Preamble

Due to the popularity of the Internet web-based tools are essential in general graphics courses for engineering students. Our students now take E1115 at the Gateway Lab and are familiar with HTML and Mathematica. This course is intended to be a graduate version of computer graphics course for general engineering students. However, students will not require E1115 as a pre-requisite.

Individual projects will involve a graphics application of student’s choice. For example, Computer Aided Design, Computer Algebra System, Machine Design Software will be encouraged. Available lecture materials on engineering subjects using graphics will be illustrated. Multi-media extensions of computer graphics (with sound and animation) will be demonstrated. Emphasis will be on the working principles for computational engines of all graphics programs.

Time

The course will be given on a regular basis in Spring semesters, on Wednesdays 6:50 to 9:20. Additional time for student projects will be scheduled individually.

Venue

The ideal place will be in the lecture theater in the Gateway lab. Typically, after 1 hour 15 minutes of lecture the students will start working on terminals in the Lab. Mudd computer labs could also be used.

Instructor

Gautam Dasgupta will teach this course regularly in Spring semesters. The course will be announced in the bulletin and at the web site of the instructor.

Text Book

The required text is: Mathematical Elements of Computer Graphics by Rogers and Adams, McGraw-Hill.
Additional readings are for softwares, Mathematica Graphics Book by Smith and Blachman, Adisson-Wesley; Adobe Press class room books on Acrobat and PageMill. Students using CAD programs will read respective manuals.
Course Outline

The new material is emphasized to replace conventional procedures.

Lecture-1: Vector Graphics, Graphics Primitives and Graphics Directives
Lecture-2: Transformations: Affine, Perspective
Lecture-3: Plotting, generating PostScript and PDF files
Lecture-4: Using Graphics in the internet browsers
Lecture-5: 2-D Curves – mathematical formulae
Lecture-6: Rendering Curves, color graphics

Mid Term Examination

Lecture-7: 3-D Surfaces – mathematical formulae
Lecture-8: Rendering Surfaces, light source
Lecture-9: Animation – web-based tools
Lecture-10: Different color spaces, implementation for a web browser
Lecture-11: Web graphics with Mathematica, PageMill and Acrobat
Lecture-12: Integration of Sound and Animation in web-based presentation
Lecture-13: Discussions on object-oriented graphics packages, graphics in text processing (i.e., \LaTeX\ graphics) and individual projects.

Course review for the Final Examination.

Final Examination

Grading

Midterm - 20%, Final- 40%, Home work-20%, Individual project-20%.

Description of Items

1. Midterm – Matrix algebra / numeric; 2-D & 3-D geometry.
2. Final – 2-D & 3-D interpolations, perspective transformations; hand calculations; matrix algebra and numerics.
3. Home work – Five sets, answers will be posted as Mathematica Notebooks.
4. Individual project – Student will select a topic in consultation with the instructor. Home work problems from other courses will be encouraged.
Bulletin Description

*Graphics 4005y*
Instructor: Gautam Dasgupta
Mathematical basis for using and developing graphics utilities for engineering research and application are covered. *Mathematica* and MATLAB matrix transformations and graphics tools will be used to generate 3-D affine and perspective views and to carry out interpolations of curves and surfaces. Web-based applications will be emphasized in the Gateway lab. Students can select individual projects to use CAD programs. Multimedia applications with animation and sound will be included in object oriented constructs. Data analysis and data visualization will be demonstrated. There is no pre-requisite.