



CAD/CAM

Computer Aided Design & Manufacturing

MSc. Course / Production Engineering

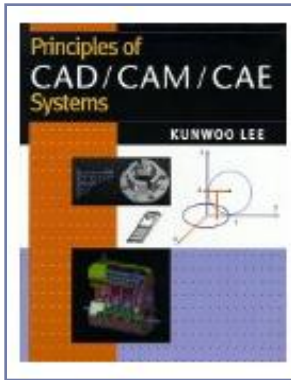
Dr. Laith Abdullah Mohammed

Dep. of Production Eng. & Metallurgy
University of Technology, Baghdad, Iraq

Website: <http://www.uotechnology.edu.iq/dep-production/laith/index.html>

Email: dr.laith@uotechnology.edu.iq

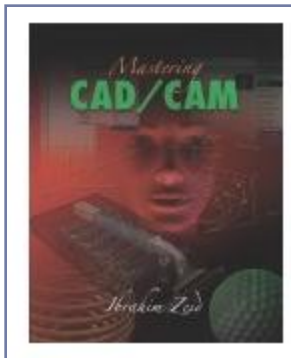
References:



Principles of CAD/CAM/CAE

By: Kunwoo Lee

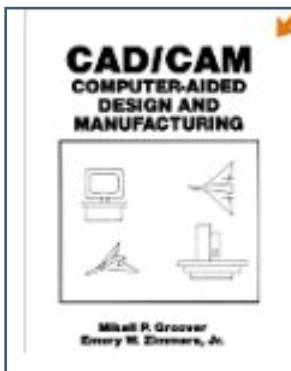
1999



Mastering CAD/CAM (Engineering Series)

By: Ibrahim Zeid

2004



CAD/CAM: Computer-Aided Design and Manufacturing

By: M. Groover and E. Zimmers

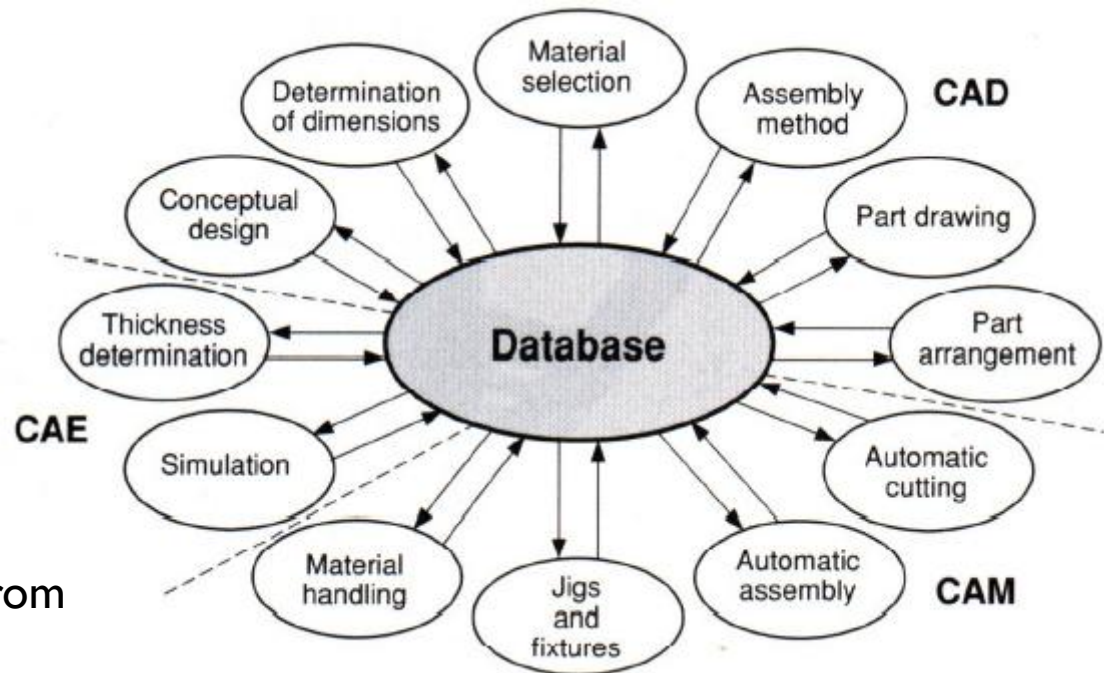
1983

Basic 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.

