WINONA STATE UNIVERSITY
PROPOSAL FOR GENERAL EDUCATION PROGRAM COURSES

Department: Mathematics and Statistics

Course No. 202
Course Name: Elements of Mathematics
Prerequisites: Score of 19 or higher on ACT Math or Math 050
Credits: 3

GEP Goal Area(s):*

CORE GOAL AREAS
- Goal 1: Communication
- Goal 3: Natural Science
- Goal 4: Mathematics/Logical Reasoning
- Goal 5: History and the Social and Behavioral Sciences
- Goal 6: The Humanities and Fine Arts

THEME GOAL AREAS
- Goal 7: Human Diversity
- Goal 8: Global Perspective
- Goal 9: Ethical and Civic Responsibility
- Goal 10: People and the Environment

* Courses may be submitted for up to two Goal Areas.

Additional Requirement Categories (list number of credits desired in appropriate category):

- Intensive: 1. Writing
  2. Oral Communication
  3a. Mathematics/Statistics
  3b. Critical Analysis

- Physical Development and Wellness

Provide information as specified in the previous directions.

Attach a General Education Program Approval Form.

Department Contact Person for this Proposal:
Nicole Williams
Name (please print)

467-0380 Phone
mwilliams@winona.edu e-mail address

[Revised 9-6-11]
WINONA STATE UNIVERSITY  
GENERAL EDUCATION PROGRAM APPROVAL FORM  

Routing form for General Education Program Course approval.  
Course: Math 202  

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<th>Department Approval</th>
<th>1/17/13</th>
<th>evalph @winona.edu</th>
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*If the dean does not approve the proposal, a written rationale should be provided to the General Education Program Subcommittee.  

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<th>GEPS Recommendation</th>
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<td>Chair, General Education Program Subcommittee</td>
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Please forward to Registrar.  

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[Revised 10-22-12]
A. Course Description

1. Description of the course as it will appear in the WSU catalog, including the credit hours, any prerequisites, and the grading method. If the course can be repeated, indicate the maximum number of credit hours for which this can be done.

Course: Math 202 Elements of Mathematics Goal Area 4: Basic Skills in Mathematics
Number of Credits: 3 credits Grading Method: Letter Grade Only
Course Description: The purpose of this course is to develop mathematical reasoning, problem solving, and communication through performing and interpreting experiments, thinking analytically, and incorporating practical applications that are important aspects of real world phenomena. Prerequisite: Score of 18 or higher on ACT Mathematics or Math 050.

2. Course outline of the major topics, themes, subtopics, etc., to be covered in the course. This outline should be, at a minimum, a two-level outline, i.e., consisting of topics and subtopics. This information will be submitted to MnSCU by the WSU Registrar's office.

Course Outline:

I. An Introduction to Problem Solving
   A. Mathematics and Problem Solving
   B. Explorations with Patterns
   C. Reasoning and Logic: An Introduction
   D. Networks

II. Decimals and Applications to Finance
   A. Operations on Decimals
   B. Nonterminating Decimals
   C. Percent and Interest

III. Real Numbers and Algebraic Thinking
   A. Real Numbers
   B. Variables
   C. Equations
   D. Functions
   E. Equations in a Cartesian Coordinate System
   F. Using Real Numbers in Equations

IV. Probability
   A. How Probabilities Are Determined
   B. Multistage Experiments with Tree Diagrams and Geometric Probabilities
   C. Using Simulations in Probability
   D. Odds, Conditional Probability, and Expected Value
   E. Using Permutations and Combinations in Probability

V. Data Analysis/Statistics: An Introduction
   A. Designing Experiments/Collecting Data
   B. Displaying Data: Part I
   C. Displaying Data: Part II
   D. Measures of Central Tendency and Variation
   E. Abuses of Statistics

