

**Western Michigan University**  
**College of Engineering and Applied Sciences**  
**Department of Industrial and Manufacturing Engineering**

**IME 246: Introduction to Computer Aided Design**  
**Fall Semester 2006**

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- Catalog Description (2003-2006): Principles of computer graphics technology and applications in CAD hardware and software components, and system operation. Survey of selected commercial CAD systems for production of two-dimensional drafting and three-dimensional wireframe part design creation. Emphasis placed upon factors affecting performance and capabilities of comparative CAD systems operation. Lecture/Lab (2 & 3 hrs.); Credit: 3 hrs.
- Prerequisites by Courses:
  - IME 142: Engineering Drafting
- Prerequisites by Topic:
  1. Understanding of Technical Graphics (IME 142)
  2. Ability to visualize orthogonal views (IME 142)
  3. Understanding of modeling using CAD software packages (IME 142)
  4. Capability for critical analysis of steps for basic solid modeling techniques (IME 142)
  5. Knowledge of standard requirements for functional documentation of technical graphics (IME 142)
  6. Understanding of sequential steps for task definition (IME142)
  7. Capability to define and follow algorithmic approaches to problem solving (IME142)
- Textbooks:
  - Parametric Modeling with I-DEAS Master Series 11, by R. H. Shih, Schroff Development Corporation Publications, Kansas. 2004.
  - Introduction to Catia V5R16, by R. Cozzens, Schroff Development Corporation Publications, Kansas, 2006.
- References:
  - On-line Help for I-DEAS, Catia, and Pro/E.
  - Pro/ENGINEER Tutorial – Wildfire 3.0, by R. Toogood, Schroff Development Corporation Publications, Kansas, 2006.

- Course Coordinator:  
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- Objectives<sup>1</sup>:  
Based on the above stated course description, at the conclusion of the semester the student should be able to:
  1. Perform basic solid modeling with feature-based CAD software packages (a, c, k)
  2. Understand and apply principles behind constraint-based CAD software packages (a, c, k)
  3. Apply and utilize concepts underlining parametric solid modeling (a, b, c, i, k)
  4. Perform critical comparison of capabilities, similarities and differences among various CAD software packages (a, i, j, k)
  5. Understand basic solid modeling techniques, together with their pros and cons (a, e, i, j, k)
  6. Identify hardware and software components in CAD systems (i, j, k)
  7. Recognize and use important sources of information for trends, evaluations and opinions of CAD hardwares and softwares (a, f, g, j)
  
- Topics:
  - Lectures:
    - ◆ Engineering Design Process and Computer effects (2 weeks)
    - ◆ Computer Graphics and Intro to CAD (2 weeks)
    - ◆ CAD components – Hardware and Software (1 weeks)
    - ◆ Solid Modeling – Techniques and Guidelines (2 weeks)
    - ◆ Primitives and Boolean Operations (1 week)
    - ◆ Feature-based Modeling and Options (2 weeks)
    - ◆ Parametric Design (1 week)
    - ◆ Surface Modeling (1 week)
    - ◆ Database transfer and systems compatibility (1 week)
    - ◆ Selection and evaluation of CAD systems (1 week)
  - Labs:
    - ◆ I-DEAS Intro, GUI and Sketcher (1 week)
    - ◆ I-DEAS Basic Features (1 week)
    - ◆ I-DEAS Advanced Features (1 week)
    - ◆ I-DEAS Born and Shell (1 week)
    - ◆ I-DEAS Documentation (1 week)
    - ◆ I-DEAS Added Features (1 week)
    - ◆ Catia Intro, GUI and Sketcher (1 week)
    - ◆ Catia Basic Features (1 week)
    - ◆ Catia Advanced Features (1 week)

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<sup>1</sup> Letter in parenthesis refers to the ABET-TAC criteria

- ◆ Catia Assembly (1 week)
- ◆ Catia Documentation (1 week)
- ◆ Catia Navigator (1 week)
- ◆ Pro/E Intro, GUI and Sketcher (1/2 week)
- ◆ Pro/E Basic Features (1/2 week)

- Evaluation: (tentative)

1. Lecture (~33% of final grade):

a) Exams (1)	18 pts
b) Software Exams (2)	20 pts
c) Quizzes (~3)	12 pts
d) Homework (~3)	10 pts
e) Report/Paper (~3)	25 pts
f) Evaluations (2)	15 pts

2. Lab (~67% of final grade):

a) Tutorials (weekly)	20 pts
b) Exercises (weekly)	15 pts
c) Homework (weekly)	55 pts
d) Hands-on Exams (2)	10 pts

- Performance Criteria<sup>2</sup>:

