LSC Use Only No: LSC Action-Date:	UWUCC USE Only No. UWUCC Action-Date:	Senate Action Date:
	09-24b AP-10/20/09	App-12/1/09

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person	Email Address
John D. Baker	jdbaker@iup.edu
Proposing Department/Unit	Phone
Mathematics	724-357-3795

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

1. Course Proposals (check all that apply)

_____ New Course   _____ Course Prefix Change   _____ Course Deletion

__X__ Course Revision   __X__ Course Number and/or Title Change   __X__ Catalog Description Change

MATH 458 Logic and Logical Games for Elementary and Middle School Teachers	MATH 458 Logic and Logical Games for Elementary/Middle Level Teachers
Current Course prefix, number and full title	*Proposed course prefix, number and full title, if changing*

2. Additional Course Designations: check if appropriate

_____ This course is also proposed as a Liberal Studies Course.   _____ Other: (e.g., Women's Studies,
_____ This course is also proposed as an Honors College Course.   Pan-African)

3. Program Proposals

_____ New Degree Program   _____ Catalog Description Change   _____ Program Revision

_____ New Minor Program   _____ Program Title Change   _____ Other

     _____ New Track

Current program name	*Proposed program name, if changing*

4. Approvals

		Date
Department Curriculum Committee Chair(s)	*[signature]*	3-9-9
Department Chair(s)	*[signature]*	3-9-09
College Curriculum Committee Chair	*[signature]*	3/16/09
College Dean	John S. Eck *[signature]*	3-6-09
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)	Joseph Demaralie TECC	07-06-09
	Mary Ann Rafath	7-29-09
UWUCC Co-Chairs	Gail S Sechrist	8-23-09

* where applicable

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1. New Syllabus of Record, etc.

I. Catalog Description

MATH 458 Logic and Logical Games for Elementary/Middle Level Teachers   (3c-0l-3cr)
Prerequisite: MATH 152

Basic ideas, terminology, and notation of mathematical logic as well as games of strategy that involve logic. Engage in methods of reasoning and proof in games and in mathematics content. Explores curricular materials, resources, and activities relevant to teaching logic and reasoning at the Elementary/Middle Level.

II. Course Outcomes

Students will:
1. recognize, describe, analyze, and extend patterns of reasoning. PDE Guidelines: II.B.1, II.B.6.b, II.B.6.c, II.B.6.d, II.B.6.e
2. write and interpret truth tables. PDE Guidelines: II.B.1, II.B.6.b, II.B.6.c, II.B.6.d, II.B.6.e
3. Students will critically analyze logical or mathematical arguments for validity. PDE Guidelines: II.B.1, II.B.6.b, II.B.6.c, II.B.6.d, II.B.6.e
4. write informal or formal mathematical proofs. PDE Guidelines: II.B.1, II.B.6.b, II.B.6.c, II.B.6.d, II.B.6.e
5. recognize how logical reasoning pervades all disciplines of mathematics. PDE Guidelines: II.B.1, II.B.6.b, II.B.6.c, II.B.6.d, II.B.6.e
6. recognize multiple representations for logical arguments, including Euler diagrams. PDE Guidelines: II.B.1, II.B.6.b, II.B.6.c, II.B.6.d, II.B.6.e
7. examine research and literature related to the teaching of logic and reasoning. PDE Guidelines: I.E.5, I.E.6, I.E.10
8. engage in playing games of strategy that develop logical reasoning, and reflect on strategies and learning. PDE Guidelines: II.B.1, II.B.6.b, II.B.6.c, II.B.6.d, II.B.6.e
9. recognize how these games can be utilized in the grades 4-8 classroom. PDE Guidelines: I.E.5, I.E.6, I.E.10
10. analyze curricular content that develops concepts of logic and reasoning in grades 4-8. PDE Guidelines: I.E.5, I.E.6, I.E.10