B. Rationale for GEP: Goal Area 4

The major focus of the course is on problem solving and the tools necessary to problem solve. These tools include analyzing data, expressing ideas in mathematical notation including logic and algebraic systems, understanding the theory of chance and how it relates to problem solving. A major emphasis of the course is emphasizing inquiry through a cyclical learning process of prediction, data collection, analysis, and communicating results.
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<th>Assessment</th>
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<td>Illustrate historical and contemporary applications of mathematics/logical systems. More specifically: - investigate situations that involve counting finite sets, calculating probabilities, tracing paths in network graphs, and analyzing iterative procedures - relate patterns in one strand of mathematics to patterns across the discipline - investigate and analyze data - understand the history of mathematics and the interaction between different cultures and mathematics - understand the connections among mathematical concepts and procedures as well as the relationship between mathematics and other fields.</td>
<td>- Students will have many opportunities to work with data including collecting, interpreting, analyzing, and building models. - Students will analyze patterns to determine mathematical results. They will work with both geometric and arithmetic sequences. - Students will calculate probabilities based on real-life phenomena. - Students will determine Eulerian and Hamiltonian circuits to determine the most efficient paths in applications such as a salesman’s route, bussing, or snowplowing. - Students will explore the history of math as it relates to sequences, number theory, networks, and statistics.</td>
<td>Students will be assessed through a series of projects, group work, and exams. They will need to collect and analyze data in order to build models and present their results.</td>
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<td>Clearly express mathematical/logical ideas in writing. More specifically: - identify and generate patterns to demonstrate a variety of relationships - use a variety of conceptual and procedural tools for collecting, organizing, and reasoning about data - communicate mathematics at different levels of formality.</td>
<td>- After collecting data on real-life applications including probability, finance, population growth, students will analyze the data by creating graphs and models. They will need to communicate the results of their findings. - Students will explore how logic, mathematical symbols, and algebra help explain results in a concise manner.</td>
<td>One of the main emphases in the course will be to assess the ability of the student to problem solve and communicate their findings in terms of equations, graphs, tables, and written summaries.</td>
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<td>Explain what constitutes a valid mathematical/logical argument (proof). More specifically: - solve problems and use mathematical notation with concepts and techniques of discrete math from areas such as graph theory, combinatorics, and recursion - interpret and draw inferences from data and make decisions in a wide range of applied problem situations - know how to reason mathematically and communicate the results.</td>
<td>- Students will analyze statements to determine their logical validity. They will use truth tables, simple mathematical proofs, and mathematical symbols to determine conclusions. - Students will reason mathematically in many situations and understand how to determine the reasonableness of their solutions. - Students will explore both experimental and theoretical probability through a series of labs. They will understand the difference between their results and how Bernoulli’s Law of Large Numbers helps in probabilistic situations.</td>
<td>Students will be assessed through a series of projects that utilize logic and mathematical reasoning. They will be assessed over their ability to problem solve and determine reasonable mathematical results.</td>
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<td>Apply higher-order problem-solving and/or modeling strategies. More specifically: - apply problem solving methods in setting such as finance, population dynamics, and optimal planning - apply numerical and graphical techniques for representing and summarizing data.</td>
<td>- Students will explore finance applications including interest, population applications including geometric and arithmetic sequences, and optimal planning through network graphs. - Students will use logic, mathematical proof, and multiple representations to communicate results.</td>
<td>Students will be assessed through a series of projects on real-life applications that include collecting and analyzing data, modeling random events, and networks. Students will be assessed over their ability to problem solve and determine reasonable mathematical results.</td>
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WINONA STATE UNIVERSITY
PROPOSAL FOR GENERAL EDUCATION PROGRAM COURSES

Mathematics and Statistics

MATH 203
Course No.
Number and Number Systems
Course Name

Credits

Prerequisites: MATH 202 Elements of Mathematics

GEP Goal Area(s):*

CORE GOAL AREAS

Goal 1: Communication
Goal 3: Natural Science
Goal 4: Mathematics/Logical Reasoning
Goal 5: History and the Social and Behavioral Sciences
Goal 6: The Humanities and Fine Arts

THEME GOAL AREAS

Goal 7: Human Diversity
Goal 8: Global Perspective
Goal 9: Ethical and Civic Responsibility
Goal 10: People and the Environment

* Courses may be submitted for up to two Goal Areas.

Additional Requirement Categories (list number of credits desired in appropriate category):

☑ Intensive:

1. Writing
2. Oral Communication
☑ 3a. Mathematics/Statistics
☑ 3b. Critical Analysis

Physical Development and Wellness

Provide information as specified in the previous directions.

Attach a General Education Program Approval Form.

Department Contact Person for this Proposal:

Nicole Williams
Name (please print)
x6380
Phone

rwilliams@winona.edu
e-mail address

[Revised 9-6-11]
WINONA STATE UNIVERSITY
GENERAL EDUCATION PROGRAM APPROVAL FORM

Routing form for General Education Program Course approval.

