

IE 406/506

Computer-Integrated Manufacturing- Fall 2013

Class Time: Tuesday and Thursday 2:00 – 3:20 pm

Location: 170 Filmor

Instructor: Prof. Chi Zhou, Ph.D.

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Office hours: Tuesday and Thursday 3:30 – 4:30 pm (or by appointment)

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Teaching Assistant: Guanglei Zhao

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Office hours: Monday and Wednesday 10:00-11:00 am (or by appointment)

Office: 436 Bell Hall

Pre-requisite: IE 326 or permission of instructor

Textbook (required): Computer Aided Manufacturing, by T.C. Chang, R.A. Wysk, and H.P. Wang 3rd Edition, Prentice Hall, 2005.

Supplementary References: Systems Approach to Computer-Integrated Design and Manufacturing, by Nanua Singh, John Wiley & Sons, 1996.

Computer Integrated Design and Manufacturing, by D. D. Bedworth, M. R. Henderson, P. M. Wolfe, Mc-Graw Hill, 1991.

Catalog Description:

IE 406/506 is concerned with the basic and important principles in computer-integrated manufacturing (CIM). Based on an understanding of modern production and manufacturing systems, the course will further introduce the use of computers for the integration of all functional areas in a manufacturing enterprise. Topics include: computer-aided design (CAD), geometric models and data structures, computer-aided manufacturing (CAM), rapid prototyping, automation, group technology (GT), and computer-aided process planning (CAPP).

Objective of the course: At the conclusion of this course, you should be able to:

- Describe, select and analyze various Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) techniques to design and manufacture parts.
- Develop and apply Computer Aided Process Plans (CAPPs) for manufacturing various industrial parts.
- Identify automation requirements in a facility, design and implement automated systems to solve manufacturing related problems.
- Understand how Numerical-Control (NC) machines work, develop and implement NC programs to control CNC machines.

- Identify various rapid product development methodologies in producing mass-customized prototypes/parts.
- Integrate and analyze all the components of CIM such as CAD, CAM, CAPP, etc.
- Work effectively in a team to solve various CIM related problems.

Policies and Procedures:

- **Homepage:** <http://ublearns.buffalo.edu>
- **Exams:** There will be two 80-minute in-class progress exams during the semester and a comprehensive final exam.
- **Missed Exams:** No excuses for missed exams will be accepted other than certified medical excuses or prior instructor's approval.
- **Homework:** Completed assignments should be turned in at the beginning of the class in which they are due. Penalty for late homework/assignments will be 10% per late day and up to a maximum of 50%.
- **Projects:** There will be several small projects/ lab experiments throughout the semester. Groups of four will be formed to work on the projects.
- **Posted solutions:** The solutions for the assignments will not be posted. It is your responsibility to make sure to solve the problems by getting help before they are due and/or after they have been handed in.
- **Individual effort:** Unless otherwise instructed, each student must work on his/her assignment individually. However, you are allowed to discuss (not copy) the assignments with your classmates. Any academic dishonesty (i.e. cheating, plagiarism...) shall be resolved according to the University's **Academic Integrity Policy**. Please check the following page for more information:
<http://www.ub-judiciary.buffalo.edu/art3a.shtml##integrity>
- **Team effort:** Teams will periodically be asked to submit individual effort assessment with completed assignments. These assessments will be incorporated into assignment grades. Teams having problem working together should make every effort to resolve them by themselves. If that doesn't work, see the instructor for a help.
- **Review paper:** IE 506 students are required to write a review paper on a CIM related research topic
- **Attendance:** Formal roll may be held on an occasional basis. If your final grade is in a "gray area", your attendance and performance in the class might increase your final grade one letter higher. For instance, two people getting the same overall grade (say, 89) might therefore get different letter grades (A- and B+) based on their participation in the class.
- **Course grade:** A weighted-average grade will be calculated for IE 406 and 506 students separately as shown below. Letter grades will be assigned to the overall grades.

Grade Distribution for the course is as follows:

	<u>IE 406</u>	<u>IE 506</u>
Homework Assignments.....	15%	10%
Projects.....	20%	15%
Review Paper.....	N/A	10%
Midterm.....	25%	25%
Final Exam	40%	40%

Total.....	100 %	100%

Tentative Schedule

Week	Day	Date	Topic	Reading
1	Tue	8/27	Introduction	Chp. 1
	Thu	8/29	Product development and design	Chp. 2
2	Tue	9/3	Geometric dimensioning and tolerancing	Chp. 3
	Thu	9/5	Rosh Hashanah, No Class!	Chp. 3
3	Tue	9/10	Geometric dimensioning and tolerancing	Chp.3
	Thu	9/12	Computer Aided Design (CAD)	Chp.4
4	Tue	9/17	Surface and solid modeling	Chp.5
	Thu	9/19	Solid modeling	Chp.5
5	Tue	9/24	Manufacturing processes	Chp. 6
	Thu	9/26	Manufacturing processes	Chp. 6
6	Tue	10/1	Introduction to Computer-Aided Process Planning (CAPP)	Chp. 6
	Thu	10/3	Computer Aided Process Planning (CAPP)	Chp. 6
7	Tue	10/8	Variant and Generative CAPP	Chp. 6
	Thu	10/10	Variant and Generative CAPP	Chp. 6
8	Tue	10/15	Introduction to Numerical Control (NC)	Chp. 12
	Thu	10/17	CNC part programming	Chp. 13
9	Tue	10/22	Computer-aided part programming	Chp. 13
	Thu	10/24	Computer-aided part programming	Chp. 13
10	Tue	10/29	Midterm Exam (in class)	
	Thu	10/31	Fixed Automation	Chp. 10
11	Tue	11/5	Programmable Logic Controllers (PLC)	Chp. 10
	Thu	11/7	Automated system design	Chp. 15
12	Tue	11/12	Introduction to Robotics	Chp. 15

	Thu	11/14	Industrial Robotics	Chp. 15
13	Tue	11/19	Rapid Prototyping (RP): Solid Freeform Fabrication	Chp. 14
	Thu	11/21	Solid Freeform Fabrication	Chp. 14
14	Tue	11/26	Solid Freeform Fabrication	Chp. 14
	Thu	11/28	Fall Break	
15	Tue	12/3	Process Planning for RP	Chp. 14
	Thu	12/5	Enterprise integration	----