Course Outcomes	College Conceptual Framework / Danielson	INTASC Standard/ Principle	NCATE / NCTM Middle Level Mathematics Standards	Course Assessment Measuring Outcome
#1	1	1	1, 2, 3, 4, 5, 9, 10, 11	Key Assessment: Final Exam
#2	1	1	2, 5	Projects, Quizzes, Activities Midterm &Final Exam
#3	1	1	1, 2, 3, 4, 5, 9, 10, 11	Projects, Quizzes, Activities Midterm &Final Exam
#4	1	1	1, 2, 3, 4, 5, 9, 10, 11	Projects, Quizzes, Activities Midterm &Final Exam
#5	1	1	1, 2, 4, 9, 10, 11	Projects, Quizzes, Activities Midterm &Final Exam
#6	1	1	2, 4, 5	Projects, Quizzes, Activities Midterm &Final Exam
#7	1	1	7, 8	Projects, Quizzes, Activities Midterm &Final Exam
#8	1	1	2, 4, 5, 7, 8	Projects, Quizzes, Activities Midterm &Final Exam
#9	1	1	2, 4, 5, 7, 8	Projects, Quizzes, Activities Midterm &Final Exam
#10	1	1	2, 4, 5, 7, 8	Projects, Quizzes, Activities Midterm &Final Exam

III. Detailed Course Outline

A. String Games *(Outcome #1, 3, 4, 5, 8, 9)* 4 academic hours
  1. Playing and analyzing the string games
  2. Reflective engagement in and extension of the string games
B. Other Games of Strategy/Reasoning *(Outcome #1, 3, 4, 5, 8, 9)* 9 academic hours
  1. Playing and analyzing games
  2. Reflective engagement in playing games
C. Logical connectives *(Outcome #1, 2, 3, 9)* 12 academic hours
  1. Introduction to logical connectives and truth tables
  2. Uses of truth tables
  3. Valid and invalid arguments
D. Sets *(Outcome #1, 3, 4, 5, 6, 7, 8, 9, 10)* 4 academic hours
  1. Overview of sets and set operations
  2. Euler diagrams, and relationship to logic
E. Proofs *(Outcome #1, 2, 3, 4, 5, 6)* 5 academic hours
  1. Reading and understanding formal and informal proofs
  2. Writing informal or formal proofs
F. Investigation of grades 4 to 8 curricular materials *(Outcome #7, 9, 10)* 5 academic hours

This syllabus covers 39 academic hours, leaving 3 academic hours for testing and/or review. The final is an additional 2 academic hours.

IV. Evaluation Methods

Class work / participation / daily work	30%
Written proof and peer review of a proof	10%
Presentations / projects / portfolios / games kit	30%
Midterm	15%
Final (*Key Assessments*)	15%

V. Grading Scale

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

VI. Undergraduate-Course Attendance Policy

Attendance policy will conform to university guidelines.

VII. Required Textbook

None.

VIII. Special Resource Requirements

None.

IX. Bibliography

Black, H. and Black, S. (1985). *Building Thinking Skills: Book 3, Verbal.* Pacific Grove, CA: Critical Thinking Press and Software.

Findell, C. and Greenes, C. (2000). *That's Logical!* Chicago: Creative Publications.

Harnadek, A. (1998). *Critical Thinking Book One.* Pacific Grove, CA: Critical Thinking Press and Software.

Harnadek, A. (1998). *Critical Thinking Book Two.* Pacific Grove, CA: Critical Thinking Press and Software.

Kroner, L. (1997). *In the Balance.* Chicago: Creative Publications.

Lipman, M. (1982). *Harry Stottlemeier's Discovery.* Montclair, NJ: Institute for the Advancement of Philosophy for Children.

Meyer, R., Meyer, W., and Feldberg, S. (2005). *Logic and Reasoning in the 21st Century.* Boston: Peason.

National Council of Teachers of Mathematics (1993). *Assessment Standards for School Mathematics.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (1989). *Curriculum and Evaluation Standards for School Mathematics.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (1999). *Developing Mathematical Reasoning in Grades K-12.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (2005). *Navigating through Problem Solving and Reasoning in Grade 4.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (2007). *Navigating through Problem Solving and Reasoning in Grade 5.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (2008). *Navigating through Reasoning and Proof in Grades 9 - 12.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (1991). *Professional Standards for Teaching Mathematics.* Reston, VA: NCTM.

Post, Beverly, and Eads, Sandra. (1996). *Logic, Anyone?* Torrance, CA: Fearon Teacher Aids.

