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
  - Doing simulations
    - Finite Element Analysis
    - Dynamics
    - Fluid Flow
  - Visualization
    - Checking how things fit together to make sure they don’t interfere
    - Checking how product will look to the customer
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.
Modern CAD/CAM/CAE practice

Information from all product lifecycle activities is available from a single database.

PLM System

Management

Component Design

Assembly Design

Motion Simulation

Structural Analysis

Other Physics Sim.

Production Planning

CNC Path Generation

Database

PDM System

Operations/Maintenance

Manuals

Customer Support

Marketing

Purchasing

Subcontracting

Marketing

Operations/Maintenance

Customer Support

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Subcontracting

Management

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Assembly Design

Motion Simulation

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Other Physics Sim.

Production Planning

CNC Path Generation
PDM and PLM

• **PDM** – **Product Data Management**
  is the activity of storing, retrieving, and controlling the use of digital product data shared by multiple users.

• **PLM** – **Product Lifecycle Management**
  is the strategic, integrated use of diverse software to support all product lifecycle activities of a manufacturing enterprise, from the conception of a product, through design, manufacturing, customer support, and product retirement.
Components of CAD Systems

CAD/CAM/CAE System

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

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

...
Components of CAD Systems

• Input Devices

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Components of CAD Systems

• Output Devices

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Components of CAD Systems

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

- Integrated Input/Output Devices – Virtual Reality

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# SolidWorks versus other CAD software

<table>
<thead>
<tr>
<th></th>
<th>Drafting</th>
<th>Solid/Ass. Modeling</th>
<th>Parametric Solid/Ass. Modeling</th>
<th>Integrated Simulation</th>
<th>Integrated Manufacturing</th>
<th>Integrated Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siemens PLM NX</td>
<td></td>
<td></td>
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MAE 455 Computer-Aided Design and Drafting
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