

Proposal For A New Non-General Education Course: Information Visualization

1. Details

- a. **Course Title:** Information Visualization
- b. **Sponsor:** Adrian Rusu, Computer Science Department, Rowan University.
- c. **Semester hours:** 3
- d. **Course Level:** Graduate.
- e. **Prerequisites:** Linear Algebra (1701.210) or Math for Engineering Analysis II (1701.236).
- f. **Suggested Time and Scale of Implementation:** This course is to be offered every other year, or based on demand.

2. Curricular Effect

This course will be an elective for students in graduate programs within the University, such as those in the Master of Arts Higher Education program who specialize in Computer Science. An Information Visualization course will increase the number and variety of those electives making University's curriculum more attractive to prospective and current graduate students. This course will examine the expanding field of Information Visualization, exposing students to existing and developing information visualization algorithms and techniques.

- **Offerings:** No class will be dropped as a result of this course.
- **Adequacy of Resources:** The current computers & software available in the open labs and computer science advanced lab are adequate to carry out this course at the present time. However it is fully expected that the equipment will need to be regularly upgraded to support this course, as well as all of the courses in our major. Thus it is, of course, necessary that a reasonable replacement cycle be maintained.
- **Recommended Library Resources:** Current library resources are adequate.
- **Short-term Evaluation:** This course has not been offered previously.

3. Rationale

A large component of human perception of the world is through sight. There is simply more bandwidth and processing power for input through the human eyes than through any other sensory modality. By contrast to its related, and much more mature discipline of scientific visualization, which deals primarily with three-dimensional physical objects and processes, such as blood flowing through heart valves, tornado

formation, crystal growth, protein structures, or oil reservoir shapes, the relative young field of information visualization is concerned with abstract phenomena for which there may not be a natural physical reality, such as stock market movements, social relationships, gene expression levels, manufacturing production monitoring, survey data from political polls, or supermarket purchases. The users of information visualization tools are interested in finding relationships among variables, discovering similar items, and identifying patterns such as clusters, outliers, and gaps. The expansion of the market and the application areas of information visualization are predicted to have an explosive growth for many years to come, as more and more data is being generated and needs to be understood. Well-qualified professionals in this area are, and will, in the foreseeable future, continue to be in great demand internationally and command substantial rewards.

Currently, there is no course that covers Information Visualization for graduate students. This course will help to fill this gap and will strengthen the department's current offering of electives for graduate students, in accordance with expertise of new faculty in Department of Computer Science. The course will also serve as an elective for students pursuing graduate degrees in other departments on campus. In practice, this course will frequently be offered concurrently with an undergraduate course Introduction to Information Visualization, which is being proposed at the same time. Students will be required to study in depth and complete in-depth assignments from each topic covered in class. Students will also be required to complete in-depth projects, such as projects born from research-oriented topics. In addition, students will be required to read, summarize, and present in class at least two recent conference or journal papers from the information visualization literature on their chosen research topic, and will be required to prepare term papers with regard to an information visualization research topic.

4. Essence of the Course

- a. **Objectives in Relation to Student Outcomes:** Upon completion of this course, students will be able to:
 - understand information visualization principles
 - implement information visualization techniques and algorithms using a graphics programming language
 - be able to apply advanced techniques to visualize 1-dimensional, 2-dimensional, and N-dimensional information
 - be able to apply advanced techniques and algorithms to browse and visualize image and digital libraries, as well as the World Wide Web
 - understand how to model information in the form of graphs, and then how to apply advanced graph visualization techniques
 - understand the theories behind information visualization
 - specify, design, implement, and document a large software project related to information visualization

- be able to understand information visualization state-of-the-art research and trends

b. Topical Outline/Content:

- Introduction to Graphics Programming
- Information Visualization Principles
- Capabilities of Human Beings
- Human Perception of Color
- User-Centered Website Development
- Dynamic Queries
- Browsing and Visualization of Image Libraries
- Zoomable User Interfaces
- Browsing and Visualization of Digital Libraries
- Browsing and Visualization of the World Wide Web
- Understanding Hierarchical Data
- Graph Visualization
- Innovating Interaction Techniques
- Theories for Understanding Information Visualization

c. Evaluation of students and grading procedure: Students will be evaluated by traditional methods such as homework and projects assignments, quizzes, presentations, and exams.

d. Course Evaluation: This course will be evaluated through student surveys, as well as by the Computer Science Accreditation Commission when our major is to be re-evaluated in 2006.

5. Consultations

- a. Management & M.I.S.
- b. Electrical & Computer Engineering
- c. Mathematics
- d. Psychology

6. Catalog Description

0707.570 (Suggested hegis number)

3 s.h.

Information Visualization

(Prerequisite: 1701.210 or 1701.236)

This is a graduate level course in Information Visualization. Topics covered include graphics programming, information visualization general principles, visualization techniques for 1-dimensional, 2-dimensional, and N-dimensional information, graph visualization, visualization techniques for image and digital libraries, as well as for the World Wide Web, interactivity, theories behind information visualization, and focus+context techniques. This course also includes the implementation of techniques presented in lecture. Students are encouraged to devise new techniques, implement them, and determine their effectiveness. Students will be required to complete in-depth assignments, read, summarize, and present recent journal papers from the information visualization literature, and prepare term papers with regard to an information visualization research topic. Students will also be required to specify, design, implement, and document a semester-long software project related to information visualization.