

LSC Use Only Proposal No:

LSC Action-Date: App 2-9-12

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UWUCC Action-Date: App 3/6/12 Senate Action Date: App 3/20/12

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) <b>Edel Reilly</b>	Email Address <b>ereilly@iup.edu</b>
Proposing Department/Unit <b>mathematics</b>	Phone <b>7-7907</b>

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

- New Course       Course Prefix Change       Course Deletion  
 Course Revision       Course Number and/or Title Change       Catalog Description Change

Current course prefix, number and full title: MATH 152: Elements of Mathematics II

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

- Learning Skills     Knowledge Area     Global and Multicultural Awareness     Writing Across the Curriculum (W Course)  
 Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)  
 Global Citizenship     Information Literacy     Oral Communication  
 Quantitative Reasoning     Scientific Literacy     Technological Literacy

3. Other Designations, as appropriate

- Honors College Course     Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

- Catalog Description Change     Program Revision     Program Title Change     New Track  
 New Degree Program     New Minor Program     Liberal Studies Requirement Changes     Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)	<i>Edel Reilly</i>	12/6/11
Department Chairperson(s)	<i>[Signature]</i>	12/6/11
College Curriculum Committee Chair	<i>[Signature]</i>	12/15/11
College Dean	<i>[Signature]</i>	12/16/11
Director of Liberal Studies (as needed)	<i>[Signature]</i>	3/5/12
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate	<i>Edel Reilly, TECC Chair</i>	3/2/12 2/29/12
UWUCC Co-Chairs	<i>Gail Schuist</i>	3/6/12

Received

MAR 2 2012

Liberal Studies

Received

FEB 14 2012

Liberal Studies

Received

DEC 19 2011

Liberal Studies

## Elements of Math II

### **Overview of changes from original syllabus of record**

1. Objectives: The course objectives were aligned with the Expected Undergraduate Student Learning Outcomes.
2. The textbook has been updated.

## **MATH 152: Elements of Math II**

### **SYLLABUS OF RECORD**

#### **I. CATALOG DESCRIPTION**

MATH 152 Elements of Mathematics II

3c-01-3cr

**Prerequisite:** MATH 151

Topics included are organizing and analyzing data, statistics, probability, geometric shapes, measurement, congruence and similarity, coordinate geometry, and transformational geometry.

#### **II. COURSE OBJECTIVES**

**RELATIONSHIP OF COURSE TO COLLEGE CONCEPTUAL FRAMEWORK:** The College of Education has developed a teacher education program based upon a preservice teacher who is competent in content and pedagogy. MATH 152 is a content course which broadens and deepens the student's knowledge of the mathematics content of the elementary grades as a vehicle to develop a pedagogical framework for learning to teach mathematics. In the course, students use a variety of materials for learning, work with conceptual models, use conceptual models to do mathematics, perform activities that develop new perspectives, and demonstrate competence in elementary school mathematics. These activities help preservice teachers become reflective practitioners who are capable of inquiry into a variety of methods of communicating mathematics while learning to collaborate and interact with their peers and with experienced teachers.

##### **Objective 1:**

Examine and develop elementary school geometry content, concepts, and skills.

##### **Expected Student Learning Outcomes 1 and 2:**

Informed and Empowered Learners

##### **Rationale:**

Assignments will require students to have a level of knowledge of elementary geometry that will enable them to understand the geometry taught at the elementary and middle level schools. Assignments will also require students to critically analyze features of shapes, transformations, and coordinate geometry. Students will be asked to demonstrate their knowledge by developing mathematical arguments about geometric relationships, use visualization, spatial reasoning, and geometric modeling to solve problems.

##### **Objective 2:**

Examine and develop elementary school measurement content, concepts, and skills

##### **Expected Student Learning Outcomes 1 and 2:**

Informed and Empowered Learners

##### **Rationale:**

Assignments will require students to have a level of knowledge of measurement that will enable them to understand the underlying structure of measures and the requirements for taking measurements. Assignments will also require students to critically analyze the fundamental ideas of measurement: the need to select a measureable attribute, the concept that measurement involves comparison, and the

need and role of units. Students will be asked to develop and apply appropriate techniques, tools, and formulas to determine measurements.

**Objective 3:**

Examine and develop elementary school data analysis and probability content, concepts, and skills.

**Expected Student Learning Outcomes 1 and 2:**

Informed and Empowered Learners

**Rationale:**

Assignments will require students to have a level of knowledge of data analysis and probability that will enable them to interpret data from a variety of settings and to recognize trends in these data. Assignments will also require students to interpret, critically analyze, and use numerical and graphical data. Assignments will also allow students to explore and apply basic concepts of probability.

**Objective 4:**

Analyze and explain mathematical representations such as formulas, using deductive and other reasoning, problem solving, and communication in order to gain insight and perspective into the nature of mathematics as taught in the elementary school, including appropriate applications of technology.