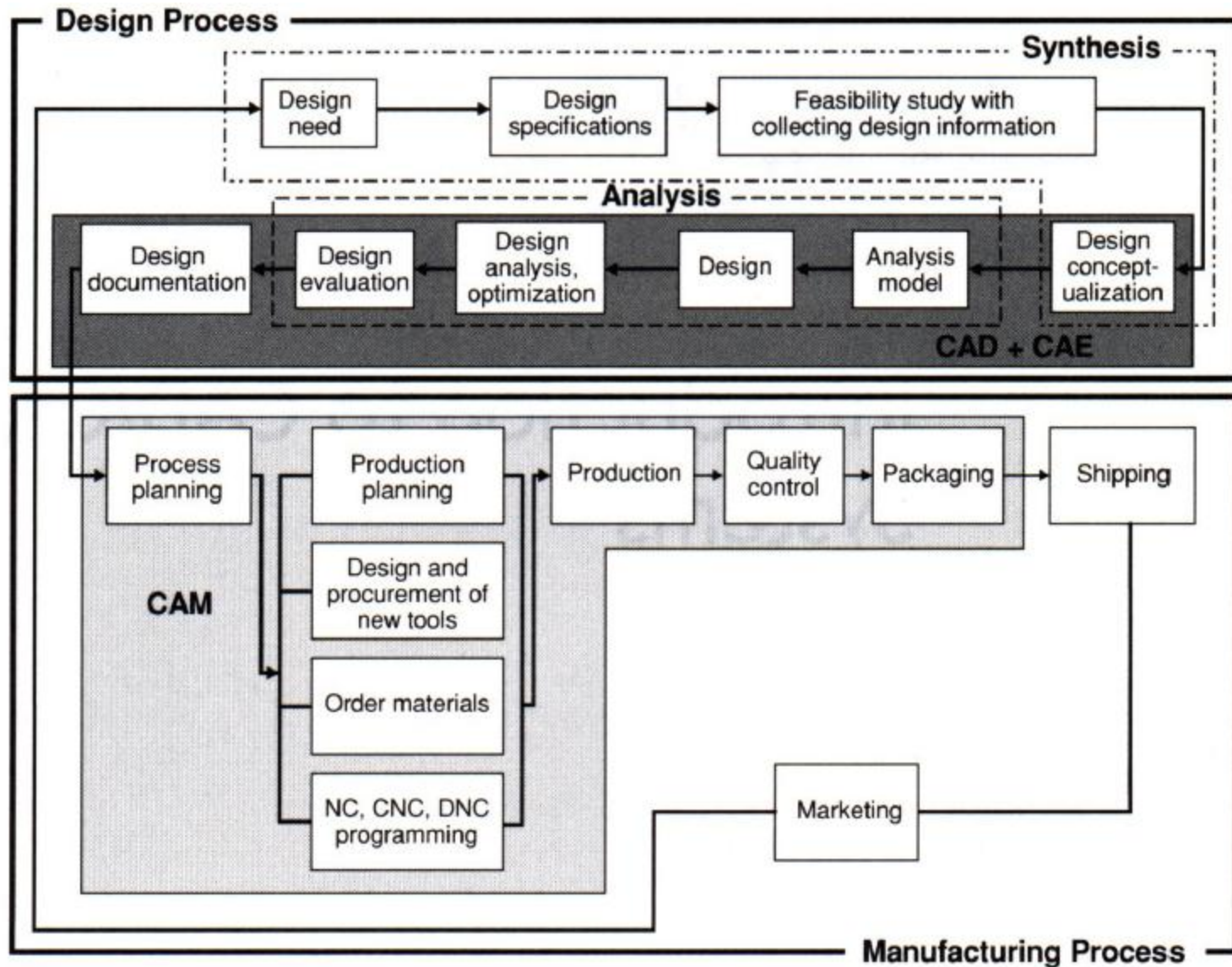
Computer-Aided Manufacturing (CAM) is the technology concerned with the use of computer systems to plan, manage, and control manufacturing operations.

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.



