IEEM5357 CAD/CAM Spring 2010

Instructor: 瞿志行
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Class Time: Fr 9:00AM – 12:00PM

Class Room: First Engineering Building, Room 203

Course Website: TBD

TA: TBD

Textbook:

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

Reference books:

1. Principles of CAD/CAM/CAE Systems, K. Lee, Addison-Wesley, 1999.
2. Geometric Modeling, Michael E. Mortenson, John Wiley & So, 1997.
3. Surface Modeling for CAD/CAM, Byoung K. Choi, Elsevier Science, 1991.

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, solid 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.

Grading:

Homework	30%
Midterm	40%
Term Project	30%

Notes:

1. There are handon labs and programming assignments in this class. Students are expected to have basic programming skills (C++ or Java). A series of C++ exercises will be given step by step to equip them with enough programming capability.
2. Students must complete a term project in group. 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. Undergraduate students may be able to use ACIS exercises as the project topic.

Course Contents:

- **Introduction to CAD/CAM**
- **Basic Concepts of 3D Coordinate Transformations**
  - Vectors and related operations
  - 3D coordinate transformation: rotation, translation, scaling, mirror
  - Applications
- **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
- **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
- **Solid Modeling**
  - Wire-frame Model
  - Constructive Solid Geometry (CSG)
  - Boundary Representation (B-Rep)
  - B-Rep Data Structure, Euler Operations, Boolean Operations
- **Advanced Topics**
  - Free form machining
  - 3D part search
  - Virtual Reality/Augmented Reality in CAD/CAM
  - 3D CAD Streaming