

APR 1 2004

PROCESS A
ROWAN UNIVERSITY

NON-GENERAL EDUCATION ~ CURRICULUM PROPOSAL
LIBRARY RESOURCE FORM REQUIRED

SCC #03-04- 177

Deadlines

October 3, 2003 to be implemented Fall 2004 ~ February 13, 2004 to be implemented Spring 2005

April 2005

PROPOSAL TITLE: School Mathematics from an Advanced Standpoint

Sponsor(s): Dr Eric Milon E-Mail: milon@rowan.edu Ext: 3876
Dr Jill Perry E-Mail: perry@rowan.edu Ext: 3732

DEPARTMENT: Math

COLLEGE: LAS

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

- 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

THE FOLLOWING SIGNATURES REPRESENT APPROVAL

Department Chair: Ronald J. Gordon Date: 3/8/04
Department Curriculum Chair: Abdul Hansen Date: 3/10/04
Academic Dean: [Signature] Date: 3/10/04

COLLEGE CURRICULUM COMMITTEE

Closed
OPEN HEARING Date: 12/7/03 Approved Not Approved

COLLEGE CURRICULUM CHAIR: [Signature]
Senate Curriculum Chair Signature: [Signature] Date: Senate Announcement 3-22-2004

Comments: Associated with 03-04-806

EXECUTIVE VICE PRESIDENT/PROVOST Signature: [Signature] Date: 7/04

Approved Not Approved

Date: 7/14/04 REGISTRAR Course Description Received & Approved ~ Hegis Taxonomy & Course #: 1701561

Registrar Signature: [Signature]

NOTIFICATION FORWARD

- SCC Chair
- Academic Dean
- Department Chair
- Registrar
- IR
- CAP
- VP Student Affairs
- Others

Transmitted 7-27-04

New Course Proposal

1. Details

- A. Title: School Mathematics from an Advanced Standpoint
- B. Sponsor: Dr. Eric Milou, Department of Mathematics
- C. Credit Hours: 3
- D. Course Level: Graduate
- E. Prerequisites: Undergraduate degree in mathematics or secondary mathematics teaching certificate
- F. Suggested Time, Implementation: One section of the course to be offered once every other year
- G. Curricular Effect: Required course for all in M.A. subject matter teaching - mathematics.
- H. Adequacy: Present staff is adequate.
- I. Resources: Faculty, computer equipment, and mathematics department resources are adequate.

2. Rationale:

- (a) With the completion and implementation of the NJ Mathematics Curriculum Frameworks (1996) across the state, the mathematical content knowledge of in-service teachers needs to be upgraded. There is content in the Standards (e.g: mathematical modeling, discrete mathematics, geometric transformations) that many teachers did not learn as undergraduates. This course will provide the opportunity for teachers (K-12) to update their mathematical content knowledge, preparing their students to pass the mathematics sections of the new state tests (ESPA, GEPA, and HSPA).
- (b) This course will also enable teachers and others who wish to deeper their knowledge and understanding of mathematics preparing them for research into mathematics education.

3. Essence of the Course and Outline:

The objective of this course is to develop a deeper understanding of high school mathematics and a new appreciation of its beauty, its logical structure and its applicability. The course will take into account not only the many interconnections

among high school mathematics topics but also their relationship to higher mathematics.

The mathematical content for this course is an area of mathematics that is of great benefit to all those in secondary mathematics teachers but is rarely seen by them. Specifically, content includes:

- I. Algebra & Analysis with connections to Geometry
 - Real Numbers - decimal representations of real numbers and periods of periodic decimals
 - Complex Numbers - the geometry of complex number arithmetic
 - Functions - historical evolution, problem analysis, properties, limiting behavior, fitting data
 - Equations - Isomorphism, algebraic structure
 - Integers & Polynomials - Induction, recursion, FTA, bases, division algorithm, Euclidean algorithm
 - Number System Structures - Modular arithmetic, integer congruence, number fields
- II. Geometry with Connections to Algebra & Analysis
 - Congruence - Euclid's Elements, transformations, symmetry
 - Distance & Similarity - Locus, distance on a sphere; similarity of graphs, polygons, and arcs; geometric means
 - Trigonometry - Modeling with trigonometric functions, historical development, algebraic properties
 - Area and Volume - Area formulas, area as probability, polyhedra, spheres
 - Axiomatics and Euclidean Geometry - Incidence Axioms, Betweenness, Parallel Postulate, Euclid's 5th, Cartesian coordinates

