

## ME477-3 Fundamentals of CAD/CAM

**INSTRUCTOR:** Dr. Tsuchin Philip Chu, E 016, (618) 453-7003, tchu@siu.edu

**TEACHING AND LAB ASSISTANT:** Caleb McGee, (618) 453-7049, caleb.mcgee@siu.edu

**TEXTBOOK:** N/A

**CLASS SCHEDULE:** 1:00 – 1:50 PM, MWF, EGRA 0209 (CAD Lab)

**OFFICE HOURS:** **Dr. Chu** – 10-12am MTW or by appointment, Mr. McGee – TBA

**GRADE DISTRIBUTION:** (total 1000 points)

Homework/Lab Assignments	400 points
Design Project(s)	300 points
Computer Test(s) (Inventor):	200 points (100 pt. Midterm, 100 pt. Final)
Written Test (1)	100 points (final)

<b>900 &amp; above</b>	<b>A</b>
<b>800 to 899</b>	<b>B</b>
<b>700 to 799</b>	<b>C</b>
<b>600 to 699</b>	<b>D</b>
<b>below 600</b>	<b>F</b>

**COURSE DESCRIPTION:** Introduction to the concepts of computer-aided design and manufacturing (CAD/CAM). Subjects include design process, CAD/CAM integration, parametric design, surface modeling, solid modeling, design assembly, documentation with computer-aided drawings, dimensioning, engineering analysis with finite element analysis (FEA), computer numerical controls, and computer integrated manufacturing (CIM). Students are required to use computer packages for projects.

**COURSE OPERATION:** This course covers a lot of materials. Some of which you may already know about and other things you will learn about for the first time. The purpose of this broad coverage is to expose you to the concept, methodology, technology, computer packages, and the state-of-the-art development in CAD/CAM. It is impossible to cover all aspects of CAD/CAM within this semester. The research/survey project assignments will provide you with more insight to each subject.

Each topic will be covered in one or two classes. If you miss one class you may miss one important topic completely. During the lab session, you will learn how to use CAD/CAM packages. Your home work assignments will also be checked and graded during the lab hours. You should expect spending a minimum of **5 additional hours** per week to learn the basics of each major CAD functions, depending on your computer background and proficiency.

**No late homework will be accepted.** No incomplete will be given for any reason.

### COURSE OUTLINE:

#### Part 1. CAD/CAM Overview

- Design process and CAD/CAM.
- Introduction to geometric modeling & parametric design.
- Engineering analysis & optimization – introduction to FEA.
- Brief introduction to CAM.

#### Part 2. Parametric Design with Autodesk Inventor

- Getting Started – startup dialogue box, units setup, screen layout.
- Parametric modeling fundamentals – sketching, profiling, constraints, sketch planes.
- CSG concepts – CSG, binary tree, Boolean operations, base feature, Placed features, Extrusion.
- Model history tree – *Desktop Browser*, feature interactions, profile tolerance setting, modify feature dimension, history-based part modification, basic design changes.
- Parametric constraints – parametric relations, dimensional variables, modify geometric constraints, modify parametric relations.
- Geometric Construction Tools - create 2D sketches, autodimension command, fillet, profile.
- BORN technique – BORN technique, reference geometry, placed features, OFFSET work plane, understand the parent/child relations.
- Part drawings – drawing layouts, associative functionality, 2D views, sections, feature dimensions, reference dimensions.
- Datum features & auxiliary views.
- Symmetric features – revolved features, mirroring, construction geometry, combined parts, feature arrays.
- Advanced 3D construction tools.
- Assembly – methodology, local parts, assembly constraints, DOF, external parts, scenes, exploded assemblies.

#### Part 3. Selected Advanced Topics

- Sheet metal design.
- Content center and basic motion analysis
- Introduction to FEA
- Weldment.

- Cable and harness design.
- Tube and pipe design.
- Dynamic simulation to test design performance.
- Photorealistic rendering – 3D Studio.

#### REFERENCES:

##### Autodesk Inventor:

- Shih, Randy, *Parametric Modeling with Autodesk Inventor*, SDC
- Banach, Daniel T. T. and Jones T., *Autodesk Inventor from the Top*, Thomson Learning

##### Introduction to CAD/CAM:

- Lee, Kunwoo, *Principles of CAD/CAM/CAE Systems*, Addison Wesley Longman, 1999.
- Amirouche, F., *Computer-Aided Design and Manufacturing*, Prentice-Hall, 1993.
- Taylor, Dean L., *Computer-Aided Design*, Addison Wesley, 1992.
- Zeid, Ibrahim, *CAD/CAM Theory and Practice*, McGraw-Hill, 1991.

##### Geometric Modeling:

- Beach, R.C., *An Introduction to the Curves and Surfaces of Computer-Aided Design*, Van Nostrand Reinhold, 1991
- Rogers, D.F. & Adams, J.A., *Mathematical Elements for Computer Graphics*, 2nd ed., McGraw-Hill, 1990.
- Faux, I.D. & Pratt, M.J., *Computational Geometry for Design and Manufacture*, John Wiley and Sons, 1981.

##### Computer-Aided Manufacturing (CAM):

- Groover, M.P., *Automation, Production, Systems, and Computer-Integrated Manufacturing*, Prentice-Hall, 1987.

#### JOURNALS AND MAGAZINES:

- Cadalyst
- Computer-Aided Design
- Computer-Aided Engineering Journal
- Design News
- Machine Design
- Manufacturing Engineering
- Mechanical Engineering

#### WEBSITES:

- <http://www.autodesk.com>
- <http://www.ptc.com>
- <http://www.schroff.com>
- <http://www.ansys.com>

**Emergency Procedures.** Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT's website at [www.bert.siu.edu](http://www.bert.siu.edu), Department of Safety's website [www.dps.siu.edu](http://www.dps.siu.edu) (disaster drop down) and in Emergency Response Guideline pamphlet. Know how to respond to each type of emergency. Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. **It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency.** The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.