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

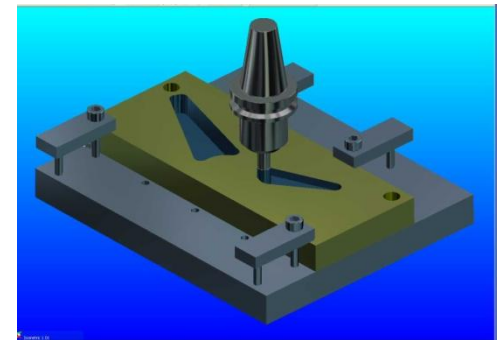
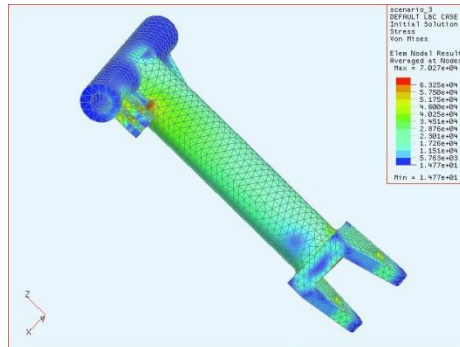
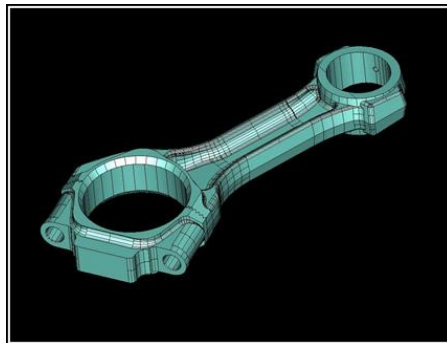
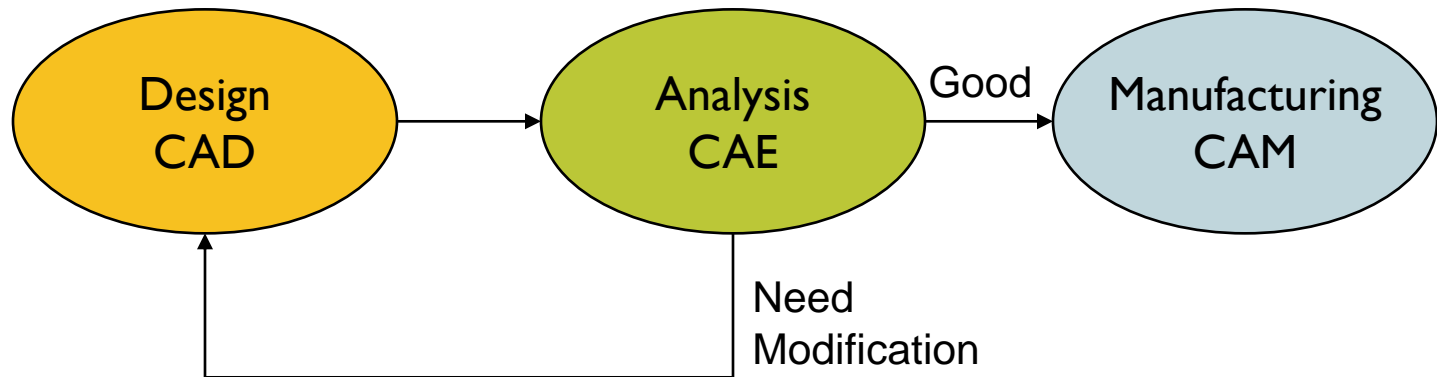
Typical Product Life Cycle



Website: <http://www.uotechnology.edu.iq/dep-production/laith/index.html>

Email: dr.laith@uotechnology.edu.iq

Simple CAD/CAE/CAM Product Lifecycle



CAD/CAM : It is the technology concerned with the use of computers to perform design and manufacturing functions.

Website: <http://www.uotechnology.edu.iq/dep-production/laith/index.html>

Email: dr.laith@uotechnology.edu.iq

Manufacturing Methods

Net shape

- Plastics (Injection Molding)
- Bulk Deformation
(Forging, Rolling, Extrusion, Drawing)
- Sheet Metal
- Casting
- Powder Metallurgy (P/M)
- Ceramic Forming

Machining

- Cutting with single or multipoint tools
(Mills, Lathes, Saws....)
- Abrasive processes- (Grinding)
- “Non-traditional” machining- (EDM, ECM, Laser, Electron Beam, Water Jet)

