Western Michigan University
College of Engineering and Applied Sciences
Engineering Design, Manufacturing, and Management Systems (EDMMS)

EDMM 2460: Computer-Aided Design

Dr. Jorge Rodriguez
Parkview Campus E-224, 269-276-3374, jorge.rodriguez@wmich.edu

- Catalog Description: 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 solid modeling and 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:
  EDMM 1420: Engineering Drafting

- Prerequisites by Topic:
  1. Understanding of Technical Graphics (EDMM 1420)
  2. Ability to visualize orthogonal views (EDMM 1420)
  3. Understanding of modeling using 3-D CAD software packages (EDMM 1420)
  4. Capability for critical analysis of steps for basic solid modeling techniques (EDMM 1420)
  5. Knowledge of standard requirements for functional documentation of technical graphics (EDMM 1420)
  6. Understanding of sequential steps for task definition (EDMM 1420)
  7. Capability to define and follow algorithmic approaches to problem solving (EDMM 1420)

- Textbooks:
  Parametric Modeling with UGS NX 9, by R. H. Shih, Schroff Development Corporation Publications, Mission, KS, 2014.

  Introduction to Catia V5-6R2013, by R. Cozzens, Schroff Development Corporation Publications, Mission, KS, 2013.

- References:
  On-line Help for Catia and NX.

- Course Coordinator:

    Jorge Rodriguez, PhD, MBA., Parkview Campus E-224, (269) 276-3374, jorge.rodriguez @wmich.edu.

- Objectives[1]:

    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
    2. Understand and apply principles behind constraint-based CAD software packages
    3. Apply and utilize concepts underlining parametric solid modeling
    4. Perform critical comparison of capabilities among various CAD software packages
    5. Understand basic solid modeling techniques, together with their pros and cons
    6. Identify hardware and software components in CAD systems
    7. Recognize and use important sources of information for trends, evaluations and opinions of CAD hardware and software

- 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:
    - NX Intro, GUI and Sketcher (1 week)
    - NX Basic Features (1 week)
    - NX Parametrics and Constraints (1 week)
    - NX Documentation (1 week)
    - NX Advanced Features (1 week)
    - NX Assembly (1 week)
    - Catia Intro, GUI and Sketcher (1 week)
    - Catia Basic Features (1 week)
    - Catia Advanced Features (1 week)
    - Catia Assembly (1 week)
    - Catia Documentation (1 week)

- ♦ Catia Navigator (1 week)
- ♦ (possible) Pro/E Intro (1 week)

- Evaluation: (tentative)
  - 1. Lecture (~30% of final grade):
    - a) Lecture exam (1)   30 pts
    - b) Software Exams (2)   40 pts
    - c) Quizzes, In class work (~6)   50 pts
    - d) Homework (~6)   50 pts
    - e) Report/Paper (~1)   40 pts
    - f) Software Evaluations (2)   40 pts
  - 2. Lab (~70% of final grade):
    - a) Tutorials (weekly)   60 pts
    - b) Exercises (weekly)   120 pts
    - c) Homework (weekly)   75 pts
    - d) Hands-on Exams (2)   125 pts
    - e) Lab quizzes (weekly)   45 pts
    - e) Final Assembly Project (1)   75 pts

- Performance Criteria[2]:
  The student should demonstrate proficiency to:
  - Objective 1:
    - a) Define complete list of steps required for proper solid modeling with CAD software (1a, 1b, 1c)
    - b) Effectively generate solid models in CAD software (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 software (2a, 2b, 2c, 2d)
  - Objective 3:
    - a) Adequately specify dimensions and relationships in order to create parametric solid models with CAD software (2a, 2b, 2c, 2d)
  - Objective 4:
    - a) Concisely list and analyze capabilities, similarities and differences between various CAD software (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)
  - Objective 6:
    - a) Provide information and specifications of typical components in a CAD system (1a, 1b)

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[2] Number in parenthesis refers to the evaluation method

- 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 session take place at the CAE Labs. Some of the lectures might take place at the labs as well (for demonstration purposes.)

- Laboratory Project:
  Lab project is assigned in this course.

- Oral and Written Communications:
  Written reports are required during the semester. There will be homework, papers, reviews, and critiques assigned in lecture and lab.
  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.
  Evaluation Reports are a two-page-minimum submission providing your own evaluation of each one of the CAD software packages used.
  No handwritten report 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 written reports.

- Academic Honesty
  You must be familiarized with WMU's Academic Honesty Policy, which is published in the Undergraduate and Graduate Catalogs. Specific questions regarding this policy can be addressed by the Office of Student Conduct (OSC). This policy will be applied as needed.

- Comments:
  ➢ One hour of lecture a week (typically Monday) is dedicated to CAD/CAE topics, and the other hour of lecture (Wed) 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 (in handouts) 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.
- Reading assignments will be assigned in lectures and labs.
- Written evaluations are due after each software is covered. The software evaluations are your opinion (provide likes and dislikes) on the software (i.e., CATIA and NX). In the second evaluation, a final comparative paragraph is as well required.
- A course evaluation will be distributed around the middle 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 your learning.

- Electronic submission (eLearning) of lecture and lab work is required. Some assignments will be submitted as printouts as well; it will be mentioned in the assignment form.
- 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: edmm2460> week01 to week14 (InLab and HW); labquizzes (NX and Catia); papers; evaluations, and lecture assignments.
- E-mail and eLearning will be used during the semester.
- All work should be done individually. 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: 20% for submission during the same session, additional 20% for submission the same day, and additional 20% for each subsequent day. No work will be accepted after the assignment has been graded.
- Make up exams and lab quizzes will be allowed only for verified extreme circumstances.
- Use of personal computer/laptops/device is permitted during lectures/lab only for class-related activities. No use of any other personal electronic devices is allowed during lecture/lab.

Grades: Based on average and standard deviation for the group. A good estimate of grade is that average score is a high CB, and each standard deviation is one full letter grade, up or down. A minimum score of 50 is required to get a passing grade (i.e., D and above).

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.

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