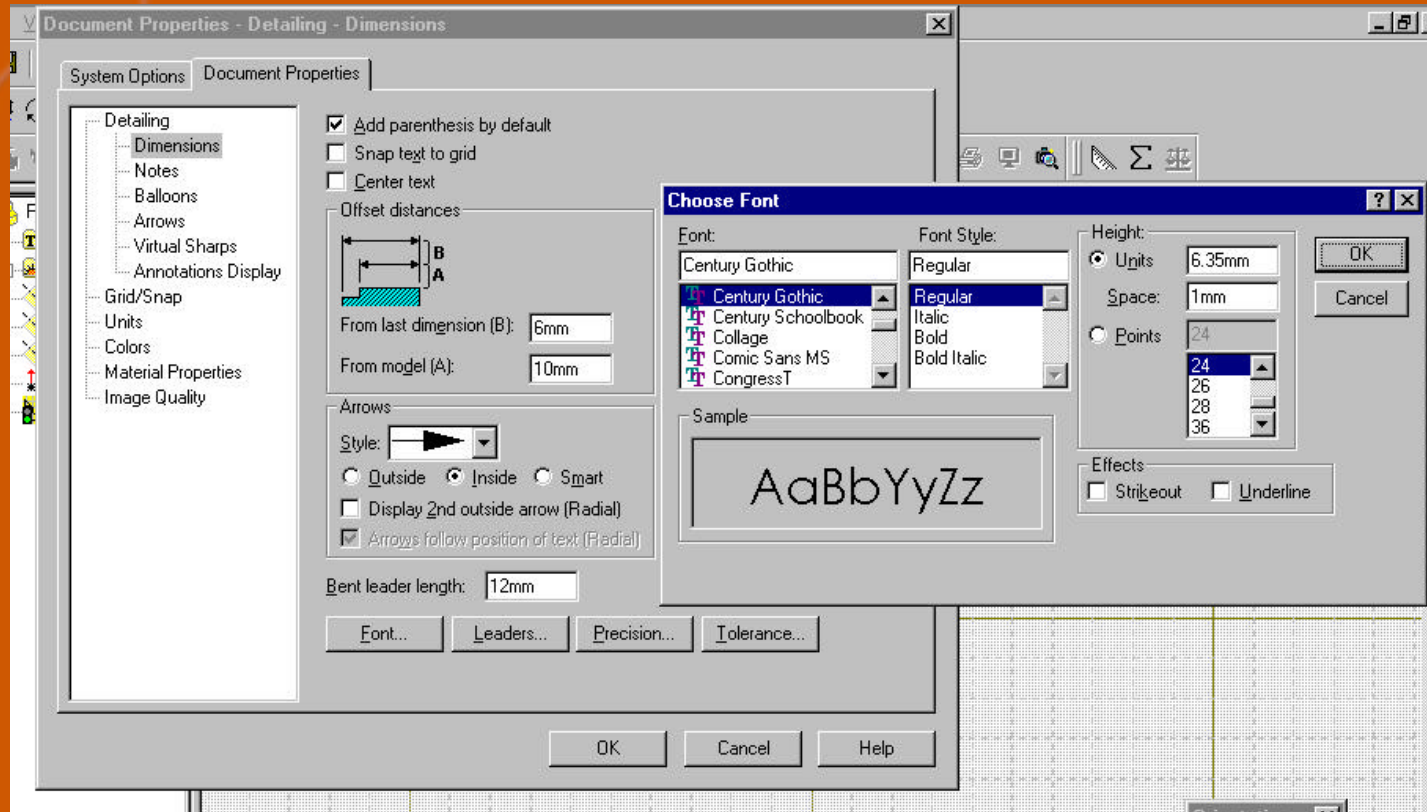
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Lettering

