

IEEM 5357 CAD/CAM Spring 2013

Instructor: Professor Chih-Hsing Chu (瞿志行)
First Engineering Building, Room 823, 5742698

Class Time: Wednesdays 9:10-12:00

Course Website: TBA

TA: 黃柏源 Room 708, 42937

Textbook: Interactive Curves and Surfaces, (with Multimedia Tutorial on CAGD), A. Rockwood and P. Chambers, Morgan Kaufman Publishers, Inc.

References:

1. Class-notes and related reading materials.
2. Principles of CAD/CAM/CAE Systems, K. Lee, Addison-Wesley, 1999.

Course Description:

CAD/CAM technologies are commonly used in industry, and have become one of the most important software tools in product development. This course is to introduce mathematical backgrounds behind and recent advances in CAD/CAM, with focuses on basic concepts of 3D geometric transformations, curve and surface modeling, and their applications in product design as well as manufacturing. There will be about 8~9 homework assignments during the semester. Students should have good understanding in calculus, and prior CAD experience is not required.

There are handon labs and programming assignments in this class. Students are expected to have basic programming skills (C++) and use of open source geometric library ACISTM. Students must complete a term project. The project will most likely involve programming work. Possible topics will be provided and students are encouraged to prepare the term project as early as possible and properly combine it with their research work. Each student will be presenting a research paper individually during the semester.

Grading: Homework 30% Paper Presentation 10%
Midterm 30% Final Project 30%

Course Contents:

1. Introduction to CAD/CAM
2. Basic Concepts of 3D Coordinate Transformations
 - Vectors and related operations
 - 3D coordinate transformation: rotation, translation, scaling, mirror
 - Applications
3. Curve Modeling
 - Parametric/Nonparametric Forms, Interpolation/Approximation
 - Lines, Circles, and Conic Curves
 - Hermite Curves, Bézier Curves, B-Spline, and NURBS Curves
 - Continuities and Composite Curves
 - Geometric Processing for Curves

4. Surface Modeling
 - Coon's Patch, Bi-cubic Patch, Ruled Patch, Developable Patch
 - Bézier, B-Spline, and NURBS Surfaces
 - Differential Geometry of Curves and Surfaces
 - Geometric Processing for Surfaces
5. Computer Aided Manufacturing
 - Fundamentals of computer numerical control (CNC)
 - Part programming in CNC: NC Code
 - Part programming in CNC: APT
 - Free form machining
 - Rapid prototyping (RP)
6. Advanced Topics
 - Developable surface design
 - 3D similar part search
 - Tool path planning in 5-axis flank milling
 - Physical modeling