**Expected Student Learning Outcomes 1 and 2:**

Informed and Empowered Learners

**Rationale:**

Assignments will require students to build new mathematical knowledge through problem solving, and to solve problems that arise in math and in other contexts. Assignments will also require students to recognize reasoning as a fundamental aspect of mathematics and to develop and evaluate mathematical arguments. Assignments will allow students to communicate their mathematical thinking through both written and oral forms of communication, and the use the language of mathematics to express mathematical ideas precisely.

**Objective 5:**

Demonstrate that one is a learner and doer of mathematics (a) by actively engaging in problem solving, applying multiple strategies to solve problems, and using critical thinking to make sense of solutions found and (b) by modeling and making connections to real world phenomenon in current and historical contexts in order for students to become more confident and able mathematically.

**Expected Student Learning Outcomes 1 and 2:**

Informed and Empowered Learners

**Rationale:**

Assignments will require students to apply and adapt a variety of appropriate problem solving strategies and to monitor and reflect on the process of mathematical problem solving. Assignments will also require students to recognize and apply mathematics in contexts outside of mathematics.

Course Objective	College Conceptual Framework / Danielson	INTASC Standard /Principle	NCATE / ACEI Elementary Education Program Standard	Course Assessment Measuring Objective
1	1a – Content & Pedagogy	1, 4	2.3 Mathematics	<b>Outcomes Assessment: Geometry Exam</b>
2	1a – Content & Pedagogy	1, 4	2.3 Mathematics	Tests, Projects, and Quizzes
3	1a – Content & Pedagogy	1, 4	2.3 Mathematics	Tests, Projects, and Quizzes
4	1a – Content & Pedagogy	1, 4	2.3 Mathematics	Tests, Projects, and Quizzes
5	1b – Knowledge of Students	9	2.3 Mathematics	Projects and Quizzes

### III. COURSE OUTLINE / TIME SCHEDULE

- A. Statistics (*Objectives #3, #4, #5*) 12 academic hours
1. Organizing and Picturing Information
  2. Analyzing Data
  3. Misleading Graphs and Statistics
- B. Probability (*Objectives #3, #4, #5*) 10 academic hours
1. Probability and Simple Experiments
  2. Probability and Complex Experiments
  3. Simulations, Expected Value, Odds, and Conditional Probability
  4. Additional Counting Techniques
- C. Geometric Shapes (*Objectives #1, #4, #5*) 4 academic hours
1. Recognizing Geometric Shapes and Definitions
  2. Analyzing Shapes
  3. Properties of Geometric Shapes: Lines and Angles
  4. Regular Polygons and Tessellations
  5. Describing Three-Dimensional Shapes
- D. Measurement (*Objectives #2, #4, #5*) 5 academic hours
1. Measurement with Nonstandard and Standard Units
  2. Length and Area
  3. Surface Area
  4. Volume
- E. Geometry Using Triangle Congruence and Similarity (*Objectives #1, #4*) 3 academic hours
1. Congruence of Triangles
  2. Similarity of Triangles
  3. Basic Euclidean Constructions
  4. Additional Euclidean Constructions
  5. Geometric Problem Solving Using Triangle Congruence and Similarity

- F. Geometry Using Coordinates (*Objectives #1, #4*) 2 academic hours
1. Distance and Slope in the Coordinate Plane
  2. Equations and Coordinates
  3. Geometric Problem Solving Using Coordinates
- G. Geometry Using Transformations (*Objectives #1, #4*) 2 academic hours
1. Transformations
  2. Congruence and Similarity Using Transformations
  3. Geometric Problem Solving Using Transformations

This syllabus covers 38 academic hours leaving 4 academic hours for testing and/or review. The final is an additional 2 academic hours.

#### IV. EVALUATION METHODS

Criteria used in assessing the competency of the student will vary depending upon the instructor, but generally include examinations, projects, presentations, lab activities, writing assignments, and class participation.

More specifically, the following guidelines are recommended:

- 60% Tests (tests and final). Tests provide a summative assessment of topics covered and fulfillment of course outcomes (*e.g., Geometry Exam to cover geometry*). Performance assessments consist of group and individual tasks and may be used as formative as well as summative evaluations.
- 20% Participation and Quizzes. Participation includes attendance, homework, and in-class activities. Quizzes provide a formative assessment of class members' understandings and fulfillment of course outcomes.
- 20% Projects. Projects include but are not limited to: in-class activities, in-class presentations, small-group project problems, course topic reflections, reviews of elementary school journals and textbooks, and a portfolio of student's work. Group and individual projects are assigned. Projects show students' understandings and application of course topics in order to fulfill course outcomes.

