



EDUCATION - CURRICULUM PROPOSAL

SCC #04-05. J.S.V.

Deadlines

Proposals to be implemented Fall 2005 - February 01, 2005 to be implemented Spring 2005

PROPOSAL TITLE: INFORMATION REORGANIZATION

Sponsor: ADRIAN RUSC Email: RUSC@RCU.ROMAN.EDU Ext: 3009

DEPARTMENT: COMPUTER SCIENCE

COLLEGE: LIBERAL ARTS AND SCIENCES

If Liberal Arts & Sciences CHECK: History/Humanities Math/Sciences Social/Behavioral Sciences
UNDERGRADUATE GRADUATE

THE ATTACHED NON-GEN-ED PROPOSAL IS BEST DESCRIBED BY THE ITEM(S) CHECKED

- Checkboxes for: New non-gen-ed course, Minor curricular changes, Existing non-gen-ed course, Non-gen-ed degree requirements, Major, Minor, specialization, concentration track, certificate program

THE FOLLOWING SIGNATURES REPRESENT APPROVAL

Department Chair, Department Curriculum Chair, Academic Dean with signatures and dates (2/3/05, 2/3/2005, 2-9-05)

COLLEGE CURRICULUM COMMITTEE

OPEN HEARING Date, Approved/Not Approved, COLLEGE CURRICULUM CHAIR, Senate Curriculum Chair's signature, Date Senate Announcement

minor change @ track name @ discuss future resource needs

EXECUTIVE VICE PRESIDENT/PROVOST Signature: [Signature] Date: 6/11/05

Approved/Not Approved checkboxes

Date: 6/28/05 Registrar: [Signature] Course #: 0707570

NOTIFICATION FORWARD

Checkboxes for: SCC Chair, Academic Dean, Department Chair, Registrar, CAP, Student Affairs, Others

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

*See  
revised copy  
5/27/05  
attached*

### 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 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 techniques to visualize 1-dimensional, 2-dimensional, and N-dimensional information
  - be able to apply 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 graph visualization techniques
  - specify, design, implement, and document a large software project related to information visualization

b. **Topical Outline/Content:**

- Introduction to Graphics Programming

- Information Visualization Principles
- Human Perception of Color
- 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, 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 projects, read, summarize, and present recent journal papers from the information visualization literature, and prepare term papers with regard to a information visualization research topic.

Rowan University,  
**CURRICULUM PROPOSAL  
 LIBRARY RESOURCE FORM**

The purpose of this form is to provide a channel of communication between the library and faculty, changing and designing new courses/programs. The information will be used to assess the resources available in the library, and to identify resources the library should acquire to support the course/program. The information will also provide rationale for institutional support for library acquisitions. This form should be completed in a coordinated effort between the course sponsor(s), and the academic department liaison librarian. **THIS FORM MUST BE COMPLETED FOR ALL CURRICULUM PROPOSALS.**

- The sponsor(s) complete parts A & B. If assistance is required to complete parts A & B, please notify the liaison librarian.
- Forward this form to the librarian who will complete parts C, D & E.

**This form must be completed and attached to the original curriculum proposal before being approved by the Senate Curriculum Committee**

A. College LIBERAL ARTS AND SCIENCES Department COMPUTER SCIENCE  
 Proposed by ADRIAN RUSC Date 04/15/05  
 Course Title INFORMATION VISUALIZATION  
 Anticipated Date for Course/Program Offering FALL 2005

B. List specific resources that should be acquired to support this course.

none

C. Describe the resources available in the library to support this course/program, including reference, monographic, electronic databases, audio-visual materials, etc. A summary statement is sufficient.

Information Visualization Perception for design, by Colin Ware  
 Graph Drawing Software, by Michael Hagner and Petra Mutzel.  
 Craft of Information Visualization, Analysis and Reflections, by Benjamin Brinkmann and  
 Leonardo's Laptop: Human Needs and the New Computing Technologies, by Ken Shneiderman

D. List key periodicals available in the library to support this course/program.

IEEE Transactions on Visualization and Computer Graphics.

E. Librarian comments and recommendations

Name LIBRARIAN LIAISON John Walters Librarian Signature John Walters

**From:** "Daniel J. McFarland" <mcfarland@rowan.edu>  
**To:** <mcfarland@rowan.edu>, <rusu@rowan.edu>  
**Date:** 1/11/05 3:28PM  
**Subject:** Re: Course Proposals Consultations

Hi Adrian,

Thank you for asking for submitting your proposals for our review. The MIS Faculty support the following new course proposals as written:

1. Computer Animation (Graduate)
2. Computer Animation (Undergraduate)
3. Information Visualization (Graduate)
4. Information Visualization (Undergraduate)

Dan.

Daniel J. McFarland, Ph.D.  
Associate Professor, MIS  
Rowan University  
201 Mullica Hill Road  
Glassboro, NJ 08028  
Tel. 856.256.5426 Fax 856.256.4439  
>>> "Adrian Rusu" <rusu@rowan.edu> 01/11/05 14:35 PM >>>  
Dear Dan,

I have finally found time to put together four new course proposals in my area (two undergraduate and two graduate). Please send me your comments on these proposals. Thank you very much.

Best Wishes in the New Year!  
Adrian

Adrian Rusu, Ph.D.  
Assistant Professor  
Department of Computer Science  
Rowan University  
201 Mullica Hill Road  
Glassboro, NJ 08028-1701  
Phone: 856-256-4500 x3884  
Email: rusu@rowan.edu  
HTTP: <http://elvis.rowan.edu/~rusu>



*Electrical and Computer Engineering*

January 30, 2005

Professor Adrian Rusu  
Computer Science Department  
Rowan University  
Glassboro, NJ 08028

Re: Information Visualization (Graduate and Undergraduate)

Dear Professor Rusu:

The Electrical & Computer Engineering department has received your course proposal entitled "Information Visualization" (Graduate and Undergraduate levels). We have reviewed the rationale, curricular effect and proposed course content and are pleased to support this course offering.

However, we request that "...or Math for Engineering Analysis II" be added to the course pre-requisites to allow ECE Graduate students and Seniors to take this course. The ECE department has active ongoing research projects (and MS theses) in the area of Virtual Reality and Modeling – and we believe that allowing this option will be mutually beneficial for both the course offering and the ECE students with related research topics who may potentially enroll in it.

Best wishes,

Shreekanth Mandayam, Ph.D.  
Associate Professor  
ECE Curriculum Committee Chair

Cc: Dr. Jennifer Kay, Chair, CS



*Psychology*

To: Adrian Rusu, Computer Science Department  
From: Keiko Stoeckig, Chairperson, Psychology Department  
Date: January 31, 2005  
Re: proposed courses: Information Visualization

The Psychology Department has reviewed the proposed two courses in information visualization. The content and objectives of these two courses do not overlap with the content and objectives of any existing Psychology course. The topical outline does include a section on human color perception, which is included in the Psychology Department's courses in Perception and Physiological Psychology, but this overlap is minimal. Moreover, understanding color perception is not noted as a major objective in the proposed courses.

While supporting the inclusion of these two proposed courses into the curriculum, the Psychology Department respectfully suggests that the difference between the proposed undergraduate and proposed graduate courses in Information Visualization be elaborated. In the proposal for the graduate course it states that "graduate students maybe required to read and summarize recent journal papers from the information visualization literature." It is unclear, without further elaboration, if this is sufficient additional work to merit graduate credit.

Thank you for the opportunity to review your course proposals. If you require any additional information, please feel free to contact me at x4821 or [stoeckig@rowan.edu](mailto:stoeckig@rowan.edu).

## 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.