

PROCESS A

CURRICULUM PROPOSAL

SCC #04-05

Deadlines: INTRO to be implemented Fall 2005 - February 11, 2005 to be implemented Spring 2005

PROPOSAL TITLE: INFORMATION LITERACY

Sponsor: ADRIAN ROSS B.M.A. Public Relations Mgr. # 88039

DEPARTMENT: COMPUTER SCIENCE

COLLEGE: LIBERAL ARTS AND SCIENCES

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

- New non-gen-ed course
- Existing non-gen-ed course
- Minor curricular changes (fewer than three to)
- Existing non-gen-ed course
- Non-gen-ed degree requirements
- Major
- Minor, specialization, concentration, track, certificate program

THE FOLLOWING SIGNATURES REPRESENT APPROVAL

Department Chair: [Signature] Date: 2/13/05  
 Department Curriculum Chair: [Signature] Date: 2/3/2005  
 Academic Dean: [Signature] Date: 2-9-05

COLLEGE CURRICULUM COMMITTEE

OPEN HEARING Date: 3/28/2005 Approved:  Not Approved:

COLLEGE CURRICULUM CHAIR: [Signature]  
 Senate Curriculum Chair's signature: [Signature] Date: 4/12/05  
 Comments: \_\_\_\_\_

EXECUTIVE VICE PRESIDENT/PROVOST Signature: [Signature] Date: 6/1/05  
 Approved  Not Approved

Date: 6/28/05 Registrar Received & Initialed - Page # 1 & Course # 0707370

REGISTRAR: [Signature]

NOTIFICATION FORWARD

SCC Chair  Academic Dean  Department Chair  Registrar  IR  CAP  
 AP Student Affairs  Others

[Handwritten notes]  
 7/6/05  
 J. 76 M

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

See  
document  
5/2/05  
attached

### 1. Details

- a. **Course Title:** Introduction to Information Visualization
- b. **Sponsor:** Adrian Rusu, Computer Science Department, Rowan University.
- c. **Semester hours:** 3
- d. **Course Level:** Undergraduate, [Junior/Senior]. General Education designation is not sought.
- e. **Prerequisites:** Linear Algebra (1701.210) or Math for Engineering Analysis II (1701.230).
- f. **Suggested Time and Scale of Implementation:** This course is to be offered every other year, or based on demand.

### 2. Curricular Effect

The proposed course will become available as “restricted elective” for computer science majors and minors. An Information Visualization course will increase the number and variety of those electives making Computer Science curriculum more attractive to prospective and current 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.

The proposed course will strengthen the department's current offering of advanced restricted electives. Currently, computer science department offers one related course: 0707.360 Computer Graphics. An Information Visualization course is related to Computer Graphics because it often uses graphics to represent information.

#### 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

0707.370 (Suggested hegis number)

3 s.h.

### **Introduction to Information Visualization**

(Prerequisite: 1701.210 or 1701.236)

This is a junior/senior level course that provides an introduction to Information Visualization techniques and algorithms. 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.

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. 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 KUST Date: 8/1/10/08  
 Course Title: INTRODUCTION TO INFORMATION VISCUALIZATION  
 Anticipated Date for Course/Program Offering: FALL 2008

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: Reception for design, by Colin Ware  
 Graph Drawing Software, by Michael Junger and Peter Mutzel  
 Craft of Informal Visualization: Examples and Reflections, by Benjamin  
 Bederson and Bill Steffen  
 Leonardo's Laptop: Human Needs and the New Computing Technologies, by Isac Diaperstein

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 of LIBRARIAN LIAISON John Williams Librarian Signature John Williams

**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).



*Mathematics Department*

**TO:** Adrian Rusu

**FROM:** Ronald J. Czocho, Chairman  
Mathematics Dept. 

**DATE:** February 8, 2005

**RE:** Consultation on Proposal for new courses entitled *Computer Animation* and *Information Visualization* (both graduate and undergraduate versions)

Thank you for the opportunity to comment on the new courses you are proposing. All four courses require Linear Algebra as a prerequisite and the Mathematics Department is in total agreement with this prerequisite. Since all Computer Science majors take Linear Algebra this should not cause any additional burden for our department. We assume that you would hope to attract engineering students to this course as well. If that is the case you might also consider Mathematics for Engineering Analysis I as an alternative prerequisite since engineering students get their exposure to linear algebra in this course and do not routinely take Linear Algebra.

Since you are proposing both courses as graduate courses as well, we might consider allowing our graduate student's to take the *Information Visualization* course as part of their program, but would need to see if there is any difference in the expectations for graduate students in the class. Both proposals are identical and this does not clearly delineate any differences between the courses if it in fact exists.

Overall, we support these courses as valuable additions to the curriculum at Rowan University.

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

# Introduction to Information Visualization

### 1. Details

- a. **Course Title:** Introduction to Information Visualization
- b. **Sponsor:** Adrian Rusu, Computer Science Department, Rowan University.
- c. **Semester hours:** 3
- d. **Course Level:** Undergraduate, [Junior/Senior]. General Education designation is not sought.
- 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

The proposed course will become available as “restricted elective” for computer science majors and minors. An Information Visualization course will increase the number and variety of those electives making Computer Science curriculum more attractive to prospective and current 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.

The proposed course will strengthen the department's current offering of advanced restricted electives. Currently, computer science department offers one related course: 0707.360 Computer Graphics. An Information Visualization course is related to Computer Graphics because it often uses graphics to represent information.

#### **4. Essence of the Course**

- a. **Objectives in Relation to Student Outcomes:** Upon completion of this course, students will be able to:
  - understand the basics of 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
  - implement and document a large software project related to information visualization
  
- 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

**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

0707.370 (Suggested hegis number)

3 s.h.

### **Introduction to Information Visualization**

(Prerequisite: 1701.210 or 1701.236)

This is a junior/senior level course that introduces basic elements of 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 implement and document a large software project related to information visualization.