Joining

- ◆ Weld, Braze, Solder
- ◆ Adhesion (Glue, Epoxy...)
- ◆ Mechanical Fasteners

Website: <http://www.uotechnology.edu.iq/dep-production/laith/index.html>

Email: dr.laith@uotechnology.edu.iq

Computer Aided Design

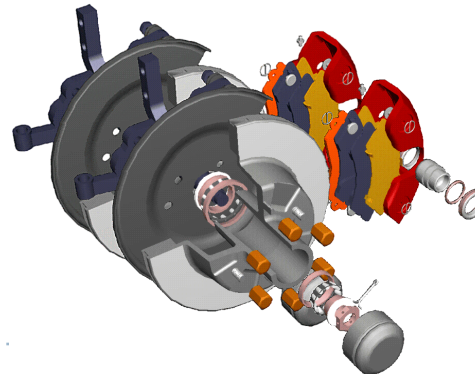
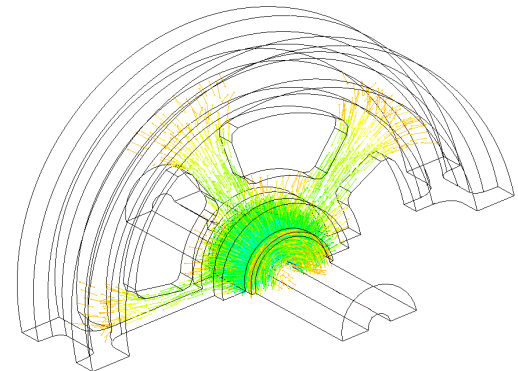
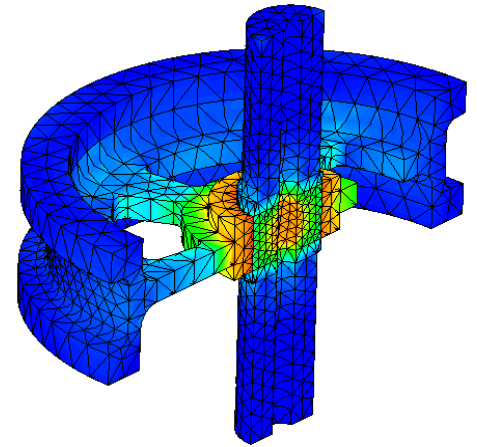
- ▶ In industry, CAD refers to any computer software that is used to produce high quality drawings and models which meet exact specifications.
- ▶ CAD software is often then linked to machinery to perform a task to manufacture part of or a whole product; this is known as CAM (Computer Aided Manufacture).

▶ Typical tools in CAD:

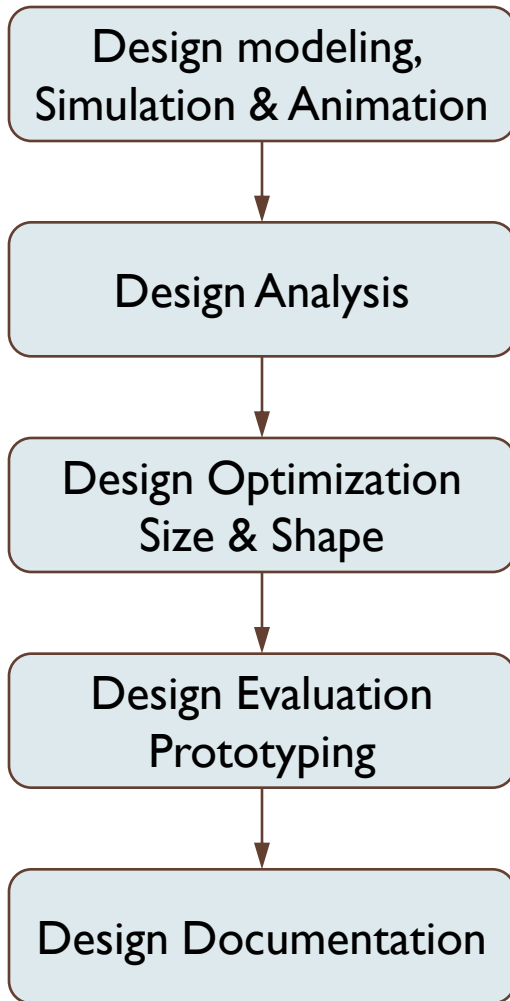
- ▶ Tolerance analysis
- ▶ Mass property calculations: Curve length, Mass, Center of mass, First moment of inertia, Products of inertia, Surface area, Volume, Centroid of a volume, Center of surface area, Cross sectional area.
- ▶ Finite-element modeling and visualization.

