INTRODUCTION TO GUI PROGRAMMING AND GRAPHICS
CS 3744

I. Catalogue Description

Design and implementation of object-oriented graphical user interfaces (GUI) and two-dimensional computer graphics systems. Implementation methodologies including callbacks, handlers, event listeners, design patterns, layout managers, and architectural models. Mathematical foundations of computer graphics applied to fundamental algorithms for clipping, scan conversion, affine and convex linear transformations, projections, viewing, structuring, and modeling. Pre: a grade of C or better in 2114; Math 1114, 1224. (3H, 3C)

Course Number: 3744

ADP TITLE: Intro GUI Programming/Graphics

II. Learning Objectives

Having successfully completed this course, students will be able to:

- author object-oriented graphical user interfaces;
- use alternative GUI architectures;
- build their own customized GUI toolkits;
- demonstrate a working knowledge of basic mathematics related to graphic design, i.e., coordinate systems, point, line, vector and curve geometry ;
- demonstrate a working knowledge of the design and structure of graphics software systems;
- manage the behavior of modern interaction devices;
- design sophisticated 2D graphics applications with quality user interfaces.

III. Justification

Virtually all modern software systems provide interaction and visualization through graphical user interfaces. The tools and methodologies for building user interfaces have grown increasingly sophisticated in recent years. Furthermore, computer graphics is such a large and important field that it is difficult to do it justice in a single semester. Accordingly, the proposed course is being introduced at the 3000 level to give students an important foundation in principles and methodologies for graphical user interface (GUI) development, as well as a solid foundation in computer graphics. In turn, this will allow the department's only existing course in computer graphics (CS 4204) to be revised to include advanced material more appropriate for a senior level elective. Furthermore, other senior level electives, which require expertise in GUI development, may use this new course as a prerequisite.

IV. Prerequisites and Corequisites

CS 2114 (Software Design and Data Structures) provides the students with necessary background in object-oriented software design, algorithm development, and classic data structures. The Math 1114 (Elementary Linear Algebra) and 1224 (Vector Geometry) prerequisites ensure that students have the mathematics background to understand and apply computer graphics algorithms.

V. Texts and Special Teaching Aids

Required:

Vince, John A., MATHEMATICS FOR COMPUTER GRAPHICS, London: Springer Verlag, 2006, ix, 248.

Supplementary Materials:

The Swing Tutorial, http://java.sun.com/docs/books/tutorial/uiswing/index.html.

VI. Syllabus

	Percent of Course
1. Introduction to GUI programming	**10**
a. WIMP (window, icon, menu, pointing device) paradigm	
b. Containment hierarchy, containers, components	
c. Layout principles and management	
2. Event-driven programming	**15**
3. Creating user interfaces	**15**
a. Design patterns	
b. Model-View-Controller pattern	
c. Usability and accessibility	
d. GUI development	
4. Pixels, lines, polygons, and planes	**15**
a. Coordinate systems	
b. Graphical primitives and representations	
5. Vector geometry	**5**
6. Transformations	**15**
a. Linear transformations	
b. Homogeneous coordinates	
c. Determinants	
d. Viewing	
7. Curves and tesselation	**10**
8. Scan conversion and clipping	**10**
9. Color and texture mapping	**5**
TOTAL	**100**

VII. Old (Current) Syllabus

N/A

VIII. Core Curriculum Guidelines

N/A