

MECH 412 - COMPUTER AIDED MECHANICAL DESIGN

Course Description

Overview of computer-aided design and manufacturing systems. Introduction to fundamental approaches of computer-aided geometric modelling, solid modelling and engineering simulations. Application of a CAD/CAM system on mechanical design.

General Course Information	
Lecture Time & Location	13:15 – 15:45 on Fridays, Room: CL233, SGW
Labs	07654 Lab XI: 08:45 – 10:35 SGW (1), H549-37, on Mondays 13024 Lab XJ: 08:45 – 10:35 SGW (2), H549-37, on Mondays 62793 Lab XL: 08:45 – 10:35 SGW (1), H549-37, on Wednesdays
Course Instructor	Dr. Chevy Zezhong Chen (Office: H549-24, Phone: 848-2424, ext. 3176, Email:zcchen@me.concordia.ca).
Lab Instructor	Mr. Mohammed Salek (Email: mh_salek@alcor.concordia.ca)
Assignment Marker	Mr. Allan Wei Cai (Email: wei_cai@alcor.concordia.ca)
Office Hours	10:00 - 11:30 a.m. on Fridays.
Homepage	http://engineering.concordia.ca/mech6451
Reference Books	<ul style="list-style-type: none">• Kunwoo Lee, <i>Principles of CAD/CAM/CAE Systems</i>, Addison Wesley, ISBN: 0-201-38036-6.• Ibrahim Zeid, <i>CAD/CAM Theory and Practice</i>, McGraw-Hill, Inc., 1991, ISBN: 0-07-072857-7.• <i>Mech 412 Lab Manual</i>, Concordia University.• Richard Cozzens, <i>CATIA V5 Workbook (Release 10 & 11)</i>, SDC Publications, ISBN: 1-58503-138-0.

Course Outline

1. Introduction to Computer-Aided Design

- Engineering design process
- CAD/CAM system concept
- CAD/CAM hardware and software

2. Graphics Concepts

- Coordinate transformations (translation, rotation, scaling, reflection)
- Projections (parallel vs. perspective, orthographic vs. oblique, isometric, etc.)
- Shading & smoothing

3. Geometric Modeling Systems

- Set operations
- Constructed solid geometry
- Boundary representation
- Other solid modeling methods

4. Representation of Curves

- Parametric design
- Analytic curves (line, circle, ellipse, parabola, hyperbola)
- Synthetic curves (cubic spline, Bezier, B-spline)
- Manipulation of curves (segmentation, trimming, blending)

5. Representation of Surfaces

- Analytic surfaces (plane, cylinder, sphere)
- Synthetic surfaces (ruled, revolution, bi-cubic spline, Bezier, B-spline, Coons)
- Manipulation of surfaces (segmentation, trimming, blending, offsetting)

6. CAD/CAM Data Exchange

- Data types and exchange methods (direct, indirect)
- Neutral data exchange format: IGES, STEP

7. Numerical Control

- CNC machines
- Basic concepts of CNC programming

8. CAD Applications in Mechanical Engineering

Course Grading Scheme

The following grading scheme will be used for the final grades.

Assignments (Five)	10 %
Labs	15 %
Course Project	35 %
Final Paper Exam	40 %

CLASS SCHEDULE

Week	Date	Chapter	Topics
1	Jan. 7	1, 2	Course Introduction, Introduction to Computer Aided Mechanical Design
2	Jan. 14	3	Graphics Concept
3	Jan. 21	3	Graphics Concept
4	Jan. 28	5	Geometric Modeling Systems
5	Feb. 4	6	Geometric Modeling Systems, Representation and Manipulation of Curves
6	Feb. 11	6	Representation and Manipulation of Curves
7	Feb. 18	6	Representation and Manipulation of Curves
8	Feb. 25		Mid-term Reading Break
9	Mar. 4	7	Representation and Manipulation of Surfaces
10	Mar. 11	7	Representation and Manipulation of Surfaces, Course Project Introduction
11	Mar. 18	7	Representation and Manipulation of Surfaces
12	Apr. 1	10	Data Exchange between CAD/CAM Systems
13	Apr. 8	11	Numerical Control, Course Review, Teaching Evaluation
14	Apr. 12		Course Project Presentations

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Lab Schedule

Room # H 549 - 37

Winter 2005

Lab Instructor: Mohammed Salek

E-mail: mh_salek@alcor.concordia.ca

Lab Description	Section XI Monday 08:45 - 10:35	Section XL Wednesday 08:45 - 10:35	Section XJ Monday 08:45 - 10:35
Lab 1 - Sketcher	Jan 17	Jan 19	Jan 10
Lab 2 - Part Design	Jan 31	Feb 02	Jan 24
Lab 3 - Drafting Design	Feb 14	Feb 16	Feb 07
Lab 4 - Assembly Design	Mar 07	Mar 09	Feb 28
Lab 5 - Wireframe & Surface Design	Mar 21	Mar 23	Mar 14
Lab 6 - Structural Analysis	Apr 04	Apr 06	Apr 11

Important Notes:

- There will be an assignment given on each lab.
- Students are to submit the solutions of the assignments in the next lab.
Delay in submission will result in reduction in grades.
- The grading scheme for the lab is 15%.
- There will be no mid term or final exam for the lab. So the assignments, lab participation and overall performance will carry the grades.