A CAD system consists of three major parts:

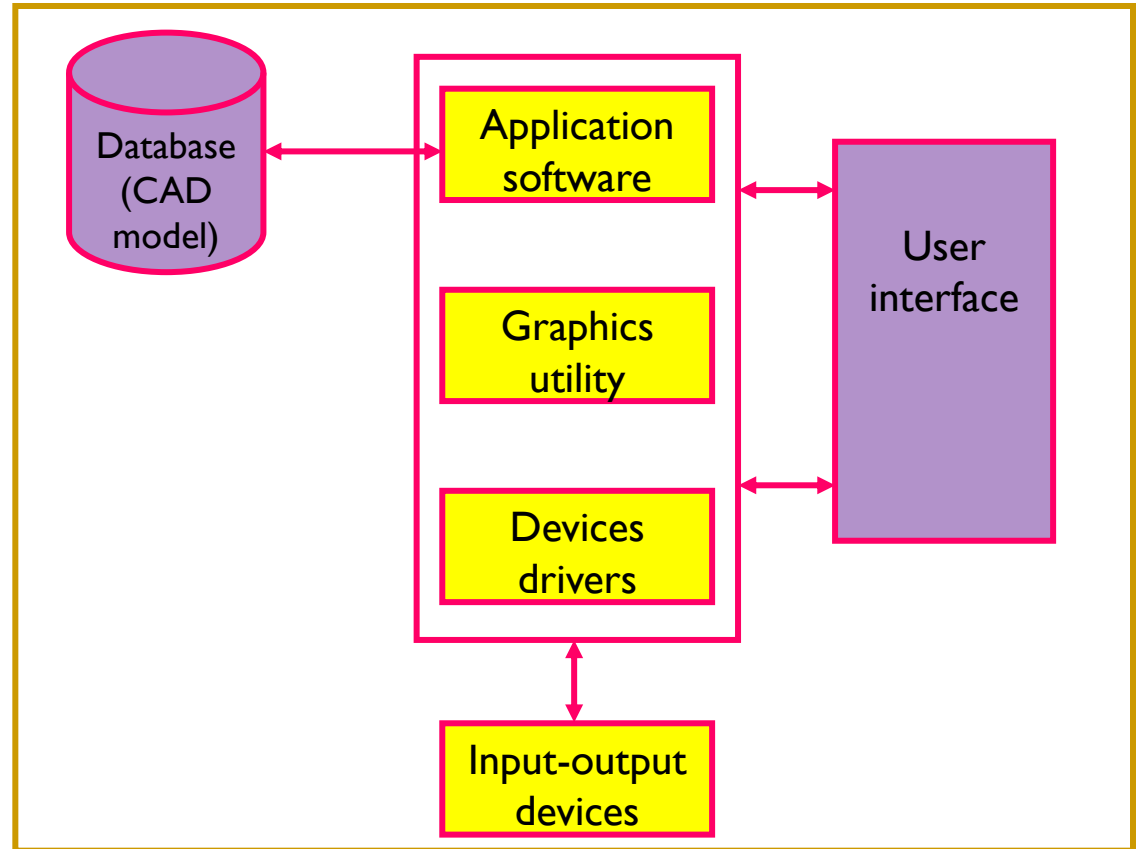
- Hardware: computer and input/output devices.
- Operating system software.
- Application software: CAD package.