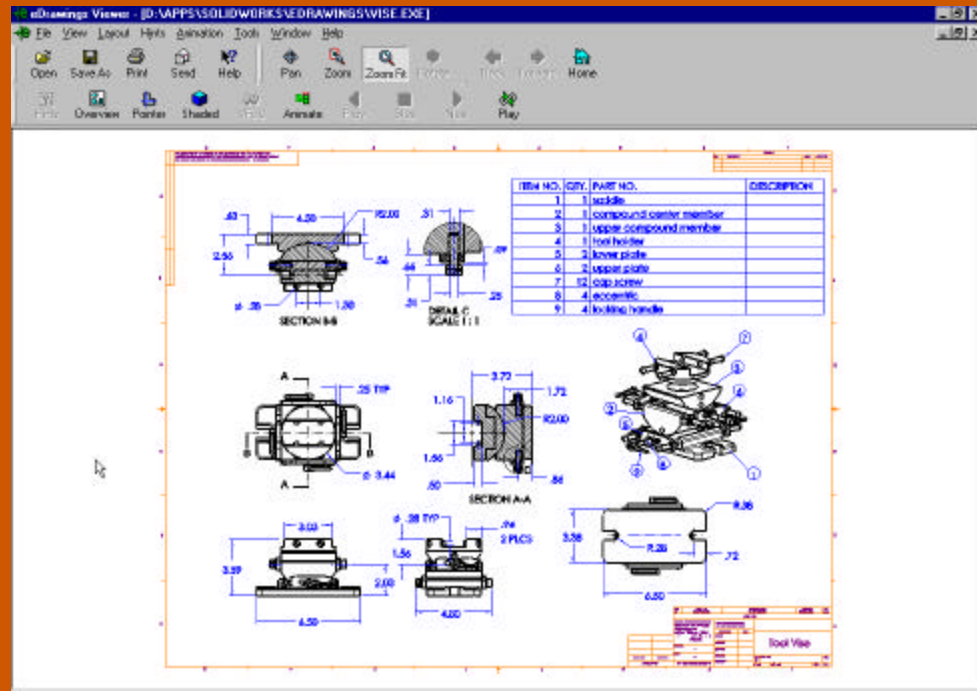


Lettering

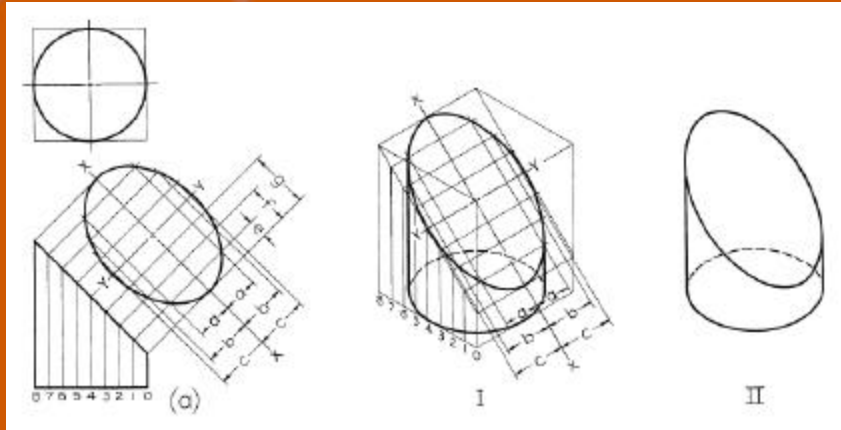


Multi-view Projection

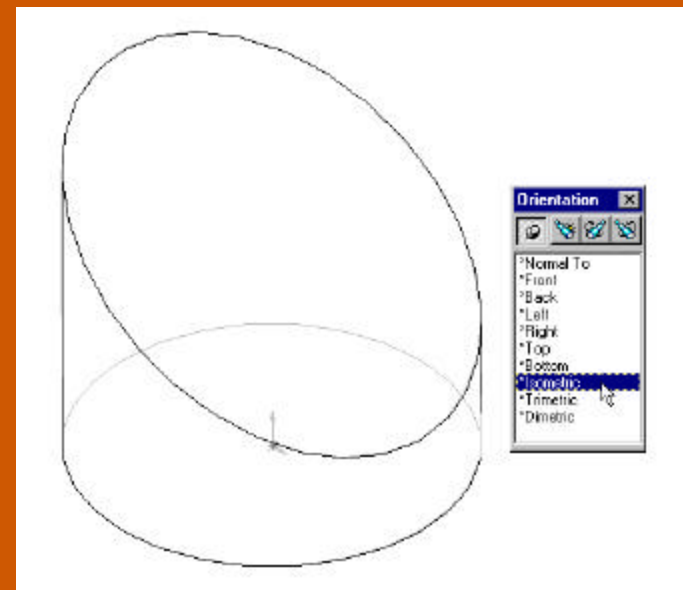
- E-Drawing