The student should demonstrate proficiency to:

- Objective 1:
  - a) Define complete list of steps required for proper solid modeling with CAD softwares (1a, 1b, 1c)
  - b) Effectively generate solid models in CAD softwares (2a, 2b, 2c, 2d)
- Objective 2:
  - a) Explain types and effects of dimensional and non-dimensional constraints (1a, 1b, 1c)
  - b) Efficiently apply proper constraints to solid models in CAD softwares (2a, 2b, 2c, 2d)
- Objective 3:
  - a) Adequately specify dimensions and relationships in order to create parametric solid models with CAD softwares (2a, 2b, 2c, 2d)
- Objective 4:
  - a) Concisely list and analyze capabilities, similarities and differences between various CAD softwares (1a, 1c, 1d, 2e)
- Objective 5:
  - a) Enumerate and analyze standard solid modeling techniques and guidelines (1a, 1c)
  - b) Develop efficient solid modeling methodologies (2b, 2c, 2d)

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<sup>2</sup> Number in parenthesis refers to the evaluation method

- Objective 6:
  - a) Provide information and specifications of typical components in a CAD system (1a, 1b)
- Objective 7:
  - a) Critically read and summarize information regarding CAD systems from articles and the internet (1a, 1d)
  - b) Present in written format information on trends and news referring to CAD in general, linking to covered class materials (1d, 2e)
- Computer Usage:  
Extensive use of computer hardware and software is required in this course. All lab sessions take place at the CAE Labs. Some of the lectures will take place at the labs as well (for demonstration purposes.)
- Laboratory Project:  
No lab project is assigned in this course.
- Oral and Written Communications:  
Written reports are required during the semester. Three major Review Papers should be based on articles distributed in class, together with articles from library/web. Each one of these reports is a two-page-minimum submission, consisting of a summary and a critique of the articles utilized.  
The Evaluation Reports are a two-page-minimum submission providing your own evaluation of each one of the CAD software packages used. The last one of them should include a comparative evaluation of all three softwares used.  
No handwritten submissions are accepted.
- Calculus Usage:  
No use of calculus is expected in this course.
- Library Usage:  
Use of the Library is expected to obtain proper references for all written reports.
- Comments:
  - One hour of lecture a week is dedicated to CAD topics, and the other hour of lecture to software-related issues. The three hours of lab a week are dedicated to lab work.
  - Lecture quizzes are written ones. Lecture quizzes could be previously announced or not.
  - Lab quizzes/exams are written and/or hands-on.
  - All homework is due at the beginning of the following lecture of the same type (i.e., lecture or lab), unless indicated otherwise.
  - Lab tutorials (from textbooks), exercises (from textbooks) and homework will be given during lab sessions. The tutorials are due at the end of the lab session. Some exercises are due at the end of the lab session as well. Homework is due the following lab session.

- Reports/papers are written summary & critique of news articles or magazine report about CAD and its applications/advances. Some articles will be provided, for others you will be doing a library search.
- Written evaluations are due after each software is covered. The software evaluations are your opinion (provide likes and dislikes) on the software (i.e., I-DEAS and CATIA). In the second evaluation, a final comparative paragraph is as well required.
- An evaluation will be distributed towards the end of the semester. It covers what you have learned in the lecture and the lab, what you would like to see changed and kept, and any recommendations or suggestions you might have to improve the course and the learning.
  
- Electronic submission of lab work will be required.
- You must create proper directories and name your files in a sequential fashion according to the instruction that will be given during class/lab. The set of folder that need to be created in your account is as follows: ime246> week01 to week14; quizzes; papers.
- E-mail will be used during the semester.
  
- All work should be done individually. Student is responsible for being aware of the “Academic Honesty” section of the Student Rights and Responsibilities (WMU Undergraduate Catalog, page 268).
- Presentation is important. Hand-written reports are not acceptable.
- Strict control of the due dates will be kept. Penalty applies to any late submission of work. The penalties are: 10% for submission during the same session, 15% for submission the same day, 20% per calendar day for subsequent days.
- No work will be accepted after the assignment has been graded.
- No makeup quizzes (lecture) will be given. Make up exams and lab quizzes will be allowed only for verified excused absences.

Grades: Based on average and standard deviation for the group. A very good estimate of your grade at any time during the semester is to multiply by the factor (80/Average) and follow a standard scale: 100-93/92-89/88-83/82-79/78-73/72-69/68-63/62-0.

Note: These are basic guidelines. If you have any questions or doubts about something, please ask about it. I will be more than willing to explain or clarify your doubts. Do not assume or expect anything.

**Let’s get started!!!**

Prepared by: Jorge Rodriguez

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