Basic structure of a CAD system

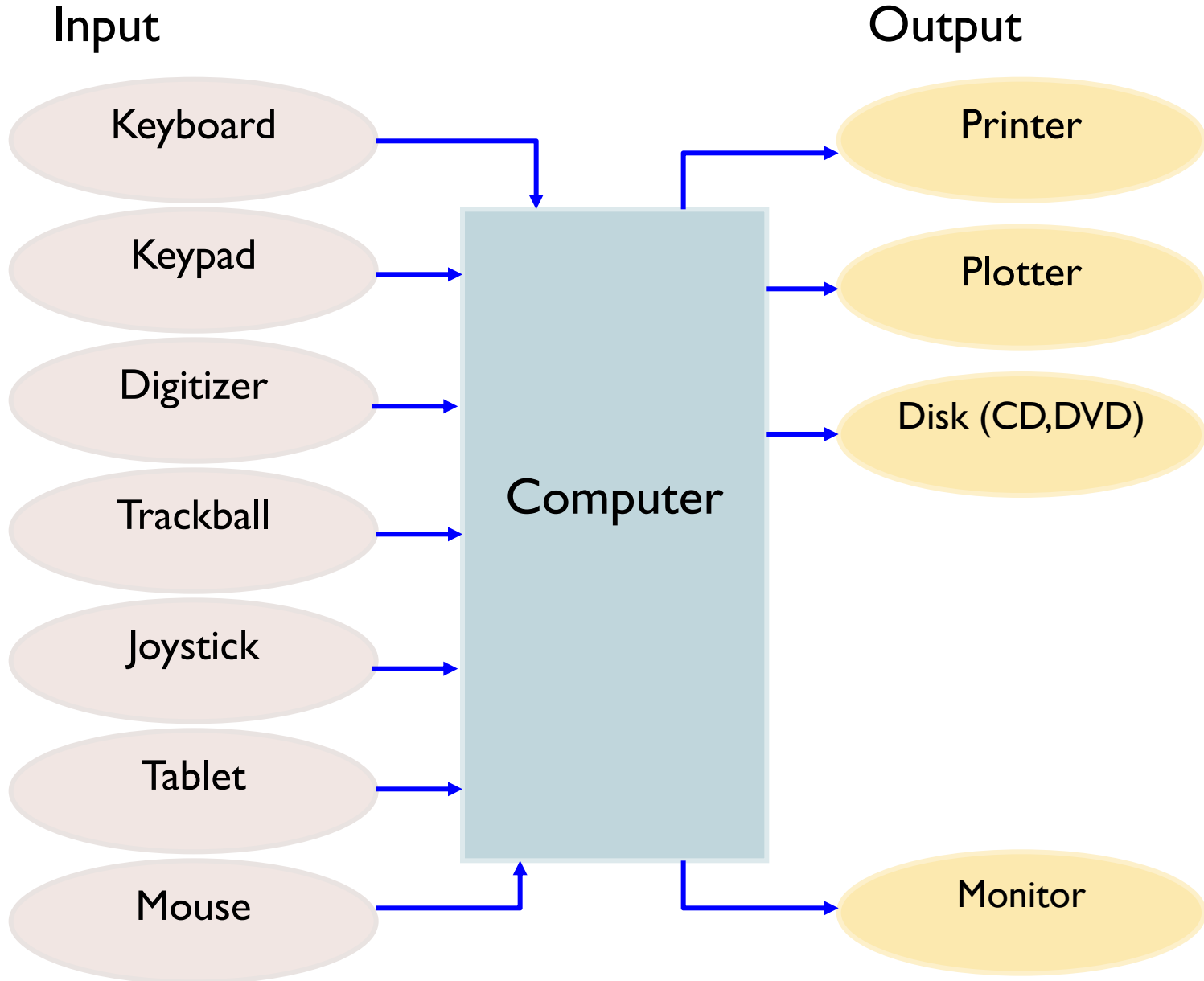


The CAD Process



- The application software is at the top level and is used to manipulate the CAD model database.
- The graphics utility system performs the coordinate transformation, windowing, and display control.
- Devices drivers are used to translate the data into and out of the specific format used by each device, they also control the devices.
- The operating system is run in background to coordinate the entire operations.
- User interface links the human and the system.