Creating Axonometric Drawings



Manual

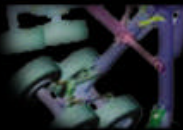
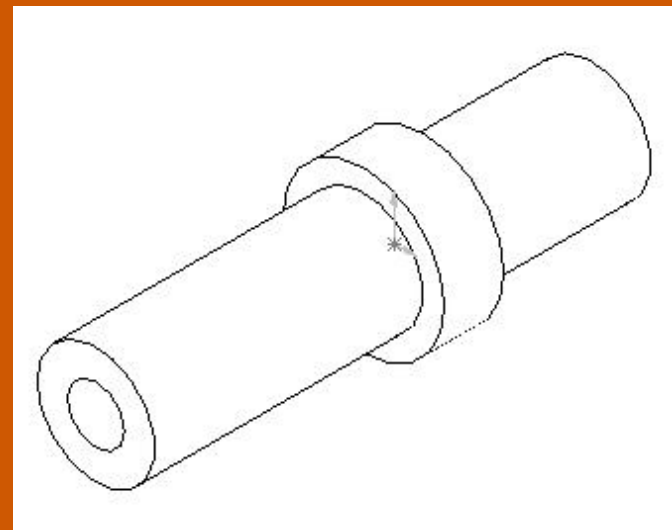
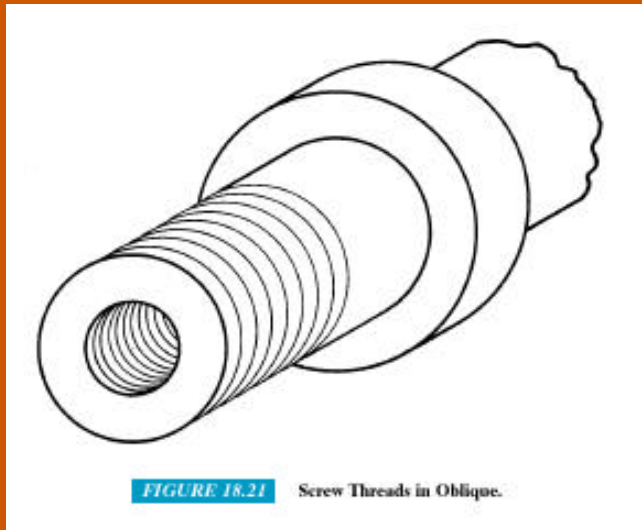


