Introduction to CAD

What Do Those Letters Mean to You?
Painting “The Big Picture”

• What is Computer-Aided Design (CAD)?
  – Creating drawings on a computer
  – Creating 3D shapes on a computer
  – Visualization
    • Checking how things fit together to make sure they don’t interfere
    • Checking how product will look to the customer
  – Doing simulations
    • Animation
    • Dynamics
    • Structural Analysis
    • Fluid Flow
    • Heat Transfer
The Design Process

- What is Computer-Aided Design (CAD)?
  Using computers to help execute the design process.
More Specific Definitions

- **Computer-Aided Design (CAD)** is the technology concerned with the use of computer systems to assist in the creation, modification, analysis, and optimization of a design. [Groover and Zimmers, 1984]

- **Computer-Aided Manufacturing (CAM)** is the technology concerned with the use of computer systems to plan, manage, and control manufacturing operations.

- **Computer-Aided Engineering (CAE)** is the technology concerned with the use of computer systems to analyze CAD geometry, allowing the designer to simulate and study how the product will behave.
Components of CAD Systems

- **Hardware**
  - Computing machine
  - Data storage devices
  - Communication devices
  - User input devices
  - User output devices

- **Software**
  - Solid Modeling
  - Assembly Modeling
  - Motion Simulation
  - Finite Element Analysis

**CAD/CAM/CAE System**
Components of CAD Systems

- Input Devices

Image from YouTube

Image from Mitutoyo (UK) Ltd

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Image from DesignerTechniques.com – Allan Macdonald

Image from YouTube
Components of CAD Systems

- Output Devices
Components of CAD Systems

- Integrated Input/Output Devices – Virtual Reality
Components of CAD Systems

- Integrated Input/Output Devices – Virtual Reality
### SolidWorks versus other CAD software

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SolidWorks vs. Autodesk
Inventor vs. Solid Edge

• Programs are similar but not equivalent:
  – Same class of software
  – Same types of tools available
  – Same general techniques used in each
  – Specific buttons, menus and input sequences different
  – Customer lists different

• Today vs. tomorrow
  – User interfaces will change
  – Fundamentals will stay the same
Course Goals

• Basic and Advanced Shape Modeling
• Parametric Modeling
• Working in Teams
• Advanced Top-Down Design Methodology
• Use of Solid Models for Downstream Applications
  – Design Documentation
  – Mechanism Analysis
  – Finite Element Analysis/Shape Optimization
  – Computer-Aided Manufacturing
Course Expectations

• Learning through doing (hands-on learning)
• Learning by studying theory
• Benefits from course
  – How to model products well, using state of the art CAD software
  – Understanding how computer is leveraged in design process