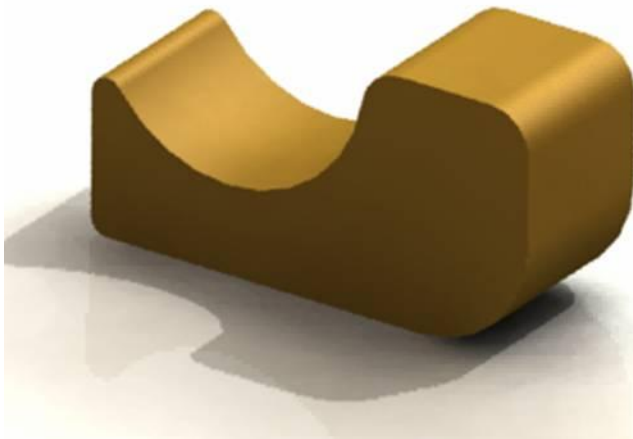
I/O devices of a CAD system



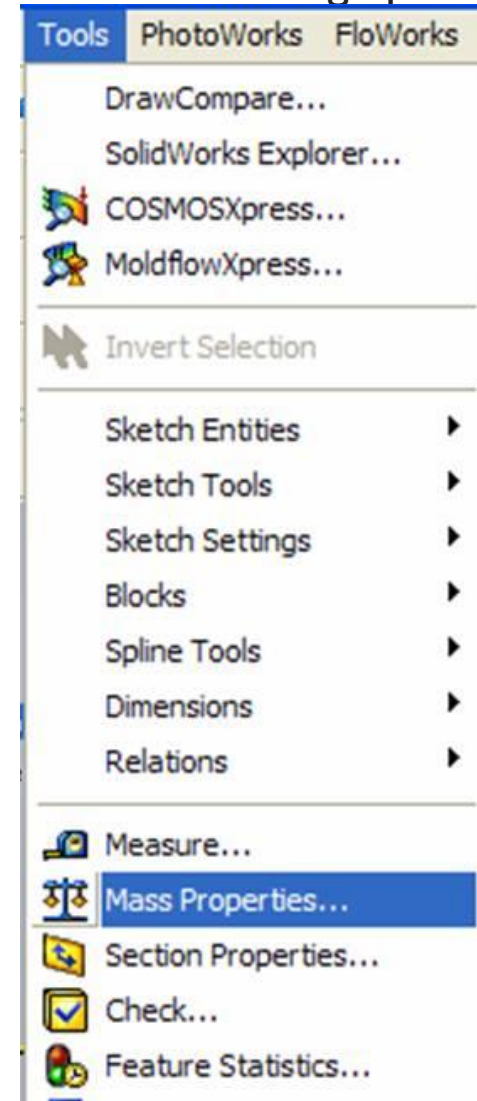
Mass Properties – CAD/CAM Systems

CAD systems typically calculate the mass properties, the user is responsible for setting up the correct units for length, angles and density.

Example: SolidWorks



Determine the mass properties

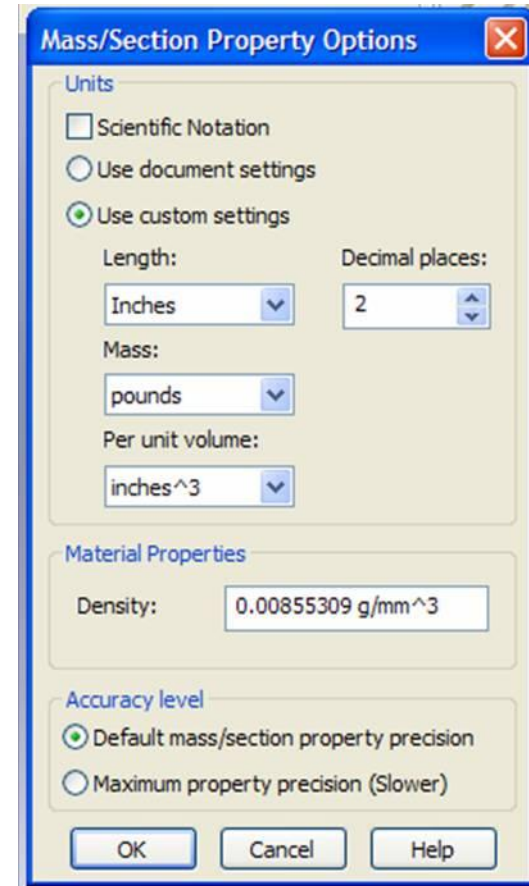
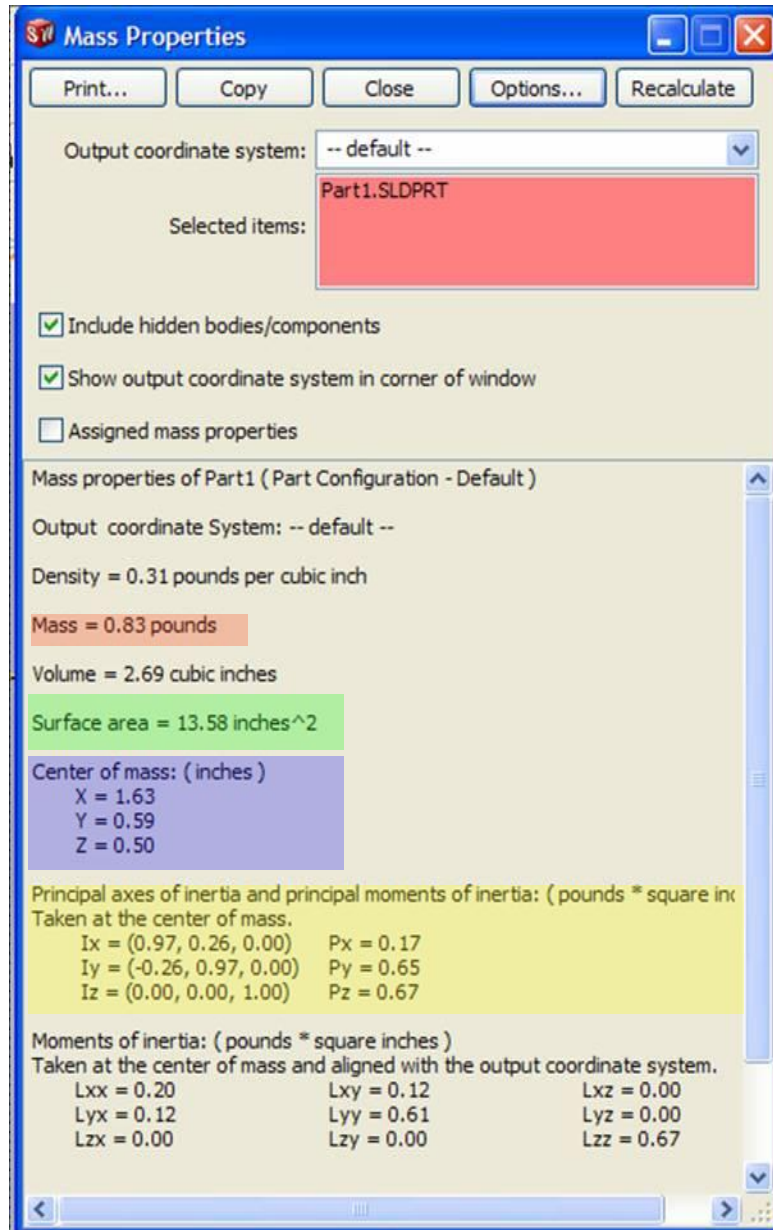