Solidworks

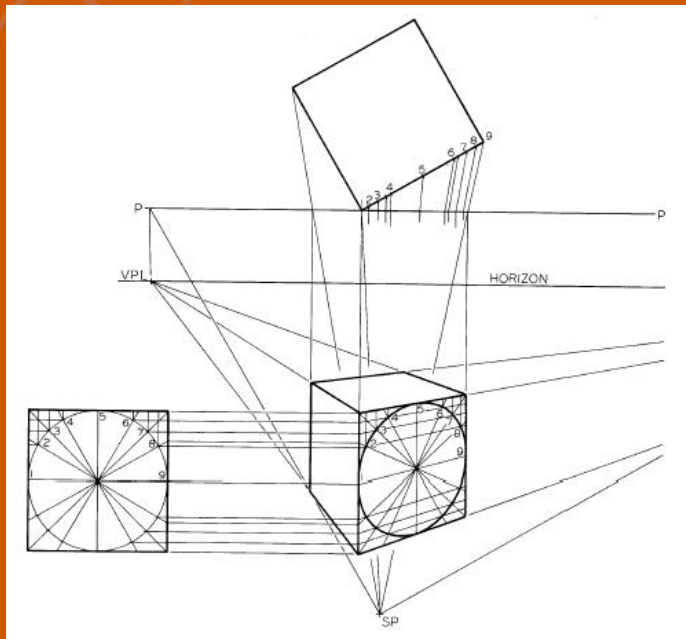


Oblique Projection

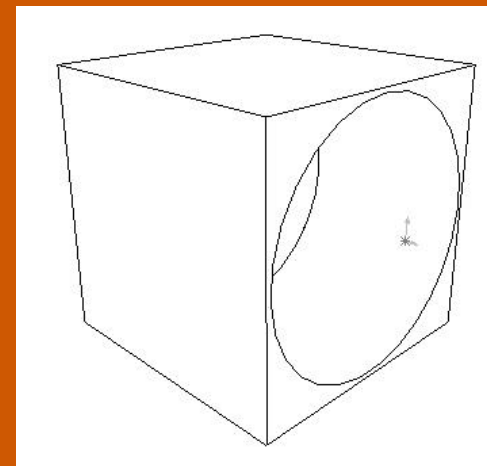
- A faked projection (simulated isometric)
- Eliminates need to draw ellipses



Perspectives



Manual



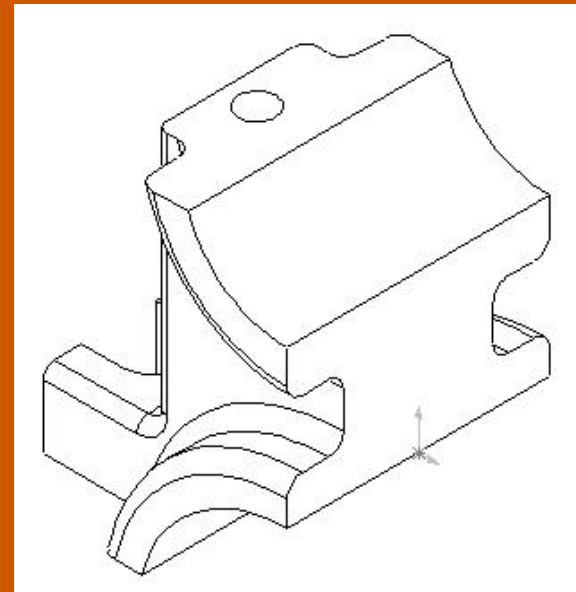
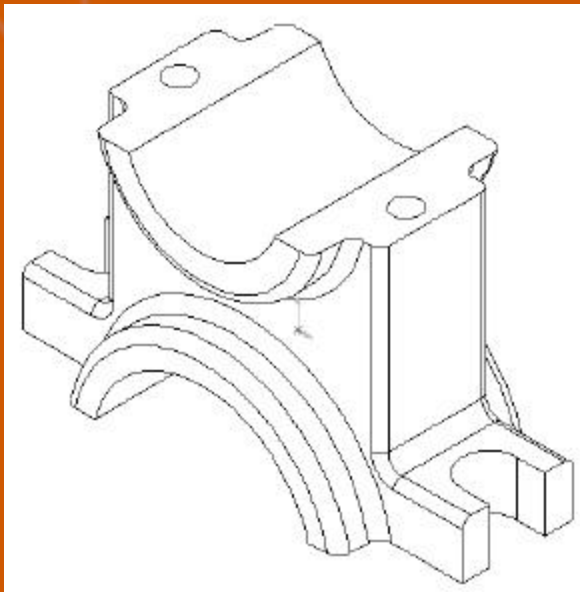
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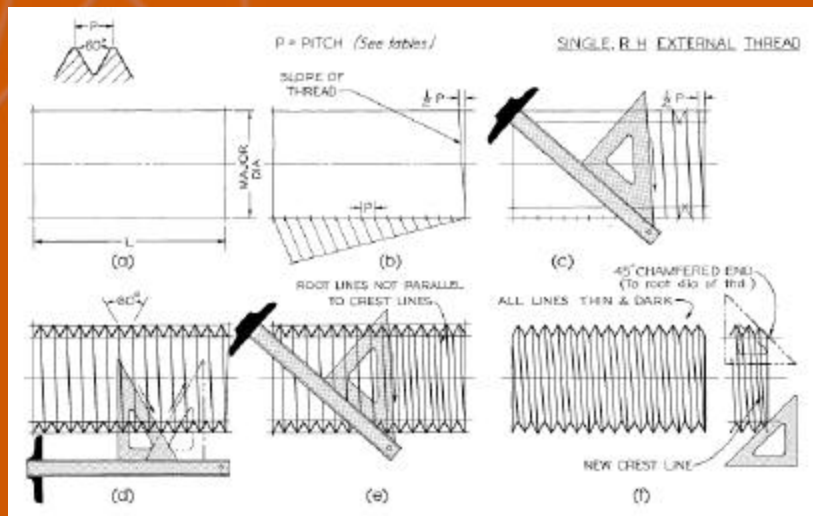
Section Views