#### V. EXAMPLE GRADING SCALE

90 – 100%	A
80 - 89%	B
70 - 79%	C
60 - 69%	D
0 - 59%	F

#### VI. UNDERGRADUATE-COURSE ATTENDANCE POLICY

The course attendance policy is consistent with the University policy.

## VII. REQUIRED TEXT

Beckmann, S. (2011). *Mathematics for Elementary Teachers*. Boston: Pearson

## VIII. SPECIAL RESOURCE REQUIREMENTS

None.

## IX. BIBLIOGRAPHY

- Bassarear, T. (2005). *Mathematics for Elementary School Teachers*. Boston, MA: Houghton Mifflin.
- Bennett, A. B & Nelson, L. T. (2004). *Mathematics for elementary teachers: A conceptual approach*. Boston, MA: McGraw-Hill.
- Burns, M. (2000). *About teaching mathematics: A K-8 resource*. Sausalito, CA: Math Solutions Publications.
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- Long, C. & DeTemple, D. (2006). *Mathematical reasoning for elementary teachers*. NY: Pearson Education.
- Masingila, J. O., Lester, F. K., & Raymond, A. M. (2002). *Mathematics for elementary teachers via problem solving*. Upper Saddle River, New Jersey: Prentice Hall.
- Musser, Burger, & Peterson. (2006). *Mathematics for Elementary Teachers: A Contemporary Approach, Seventh Edition*. New York: John Wiley & Sons.
- National Council of Teachers of Mathematics. *Teaching Children Mathematics*. Reston, Virginia. (Formerly known as the Arithmetic Teacher)
- National Council of Teachers of Mathematics. *Yearbooks*. Reston, Virginia
- National Council of Teachers of Mathematics. *Mathematics Teaching in the Middle School*. Reston, Virginia
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- National Council of Teachers of Mathematics. (1989) *Curriculum and evaluation standards for school mathematics*. Reston, Virginia: The National Council of Teachers of Mathematics.
- National Council of Teachers of Mathematics. *Navigations Series*. Reston, Virginia: The National Council of Teachers of Mathematics.
- National Council of Teachers of Mathematics. (2000) *Principles and standards for school mathematics*. Reston, Virginia: The National Council of Teachers of Mathematics.
- National Council of Teachers of Mathematics. (1991) *Professional standards for teaching mathematics*. Reston, Virginia: The National Council of Teachers of Mathematics.

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- O'Daffer, P. G., Clemens, S. R.(1992). Geometry: and investigative approach. Menlo Park, CA: Addison-Wesley.
- O'Daffer, P., Charles, R., Cooney, T., Dossey, J., Schielack, J. (2005). Mathematics for Elementary School Teachers. NY: Pearson Education.
- Smith, N., Lambdin, D., Lindquist, M., & Reys, R. (2001). Teaching elementary mathematics: A resource for field experiences. NY: John Wiley & Sons.
- Sonnabend T. (2004). Mathematics for teachers: An introductory approach for grades K-8. California: Thomson Brooks/Cole.
- Van De Walle, J. (2007). Elementary and middle school mathematics: Teaching developmentally. New York: Pearson.

## Old Syllabus of Record

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3c-01-3cr

**Prerequisite:** MATH 151

Topics included are organizing and analyzing data, statistics, probability, geometric shapes, measurement, congruence and similarity, coordinate geometry, and transformational geometry.

### II. COURSE OUTCOMES

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The student will:

1. develop and demonstrate knowledge of elementary school geometry content, concepts, and skills.
2. develop and demonstrate knowledge of elementary school measurement content, concepts, and skills.
3. develop and demonstrate knowledge of elementary school data analysis and probability content, concepts, and skills.
4. use and explain mathematical representations, reasoning, problem solving, and communication in order to gain insight and perspective into the nature of mathematics as taught in the elementary school.
5. demonstrate that one is a learner and doer of mathematics by actively engaging in problem solving, applying multiple strategies to solve problems, and making sense of solutions found.



Course Objective	College Conceptual Framework / Danielson	INTASC Standard /Principle	NCATE / ACEI Elementary Education Program Standard	Course Assessment Measuring Objective
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#### V. EXAMPLE GRADING SCALE

90 – 100%	A
80 - 89%	B
70 - 79%	C
60 - 69%	D
0 - 59%	F

#### VI. UNDERGRADUATE-COURSE ATTENDANCE POLICY

The course attendance policy is consistent with the University policy.

#### VII. REQUIRED TEXT

Musser, Burger, & Peterson. (2006). *Mathematics for Elementary Teachers: A Contemporary Approach*, Seventh Edition. New York: John Wiley & Sons.

#### VIII. SPECIAL RESOURCE REQUIREMENTS

None.

