

PROPOSAL SCC #00-01 701

(2)

CURRICULUM PROPOSAL FORM 2000-2001

NON-GENERAL EDUCATION PROCESS A

\*DEADLINES: Deadline dates for 2000/2001 submissions: Regular proposals: October 20, 2000 to be implemented in Fall 2001; Short-Term proposals: December 8, 2000 to be implemented in Fall, 2001; Regular proposals February 16, 2001 to be implemented in Spring, 2002; March 23, 2000 for short-term courses to be implemented in Spring 2002.

PROPOSAL TITLE: Technological Tools for Discovering Mathematics

SPONSOR(S): Drs. Eric Milou & Janet Caldwell

DEPARTMENT: Mathematics

COLLEGE: Liberal Arts & Sciences

IF LAS CHECK ONE:  History/Humanities  Math/Sciences  Social/Behavioral Sciences

Check one:  Undergraduate  Graduate

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

New non-gen-ed course

Short-term non-gen-ed course

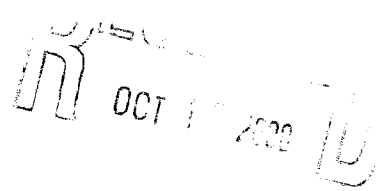
Minor curricular changes (fewer than three) to:

existing non-gen-ed course

non-gen-ed degree requirements

major

minor, specialization, concentration, track, certificate program



DEPARTMENT

(Signature indicates approval)

Abera Abay 10/17/00

Dept. Curriculum Chair / Date

Ronald J. Gorka 10/17/00

Dept. Chairperson / Date

ACADEMIC DEAN

Approved  Not Approved  Comments:

Dean's Signature/Date Joy Hays 10/19/00

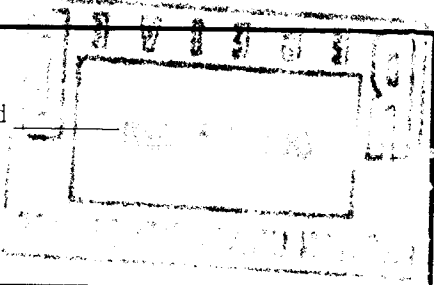
**COLLEGE CURRICULUM COMMITTEE**

Date of open hearing (if necessary) 2/20/01 Approved  Not Approved

Comments:

*Recommend consult CS Dept in future*

Signature of College Chair/Date: *M. J. Hall* 2/20/01



**UNIVERSITY CURRICULUM COMMITTEE**

Date Received/Processed 2/26/01

Comments:

Curriculum Chair Signature *[Signature]* Date Announced At Senate 5-8-01

**EXECUTIVE VICE PRESIDENT/PROVOST**

Approved  Not Approved  If no, reasons are as follows:

Student Credit Hours \_\_\_\_\_ Faculty Load Hours \_\_\_\_\_ Equalized Credit Hours \_\_\_\_\_

Official Copy & Approval Sheet Filed (Date): \_\_\_\_\_ Executive VP/Provost Signature/Date *[Signature]* 5/16/01

**REGISTRAR**

Date Approved Course Description Received 1/2/01 Hegis Taxonomy & Course Number Assigned \_\_\_\_\_

Registrar Signature/Date *[Signature]*

**NOTIFICATION FORWARD**

\_\_\_\_\_ Senate Curriculum Committee Chairperson

\_\_\_\_\_ Academic Dean(s)

\_\_\_\_\_ Department Chairpersons

\_\_\_\_\_ Registrar

\_\_\_\_\_ Sponsor(s)



*Mathematics Department*

## New Course Proposal

### 1. Details

- A. Title: Technological Tools for Discovering Mathematics
- B. Sponsor: Drs. Eric Milou & Janet Caldwell, Department of Mathematics
- C. Credit Hours: 2
- D. Course Level: Undergraduate, 200 level
- E. Prerequisites: Intro to Programming (0701.102) and Calculus I (1701.130) or permission of instructor
- F. Suggested Time, Implementation: One section of the course to be offered once a year or as needed
- G. Curricular Effect: Elective course for all mathematics majors. Recommended elective for secondary education mathematics majors.
- H. Adequacy: Present staff is adequate.
- I. Resources: Faculty, computer equipment, and mathematics department calculator resources are adequate.

### 2. Rationale:

The Rowan Vision states: To support teaching and learning, all students must have access to the technologies they need, and the ability to use the technologies intelligently in the classroom, the library, throughout the campus, and at their residences. The University's mission includes creating an environment in which students can explore, learn about, and develop their knowledge and use of technology, maximizing the benefits and adopting technologies while minimizing the frustrations. The mathematics department, in turn, stresses the use of technology in all departmental courses, as instruction in mathematics classes is greatly enhanced by the use of various technologies. Regardless of the level of students, the infusion of technology forces the mathematics to higher levels. Research has found that integrating technology into mathematics instruction provides for a greater emphasis on understanding, helps students visualize concepts,

promotes interrelationships between concepts and applications, and provides a learning environment that builds a student's confidence in his or her mathematical abilities. This course will use technologies to help students discover mathematics and to develop a better understanding of mathematics.