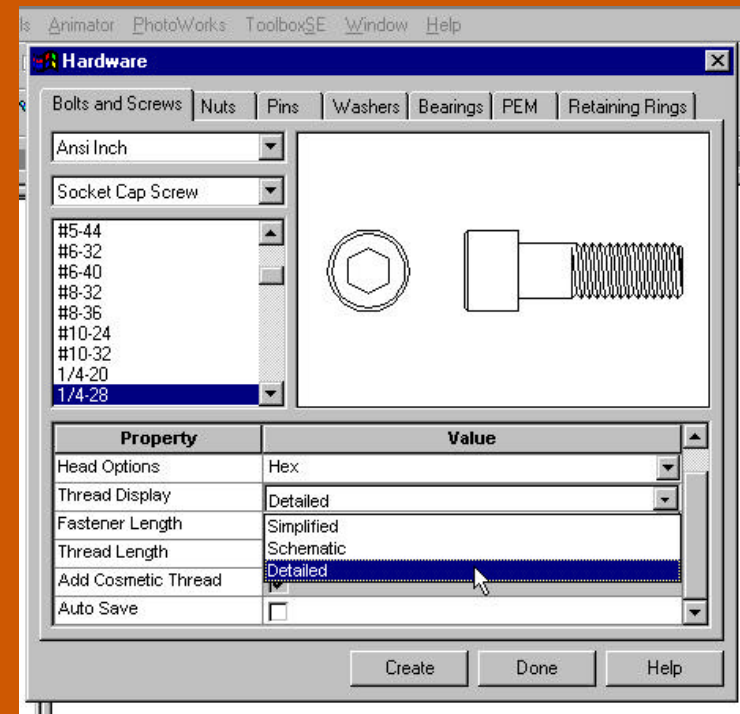
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Drawing Nuts & Bolts



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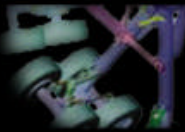


ToolboxSE



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

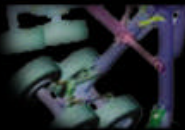



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Future Ideas

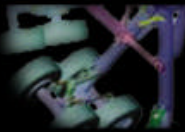
- Increase link between CAD and EG
- Increase link with manufacturing processes
- Dimensioning & Tolerancing
 - ANSI Standard Y14.5M-1994
- Design intent
- Drawings and auxiliary views
- Assembly drawings
 - Bill of materials
 - Tolerance analysis
- Analysis (FEA, kinematics & dynamic)
- Cost Analysis



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Discussion



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