

ABET COURSE SYLLABUS

ECSE 4710: Interactive Computer-Aided Design

Course Catalog Description: Development of computer-aided design techniques using computer graphics. Interactive design structures. Geometric modeling and computational geometry. Three dimensional curve and surface geometry. Curve and surface design. Introduction to industrial interactive design systems. Extensive use of the Rensselaer Computer Graphics System. Prerequisite: CSCI-1100 or thorough knowledge of a scientific computer language, preferably C. 3 credit hours.

Pre-Requisite Courses: CSCI-1100 or thorough knowledge of a scientific computer language

Co-Requisite Courses: None

Prerequisites by Topic:

1. Basic understanding of multivariable calculus, linear algebra and some differential equations
2. Basic programming skills

Textbook: Gerald Farin, *Curves and Surfaces for CAGD*, 5ed.
(and/or other required material)

References:

Course Coordinator: Michael Wozny

Overall Educational Objective: On completion of the course, students should be sufficiently familiar with the theoretical structure, formal representation, computational methods, notation, and vocabulary of curves and surfaces (Bezier, B-Splines, NURBS) and to be able to apply them.

Course Learning Outcomes:

1. Understand different parametric curve and surface schemes.
2. Understand the advantages and disadvantages of different geometry representations.
3. Gain practical experience by implementing several CAGD techniques and developing user interfaces.
4. Obtain the ability to apply CAGD methods to practical applications.

How Course Outcomes are Assessed: Daily Homework – 65 %
Term Project – 35 %

Homework is due at the *beginning* of class. Late homework will loose points.

Relation to EE/CSE/EPE Outcomes

N = none
M = moderate
H = high

Outcome	Level	Demonstrate Proficiency
	N, M, H	e.g. Exams, projects, HW
Mathematics, science and engineering	M	HW, project
Basic disciplines in Electrical Engineering	N	
Depth in Electrical Engineering	N	
Basic disciplines in Computer & Sys. Eng.	M	HW, project
Depth in Computer and Systems Eng.	H	HW, project
Electromagnetics, electromechanics, power semiconductors	N	
Power system behavior	N	
Electrical energy conversion	N	
Conduct experiments and interpret data	N	
Identify, formulate and solve problems	M	project

Design a system, component or process	M	project
Communicate in written and oral form	M	project
Function as part of a multi-disciplinary team	N	
Preparation for life-long learning	M	project
Ethical issues; safety, health, public welfare	N	
Humanities and social sciences	N	
Laboratory equipment and software tools	H	HW, project
Variety of instruction formats	N	

Topics Covered:
(number of hours or classes for each)

1. de Casteljau Algorithm
2. Bezier Curve
3. Bezier Curve Topics
4. Polynomial Interpolation
5. Spline Curves in Bezier Form
6. B-Splines
7. Differential Geometry (curves)
8. Conic Sections
9. Rational Bezier and B-spline Curves
10. Tensor Product Bezier Surfaces
11. Coons Patches (and additional material)
12. Differential Geometry (surfaces)

Computer Usage:

Graphics programs (OpenGL) and some MATLAB routine

Laboratory Experiences:

- 1.

Design Experiences:

- 1.

Independent Learning Experiences:

1. Term project

Class/Lab Schedule:

MR 4:00-5:20 pm. JEC 4304

**Contribution to the
Professional Component:**

- | | |
|---|----------------|
| (a) College-level mathematics and basic sciences: | 1 credit hours |
| (b) Engineering Topics (Science and/or Design): | 2 credit hours |
| (c) General Education: | 0 credit hours |

Prepared by:	Michael Wozny
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