Course Math 202

Department Approval

[Signature]
Department Chair

1/17/13
Date

6dora@winona.edu
E-mail address

Dean's Recommendation

Yes

No*

Charles Musick
Dean of College

1/22/13
Date

*If the dean does not approve the proposal, a written rationale should be provided to the General Education Program Subcommittee.

GEPS Recommendation

Approved

Disapproved

Chair, General Education Program Subcommittee

Date

A2C2 Recommendation

Approved

Disapproved

Chair of A2C2

Date

Faculty Senate Recommendation

Approved

Disapproved

President of Faculty Senate

Date

Academic Vice President Recommendation

Approved

Disapproved

Academic Vice President

Date

Decision of President

Approved

Disapproved

President

Date

Please forward to Registrar.

Registrar

Date entered

Please notify department chair via e-mail that curricular change has been recorded.

[Revised 10-22-12]
MTED 125 is currently a Math/Stat Intensive course. This spring the Math/Stat Dept. changed the course number to MATH 203 and reduced the credits from 4 credits to 3 credits.

Math 203: Number and Number Systems 3 credit hours

Grading Method: Grade Only
The study of concepts and properties of operations essential to mathematics in the elementary and middle school grades. Prerequisite: Math 202

Course Outline of the Major Topics and Subtopics:
I. Numeration Systems and Sets
   A. Numeration Systems
   B. Describing Sets
   C. Other Set Operations and Their Properties

II. Whole Numbers and Their Operations
   A. Addition and Subtraction of Whole Numbers
   B. Algorithms for Whole-Number Addition and Subtraction
   C. Multiplication and Division of Whole Numbers
   D. Algorithms for Whole-Number Multiplication and Division
   E. Mental Mathematics and Estimation for Whole-Number Operations

III. Number Theory
    A. Divisibility
    B. Prime and Composite Numbers
    C. Greatest Common Divisor and Least Common Multiple

IV. Integers
    A. Integers and the Operations of Addition and Subtraction
    B. Multiplication and Division of Integers

V. Rational Numbers and Proportional Reasoning
    A. The Set of Rational Numbers
    B. Addition, Subtraction, and Estimation with Rational Numbers
    C. Multiplication and Division of Rational Numbers
    D. Ratios, Proportions, and Proportional Reasoning

Rationale for Math/Stat Intensive course: The purpose of this course is to develop mathematical reasoning skills and understanding in pre-service elementary teachers. It is geared to enhancing their knowledge of mathematical models and underlying concepts of elementary mathematics. The entire focus of the course is dealing with problem solving in a 4-part cyclical process: data collection, analyzing data, determining mathematical formulas, and communicating these results based on elementary mathematical content.
Student Learning Outcomes and Assessment by category:

Category 1: Practice the correct application of mathematical or statistical models that are appropriate to their prerequisite knowledge of those areas

1. Students will use models, properties, relationships and patterns to explain their mathematical reasoning.
   Assessment: Students will be assessed on their ability to identify patterns and find a model to represent the pattern.
2. Students will model, explain, and develop computational algorithms.
   Assessment: Students will be assessed over their understanding of arithmetic and geometric sequences.
3. Students will demonstrate conceptual and procedural understanding of all basic mathematics up to and including functional relationships.
   Assessment: Students will be assessed over their mathematical understanding of mathematical content including percents, fractions, and their ability to determine functional relationships.

Category 2: Make proper use of modern mathematical or statistical methods appropriate to their level of prerequisite knowledge.

4. Students will understand the meaning of the four basic operations and use them to solve problems.
   Assessment: Students will be assessed over their ability to demonstrate understanding of the four operations in base ten, other bases, and through the use of multiple algorithms.
5. Students will use algebra to describe patterns, relations, and functions, in addition to model and solve problems.
   Assessment: Students will be assessed over their ability to describe patterns both in writing, through developing pictures, and in their ability to write equations to extend the patterns to the nth term.
6. Students will use estimation and calculators in working with quantities, computation, and problem solving.
   Assessment: Students will be assessed over their ability to use problem solving in multiple situations. Part of the problems solving process is developing a sense of number to help them estimate if their results are reasonable.
7. Students will use a variety of manipulative and visual materials for exploration and development of numbers and their relationships, four basic operations with positive and negative rational numbers, and algebraic concepts.
   Assessment: Students will be assessed over their ability to demonstrate fluency with materials such as two color counters, base ten blocks, algebra tiles, and balance scales.