## IX. BIBLIOGRAPHY

- Bassarear, T. (2005). *Mathematics for Elementary School Teachers*. Boston, MA: Houghton Mifflin.
- Bennett, A. B & Nelson, L. T. (2004). *Mathematics for elementary teachers: A conceptual approach*. Boston, MA: McGraw-Hill.
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- O'Daffer, P., Charles, R., Cooney, T., Dossey, J., Schielack, J. (2005). *Mathematics for Elementary School Teachers*. NY: Pearson Education.
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- Van De Walle, J. (2007). *Elementary and middle school mathematics: Teaching developmentally*. New York: Pearson.

## Sample Assignment and Rubric

Name: \_\_\_\_\_

### Newspaper Activity: Interpretation of Graphs

**Directions:**

- Obtain a copy of a newspaper (USA Today is a good choice).
- Select **two different** graphs from **two different** articles
- Write a paragraph (4-5 sentences) on each graph that summarizes the articles. Your paragraphs should include:
  - A brief description of the article
  - The type of graph used
  - Why that type of graph was used?
  - How the graph was used to reinforce the main points of the article.
- Your paragraph should be typed in 12-point font. Attach the graph **only** beside your paragraph on the paper.

Grading Rubric	Detailed/concise (3)	Some details given (2)	Missing details/unclear (1-0)
Description of the <b>first</b> article	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Define the first graph used and why the authors chose it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Explained how the first graph was used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Description of the <b>second</b> article	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Define the second graph used and why the authors chose it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Explained how the second graph was used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Included graphs <b>only</b>			2
<b>Total Points (20)</b>			

Additional Comments:



Please attach this page to your assignment.

## **Answers to Liberal Studies Questions**

- A. Within the department, there is a curriculum committee, the Elementary Mathematics Education Committee (EMEC), which oversees this course's scheduling, staffing, and the textbook selection. Most sections of this course are taught by members of EMEC who regularly meet and discuss issues related to the course. A Reflective Practice group was formed by the members of EMEC and continues to meet to discuss various instruction practices used in MATH 151
- B. There are many contributions to the mathematics in this course. Algorithms, games, and visual representations come from many cultures. As mathematics educators who teach this course, we are aware of the need to recognize cultural and individual contributions. This course is presented in ways that provide perspectives to future teachers for teaching to all children with problem solving, cooperative learning, visual, and hands on approaches. The approaches we use to teach content are those that are recognized in the field for teaching children with learning disabilities, English-Language Learners, minorities, and women. In so doing, this enables us to use this course as a foundation for experiencing the mathematics and pedagogy that is presented in subsequent courses delivered to education majors. In the textbooks we use for this course, authors explicitly give contributions to the mathematics by other cultures, women, and minorities. These textbook features are made mandatory reading assignments and used in classroom lessons by instructors of the course..
- C. This course is designed to develop higher level quantitative skills, and as such, the content does not include substantial literary works.
- D. This course is intended for selected majors who have chosen education as their major. The focus of this course is to develop perspectives appropriate for understanding mathematics in ways that make sense to children. As such, mathematics is presented in non-standard ways, such as using blocks, counters, or visual representations to show a mathematical concept or idea. Students practice the mathematics they have already learned, but also, students are involved in activities that show the math in ways they may not have seen or approaches they may have forgotten.

### **Answers to Course Analysis Questionnaire**

- A. 1 The course is a three credit mathematics course intended for selected majors who have chosen education as their major. The focus of this course is to develop perspectives appropriate for understanding mathematics in ways that make sense to children. As such, mathematics is presented in non-standard ways, such as using blocks, counters, or visual representations to show a mathematical concept or idea. Students practice the mathematics they have already learned, but also, students are involved in activities that show the math in ways they may not have seen or approaches they may have forgotten.
- A. 2 No this course does not require a change to an existing program.
- A. 3 Yes, this course has been taught at IUP for many years.
- A. 4 This course is not a dual-level course.
- A. 5 This course is not offered for variable credit.
- A. 6 Yes, any institution preparing education majors who plan to work with elementary or middle level students will have a similar course. For example, West Chester University of Pennsylvania, MAT 102.
- B. 1 This course will only be taught by instructors from the Elementary Mathematics Education Committee.
- B. 2 The content of this course does not overlap that of any courses offered in other departments.
- B. 3 This course is not cross-listed.
- B. 4 There will be seats in this course for students in the School of Continuing Education.
- C. 1 Faculty resources are currently adequate.
- C. 2 Resources for this course are adequate.
- C. 3 None of the resources for this course are covered by a grant.
- C. 4 This course will be offered every semester.
- C. 5 There are currently 2 sections of this course offered in the fall semester and four sections offered in the spring semester.
- C. 6 The maximum enrollment will be 40 students per section. This is based on room capacity.
- C. 7 No professional society recommends enrollment limits or parameters for this course.