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Department of Mechanical and Aerospace Engineering
ME 7194 – Three Dimensional Geometric Modeling for Engineers
Spring 2016

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Course Description:
The course is designed as a graduate level course for those who wish to pursue careers in digital design and manufacturing. The course will focus on the tools available to engineers for parametric design and geometric reasoning. The course will also cover constraint management in design and geometric constraint solving. The emphasis will be on solid modeling and the use of commercial libraries and components applied to mechanical design and manufacturing issues. Extensive use will be made of the ACIS 3D Toolkit and MS/Visual Studio will be used as the programming environment for C++.

Course Instructor:　　Prof. Jami Shah
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Textbook　　　　　　　Class Notes

Credits　　　　　　　　3

Time and Classroom　TBD.

Recommended references:
　　　　　　　　　　　1. Sedgewick: Algorithms in C++
　　　　　　　　　　　2. Corney & Lim: 3D modeling with ACIS
　　　　　　　　　　　3. Shah & Mantyla: Parametric & Feature based CAD/CAM

Pre-requisite:
　　　　　　Graduate standing in MAE, ISE, CSE
　　　　　　Ability to program in C++
　　　　　　Linear Algebra**.**

Student learning objectives

Master knowledge of selected data structures and algorithms required for geometric computing
Master the use of ACIS and MS/Visual Studio
Knowledge of creating, manipulating and querying BRep data structures (solid models)
Knowledge of structure and issues in the design of parametric design and solid modeling programs
Knowledge of representational models for curves and surfaces
Knowledge of digital data exchange standards such as STEP
Knowledge required for geometric reasoning and feature recognition in design and manufacturing

Course Topics

Topic	Lectures Hours
Introduction to CAD/CAM software development & components	2
Review of C++ data structures and algorithms to support geometric computing	2
Review of graph and geometric algorithms for design applications	2
Computational geometry: representation models for curves, surfaces	3

Review solid modeling theory: adjacency topology; point set topology; BRep and CSG	3
Theory and implementation of Boolean operations	2
Geometric constraint solving; parametrics in CAD	7
Construction histories: rollback, roll forward	2
ACIS topology data structure	3
ACIS Application Interfaces	4
3D features & operations	4
Geometric reasoning and parametric feature recognition applications in design and manufacturing	4
Interoperability; STEP and other data exchange standards	2
Exams and quizzes	2

Software:
- C++, MS/Visual Studio
- ACIS 3D Toolkit

Graded Work:
- There will be six projects emphasizing different aspects of parametric design and occasional quizzes
- Quizzes: 20%
- Projects: 80%