

University of Wisconsin-Whitewater
Curriculum Proposal Form #3

New Course

Effective Term: 2141 (Spring 2014)

Subject Area - Course Number: **Math 421/621**
(See Note #1 below)

Cross-listing:

Course Title: (Limited to 65 characters) Mathematics for High School Teachers I

25-Character Abbreviation: Math for H. S. Teachers I

Sponsor(s): Tamas Szabo

Department(s): Mathematical and Computer Sciences

College(s): Letters and Sciences

Consultation took place: NA Yes (list departments and attach consultation sheet)
Departments: Curriculum and Instruction

Programs Affected: **Mathematics**

Is paperwork complete for those programs? (Use "Form 2" for Catalog & Academic Report updates)

NA Yes will be at future meeting

Prerequisites: Math 280, Math 301, and at least an additional 3 credits in upper level math

Grade Basis: Conventional Letter S/NC or Pass/Fail

Course will be offered: Part of Load Above Load
 On Campus Off Campus - Location

College: Letters and Sciences **Dept/Area(s):** Mathematical and Comp. Sci.

Instructor: Tamas Szabo

Note: If the course is dual-listed, instructor must be a member of Grad Faculty.

Check if the Course is to Meet Any of the Following:

Technological Literacy Requirement Writing Requirement
 Diversity General Education Option: Select one:

Note: For the Gen Ed option, the proposal should address how this course relates to specific core courses, meets the goals of General Education in providing breadth, and incorporates scholarship in the appropriate field relating to women and gender.

Credit/Contact Hours: (per semester)

Total lab hours: 0 Total lecture hours: 48
Number of credits: 3 Total contact hours: 48

Can course be taken more than once for credit? (Repeatability)

No Yes If "Yes", answer the following questions:

No of times in major:

No of credits in major:

No of times in degree:

No of credits in degree:

Proposal Information: ([Procedures for form #3](#))

Course justification:

The proposed course is the first of a new two semester sequence that will fill a gap in the preparation of secondary mathematics teachers. It is intended to make the necessary connections and integrate knowledge learned in different courses in the university curriculum and high school curriculum. It will provide students with a deep, conceptual understanding of elementary mathematics from an advanced standpoint, crucial for becoming an effective teacher.

Relationship to program assessment objectives:

This course will directly help students in passing the Major Field Test which our department uses as an important assessment instrument of our majors. It also teaches skills secondary teachers of mathematics will need to learn to satisfy DPI requirements, and the teacher education program to earn accreditation.

Budgetary impact:

No additional faculty will be necessary to hire, since the restructuring of the program will have the same total number of courses taught.

Course description: (50 word limit)

The course revisits the high school curriculum from an advanced perspective. The focus is on deepening understanding of concepts, highlighting connections and solving challenging problems. The mathematical content includes number systems, functions, equations, integers, and polynomials. Connections to geometry are emphasized throughout the course.

If dual listed, list graduate level requirements for the following:

1. **Content** (e.g., What are additional presentation/project requirements?)

The assignments for graduate level would include more challenging problems with extra writing components. In addition, graduate students would receive one more individual research project than the undergraduate students, each chapter of the proposed text has numerous projects listed. Presentations of those projects would be made to the whole class.

2. **Intensity** (e.g., How are the processes and standards of evaluation different for graduates and undergraduates?)

Graduate students would be evaluated based on assignments, exams and presentations of their individual research projects. The overall weight of the research projects should not be less than 25%. This course would also be ideal for inservice workshops for secondary mathematics teachers during Summer or throughout the year who would receive graduate credit.

3. **Self-Directed** (e.g., How are research expectations differ for graduates and undergraduates?)

The extra work assigned for graduate credit could be done independently of the course and requires mostly individual work and consultations with the instructor.

Course objectives and tentative course syllabus:

Course Objectives:

Students will study the connections between different courses (e.g. calculus, abstract algebra, geometry, real analysis). The center of attention is concepts in algebra and analysis that relate to high school mathematics. The course intends to extend and generalize familiar theorems, demonstrate alternate ways of approaching problems, and discuss historical contexts in which concepts arose and have changed over time.

Evaluation:

| | |
|--|------------|
| Homework Assignments (best 10 out of 12) | 200 points |
| Research Project | 200 points |
| Two midterm exams | 200 points |
| Final Exam | 200 points |
| Total | 800 points |

Homework will be collected and graded every week. No late homework will be accepted. One midterm grade may be replaced with the final exam score (scaled down to 100 points).

Grading Scale:

| | | | | |
|-----------|-----------|-----------|-----------|----------------------------------|
| | 87-89% B+ | 77-79% C+ | 67-69% D+ | 0-59% F |
| 93-100% A | 83-86% B | 73-76% C | 63-66% D | <i>All course grades will be</i> |
| 90-92% A- | 80-82% B- | 70-72% C- | 60-62% D- | <i>in the D2L gradebook.</i> |

Textbook: *Mathematics for High School Teachers (An Advanced Perspective)* by Usiskin, Peressini, Marchisotto, and Stanley, Prentice Hall, 2003.

Tentative course coverage:

Week 1: Introduction to concept analysis, problem analysis and mathematical connections.

Week 2: The real numbers

Week 3: The complex numbers

Week 4: History of functions

Week 5: Properties of real functions

Week 6: Problems involving real functions.

Week 7: Concept of equation

Week 8: Algebraic structures and solving equations

Week 9: Process of solving equations

Week 10: Induction and recursion

Week 11: Divisibility of integers

Week 12: Divisibility of polynomials

Week 13: Modular arithmetic

Week 14: Number fields

Week 15: Presentations of projects

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Bibliography: (Key or essential references only. Normally the bibliography should be no more than one or two pages in length.)

Berlinghoff, William and Fernando Gouvea, *Math through the ages: A Gentle History for Teachers and Others*, MAA, Washington, DC, 2003.

Bremigan, Bremigan, Lorch, *Mathematics for Secondary School Teachers*, MAA, Washington, DC, 2011.

Cuoco, *Mathematical Connections: A Companion for Teachers and Others*, MAA, Washington, DC, 2005.

The Mathematical Education of Teachers, CBMS/AMS, Providence, RI, 2012.

Principles and Standards for School Mathematics, NCTM, Reston, VA, 2000.

Usiskin, Peressini, Marchisotto , and Stanley, *Mathematics for High School Teachers (An Advanced Perspective)* , Prentice Hall, 2003.

Zeitz, *The Art and Craft of Problem Solving*, Wiley, 2007.