Course Goals: Math 451, Explorations of Middle/Secondary School Mathematics

Course Description: This course focuses on mathematics knowledge for teaching at the middle/secondary level and is designed specifically to address requirements for teachers and pre-service teachers seeking MC-EA licensure with content minor in mathematics or EA-A licensure with content major in mathematics. Instruction will be guided by the Common Core State Standards for Mathematics and the NCTM Principles and Standards for School Mathematics. Topics include: problem solving, critical thinking, communication, issues of technology, number and operations, algebraic and geometric reasoning, measurement, and data analysis and probability. Prerequisites: MATH 231 or Math 222 with a grade of C or above.

Knowledge:

Students will demonstrate knowledge of

- all six NCTM Principles and all ten Standards, as well as the Wisconsin Model Academic Standards for Mathematics
- big ideas of the five content strands of mathematics (as defined by PSSM) and how these ideas relate to one another and to the process strands
- scope and sequence of middle and secondary level mathematics
- connections among mathematical concepts and between mathematics and real-world situations
- the variety and roles of various representations used in mathematics
- the historical development of selected topics in the middle/secondary mathematics curriculum
- the role of research in mathematics education

Skills:

Students will demonstrate the ability to

- solve routine and non-routine problems within each of the content strands of middle and secondary mathematics and give clear, accessible explanations of the mathematics involved in their solutions.
- analyze the mathematics involved in specific problems and identify possible steps to take with students as well as predicting possible student responses
- evaluate others' solutions to mathematical problems for correctness, validity, efficiency and potential for extension/development
- identify common mathematical errors/misconceptions and discuss how to prevent/remedy them
- carry out common and alternative mathematical algorithms and evaluate them for correctness, validity, efficiency and potential for extension/development
- explain the reasons for steps in commonly taught mathematical algorithms
- correctly and consistently use commonly accepted mathematical terminology and notation
- choose and use appropriate manipulatives/technology to solve problems and represent/explain mathematical concepts
- identify and take steps to fill gaps in own pedagogical content knowledge
- identify and describe the progression of concepts within and across content strands, and discuss how misconceptions within one concept can affect learning of other concepts.
- identify, research, and create a visual presentation regarding historical connections to topics within the middle/secondary mathematics curriculum
- choose and present engaging mathematics suitable for use with a math club or as enrichment for talented mathematics students at the middle or secondary level
- carry out and present a review of literature on an appropriate topic within middle/secondary mathematics education

Dispositions:

Students will display positive orientations towards the beliefs that

- every student can learn mathematics; it is important to have clear goals and high expectations for all students
- representing mathematics concepts appropriately is a large part of mathematics teaching
- students can construct their own knowledge about mathematics, and always have previous mathematical knowledge
- it is necessary to develop a positive disposition toward mathematics in themselves and their students
- there is more than one valid way to approach most mathematics problems
- mathematics is logical—it can and should explained rather than memorized
- research is an important component of mathematics education at every level

Approved January 2006
Description revised: September 2014
Pre-requisites revised to include Math 222: December 2014