Currently the mathematics department requires graphing calculators of all students in precalculus and beyond. Additionally, computer technologies play a role with an emphasis on *Mathematica* in Calculus. However, it is often the case that the implementation of technology is only seen as an appendix to courses by many of our students. Moreover, these experiences only provide students with brief hints as to the capabilities of these technologies; they do not examine other technologies nor pursue the advantages, disadvantages, and limitations of such technologies. This course will also examine how technology permits alternative approaches to solving problems and how technology introduces error in calculator and computer algorithms.

### 3. Essence of the Course and Outline:

The emphasis in this course will be on mathematics-specific technologies and on the discovery of mathematics using such tools. Throughout the course, students will become aware of the broad range of mathematics-specific technologies available and become proficient in the use of several of these. Some objectives of the course follow:

- Programming: Students will develop and use programs for graphing calculators and computers that illustrate mathematical concepts, simulate mathematical and probabilistic events, and carry out routine computations.
- Data Collection: Students will use calculator based probes to gather and analyze data, creating appropriate mathematical models to fit the data.
- Geometry Discovery: Students will use geometry software to discover theorems in Geometry.
- Internet: Students will review and analyze Internet resources for various branches of mathematics (analysis, algebra, history).
- Algebraic Symbolic Manipulation: Students will compare hand-held technology (TI-92 & TI-89) with symbolic algebraic manipulation capabilities to a computer application (*Mathematica*).
- Courseware: Students will evaluate commercially available mathematics software and examine shareware and public domain software available on the Internet.

#### Required Technologies:

- Geometry discovery software - Geometer's Sketchpad & Tesselmania - for discovering geometry properties and developing spatial visualization skills.
- *Mathematica* - emphasis on mathematics modeling.
- Using spreadsheets as a tool for investigating statistics, discovering mathematics, and problem solving.
- Mathematics word processing (Math Type or Equation Editor)
- Graphing calculators - emphasis on using programming for problem solving and on the utility of programming in forcing logical thinking and precise mathematical communication.
- CBL (Calculator Based Laboratory) or CBR (Calculator Based Ranger) - for data collection and discovering the relationship between reality and mathematics modeling.
- Resources for mathematicians available on the Internet

#### Optional Technologies:

- Additional geometry Software such as Cabri Geometry, Geometry SuperSupposer software, Logo (programming language) and other software associated with spatial visualization (Gyrographics, The Right Turn, Building Perspective, Kaleidomania, and The Super Factory).
- Other computer algebra & numerical systems
- SPSS, Fathom or other statistical software programs

#### Evaluation & Grading:

Students will be evaluated by the traditional methods of written homework and exams. Moreover, students will have written projects involving hands-on activities with the various technologies.

#### Course evaluation:

This course will be evaluated through the customary student evaluations as well as a regular departmental review.

#### 4. Consultation:

Consultation with the College of Education was held (Dean B. Sisco, J. Gallagher, and C. Calliari). Letter of support was written by Dr. C. Calliari, chairperson Elementary Education.

Catalog Description:

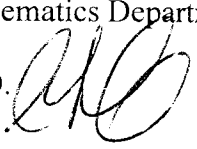
**1701.205 -Technological Tools for Discovering Mathematics - 2 sh**

(Prerequisites: Intro to Programming, 0701.102 and Calculus I, 1701.130 or permission of instructor) This course will use mathematics-specific technologies to help students discover mathematics and to develop a better understanding of new content. Throughout the course students will become aware of the broad range of mathematics-specific technologies available to mathematicians, become proficient in the use of these, and pursue the advantages, disadvantages, and limitations of such technologies. Students will solve problems and advance their understanding of topics in the areas of precalculus, calculus, geometry, and statistics.



*Elementary / Early Childhood Education*

To: Eric Milou, Mathematics Department ✓  
Janet Caldwell, Mathematics Department

From: Carl L. Calliari, Ed.D.   
Department Chair

Date: September 25, 2000

Re: Mathematics Course Proposal

After appropriate departmental consultation, I am authorized to write this letter of support for both the undergraduate course 1701.2xx Technological Tools for Discovering Mathematics (2 sh) and the graduate level selected topics course (variable credit).

Given the focus on the NJ Core Content Curriculum Standards and the national movement towards competency testing, both of these course offerings will help K-12 students to improve their mathematical skills and reasoning abilities.

The Department supports both proposals and underscores the approval of each selected topics course into the specific graduate program being made by the graduate program advisor of the program.

CLC/jpc

c: B. Sisco, Dean, College of Education  
M. Rilling, Dean, Graduate School  
L. Molinari, Graduate Program Advisor