Website: <http://www.uotechnology.edu.iq/dep-production/laith/index.html>

Email: dr.laith@uotechnology.edu.iq

Mass Properties - SolidWorks

Option button allows to set the proper units



Useful Software & Internet Resources

MATLAB®

The Language of Technical Computing

Version 7.10.0.499 (R2010a)
64-bit (win64)
February 5, 2010
License Number: 161051



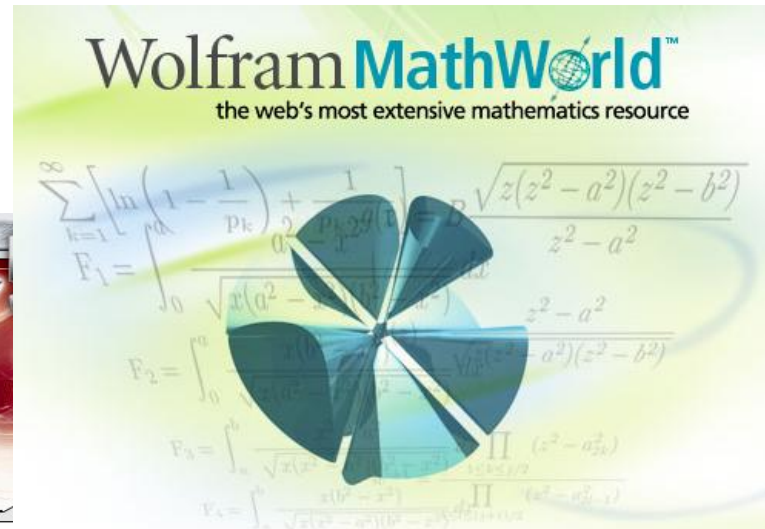
<http://www.mathworks.com/>



<http://www.mastercam.com/>



<http://www.solidworks.com/>



<http://mathworld.wolfram.com/>

Assignment:

Write a brief report about one of the CAD/CAM software

1. OneCNC
2. SURFCAM
3. EdgeCAM
4. EZ-CAM
5. AlphaCAM
6. CATIA
7. IronCAD
8. Pro/Engineer
9. SolidEdge
10. CAMWorks
11. Delcam
12. Bob CAD/CAM
13. ESPRIT
14. GibbsCAM
15. Vero software
16. Cimatron
17. TopSolid
18. Dolphin CAD/CAM
19. RhinoCAM
20. Visual Mill

Website: <http://www.uotechnology.edu.iq/dep-production/laith/index.html>

Email: dr.laith@uotechnology.edu.iq