University Of California, Berkeley
Department of Mechanical Engineering

ME 290D: Solid Modeling and CAD/CAM Fundamentals (3 units)

Graduate Course

Syllabus

CATALOG DESCRIPTION

Graduate survey of solid modeling research. Representations and algorithms for 3D solid geometry. Applications in design, analysis, planning, and manufacturing of mechanical parts, including CAD/CAM, reverse engineering, robotics, mold-making, and rapid prototyping.

COURSE PREREQUISITES

An introductory programming course; graduate standing or consent of instructor.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

Research papers that will be distributed in class or made available via the course web site.

COURSE OBJECTIVES

Students will gain experience with critical close reading of primary sources, evaluating and synthesizing the content of research papers. They will design, implement, and analyze a sample of geometric algorithms for applications in Solid Modeling and CAD/CAM.

DESIRED COURSE OUTCOMES

Students will be familiar with seminal research and important solid modeling representations and fundamental geometric algorithms, giving them insight into the capabilities and limitations of commercial solid modeling systems. They will have gained programming experience and skills and an understanding of theoretical and practical concerns as they design, implement, and analyze a sample of geometric algorithms for applications in Solid Modeling and CAD/CAM.

TOPICS COVERED

Representations and algorithms for 3D solid geometry. Applications in design, analysis, planning, and manufacturing of mechanical parts, including CAD/CAM, reverse engineering, robotics, mold-making, and rapid prototyping.

CLASS/LABORATORY SCHEDULE

3 hours of lecture per week

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

Short paper evaluation summaries
Class participation
2 quizzes on the reading & lecture material
Biweekly homework assignments

TOPICS COVERED/WEEKLY AGENDA

Sample schedule of topics:
- Representations
- Non-Manifold Geometric Boundary Modeling
- Tool-Path Generation
- Die and Mold Machining
- Rapid Prototyping
- Boundary Healing
- Reverse Engineering
- Voronoi Diagrams
- Separating an Object From Its Cast
- Visibility Maps
- Spherical Algorithms
- Robot Motion Planning
- Simplex Computation
- Fixture Layout Design

PERSON(S) WHO PREPARED THIS DESCRIPTION

Sara McMains

ABBREVIATED TRANSCRIPT TITLE (19 SPACES MAXIMUM): SOLID MODEL CAD/CAM
TIE CODE: LECT
GRADING: Letter
SEMESTER OFFERED: Fall and/or Spring
COURSES THAT WILL RESTRICT CREDIT: none
INSTRUCTORS: McMains
DURATION OF COURSE: 15 weeks
EST. TOTAL NUMBER OF REQUIRED HRS OF STUDENT WORK PER WEEK: 9 hours
IS COURSE REPEATABLE FOR CREDIT? no
CROSSLIST: None