The above content will be examined with the following in mind:

- analyses of alternative definition, language, and algorithms for mathematical ideas and concepts
- why concepts arose and how they change over time
- a wide range of applications
- calculator and computer technology approaches to problems
- analyses of common high school math problems from a deeper mathematical level
- how problems and proofs can be extended and generalized
- connections between ideas in different branches of mathematics
- how ideas studied in school mathematics relate to ideas studied later in mathematics

Resources:

Beaumont & Pierce (1963). *The Algebraic Foundations of Mathematics*. Addison-Wesley.

House & Coxford (eds). (1995). *Connecting Mathematics across the Curriculum*, 1995 Yearbook of the NCTM. NCTM.

Ifah, Georges (2000). *The Universal History of Numbers*. Wiley.

Nelson, Roger (2000). *Proofs Without Words II: More Exercises in Visual Thinking*. MAA.

Peressini, A. & Sherbert D. (1971). *Topics in Modern Mathematics for Teachers*. Holt, Rinehart & Winston.

Polya, George (1954). *Induction and Analogy in Mathematics*. Volume I and II. Wiley.

Ribenboim, Paulo (2000). *My Numbers, My Friends*. Springer-Verlag.

Silvester, J. (2001). *Geometry: Ancient and Modern*. Oxford University Press.

Usiskin, Peressini, Marchisotto, & Stanley (2003). *Mathematics for High School Teachers*. Pearson Education.

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.

Course evaluation:

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

4. Consultation:

Secondary Education

Catalog Description: School Mathematics from an Advanced Standpoint

1701.XXX - ??? - 3 sh

(Prerequisites: ??) This course is to develop a deeper understanding of mathematics and a new appreciation of its beauty, its logical structure and its applicability. The course will take into account not only the many interconnections among school mathematics topics but also their relationship to higher mathematics.

New Course Proposal

1. Details

- A. Title: School Mathematics from an Advanced Standpoint
- B. Sponsor: Dr. Eric Milou, Department of Mathematics
- C. Credit Hours: 3
- D. Course Level: Graduate
- E. Prerequisites: Undergraduate degree in mathematics or secondary mathematics teaching certificate
- F. Suggested Time, Implementation: One section of the course to be offered once every summer
- G. Curricular Effect: Required in the COGS in secondary mathematics education, elective in the M.A. in mathematics program.
- H. Adequacy: Present staff is adequate. Cost incurred would be limited to faculty summer pay for 3 sh
- I. Resources: Faculty, computer equipment, and mathematics department resources are adequate. Ten years of NJ SSI and the current MSP grant have collected a more than adequate library of materials.

2. Rationale:

a) With the completion and implementation of the NJ Mathematics Curriculum Frameworks (1996) across the state, the mathematical content knowledge of in-service teachers needs to be upgraded. There is content in the Standards (e.g: mathematical modeling, discrete mathematics, geometric transformations) that many teachers did not learn as undergraduates. This course will provide the opportunity for teachers (K-12) to update their mathematical content knowledge, preparing their students to pass the mathematics sections of the new state tests (ESPA, GEPA, and HSPA).

b) This course will also enable teachers and others who wish to deepen their knowledge and understanding of mathematics preparing them for research into mathematics education.

c) There is no current similar mathematics course at Rowan University that addresses the critical need that secondary mathematics teachers have with respect to updating their content knowledge and the relationship between secondary school mathematics and higher mathematics.

3. Essence of the Course and Outline:

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The mathematical content for this course is an area of mathematics that is of great benefit to all those in secondary mathematics teachers but is rarely seen by them. Specifically, content includes:

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- Ribenboim, Paulo (2000). *My Numbers, My Friends*. Springer-Verlag.
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Course evaluation:

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4. Consultation:

Dr. Carol Sharp, Dean of College of Education
Dr. Jay Kuder, Dean of Graduate School
Dr. Holly Willett, Department of Secondary Education

Catalog Description: School Mathematics from an Advanced Standpoint

1701.XXX - ??? - 3 sh

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