Seymour, D. and Beardslee, E. (1990). *Critical Thinking Activities, Grades 7-12.* Dale Seymour Publications.

Seymour, D. and Beardslee, E. (1988). *Critical Thinking Activities, Grades 4-6.* Dale Seymour Publications.

Stylianou, D. A., Blanton, M. L., and Knuth, E. J. (Eds.) (2009). *Teaching and Learning Proof Across the Grades.* New York: Routledge.

Wheeler, E. and Brawner, J. (2005). *Discrete Mathematics for Teachers.* Boston: Houghton Mifflin Company.

2. Summary of the Revision

We propose to change the name and prerequisite for the course, and establish a current syllabus of record. The last syllabus we have on file is from 1996.

Current – MATH 458 Logic and Logical Games for Elementary and Middle School Teachers   3c-0l-3cr

Prerequisites: MATH 152, Elementary Education concentrate.

An introduction to some of the basic ideas, terminology, and notation of mathematical logic and Boolean algebra as well as games of strategy that involve logic. In addition, an investigation of how logic is taught and used in various programs for the elementary school.

Proposed – MATH 458 Logic and Logical Games for Elementary/Middle Level Teachers   3c-0l-3cr

Prerequisites: MATH 152

Basic ideas, terminology, and notation of mathematical logic as well as games of strategy that involve logic. Engage in methods of reasoning and proof in games and in mathematics content. Explore and discuss curricular materials, resources, and activities relevant to teaching logic and reasoning to elementary / middle level students.

3. Rationale for the Revision

Overview

The state of Pennsylvania has mandated changes to teacher training programs to support its new teacher licensing scheme. The current program for elementary grades K-6 is being replaced by new requirements for two training programs in: (1) Grades pre-K to 4 and (2) Grades 4-8.

These mandates from the state require revisions to existing courses and the addition of new courses. For Grades pre-K to 4, the new IUP teacher training program includes two courses in methods of teaching. The two new methods courses are revisions of existing methods courses for early childhood and elementary education.

For Grades 4 to 8, the new IUP teacher training program must provide coursework for prospective teachers to teach all subjects, but with a specialty in one subject area. The new program has four subject area tracks with mathematics being one track. The Mathematics Department, which supports the current K-6 program through a math concentrate for elementary education majors, will have a greater role in the math-track program.

The new math-track program will consist of nine mathematics content and one methods of teaching courses. The existing math concentrate courses (of which MATH 458 is one) need approval for revisions to fit the requirements of the new math-track program. Three new courses also need approval. The three other tracks will include three math content courses and one methods of teaching course drawn from the Mathematics Department's math-track courses.

1.   Catalog Name Change

        Rationale: This change makes the name of the course consistent with the course name designations in new state guidelines.

2.   Prerequisite Change

        Rationale: The reference to a concentrate was eliminated. Under the new state mandates for teacher preparation programs, the concentrate for elementary education majors will no longer exist.

3.   Catalog Description Change

        Rationale: The current catalog description does not reflect how the course is currently taught. The change is consistent with the content prescribed in new state guidelines.

4.   Course Revision - Syllabus of Record

        Rationale: The last syllabus in our files is from 1996 and this revision is consistent with the content prescribed in the new state guidelines.

4. Old Syllabus of Record
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Mathematics Department
Indiana University of Pennsylvania
Indiana, PA 15705

Course Number: MA 458 or EM 558

Course Title: Introduction to Logic and Logical Games

Credits: 3 semester hours

Prerequisites: MA 152, Elementary Education concentration or Graduate Students enrolled in MEd. Program for Elementary and Middle School Teachers

Textbook:

Revised: 1/96

Catalog Description:
   Introduction to some of the basic ideas, terminology, and notation of mathematical logic and Boolean algebra as well as games of strategy that involve logic. In addition, an investigation of how logic is taught and used in various programs for the elementary school.

Course Outline/Time Schedule:

I.   Spirit of the Course
   Many changes have taken place in the teaching of mathematics over the past several years. In your teaching currently or in the future, you are expected to focus on problem solving, to teach for the understanding of concepts, to know how to use technology appropriately, to encourage discussion and group work, and to implement other significant changes. This course will attempt to reflect some of those changes. Keep in mind that the course is a mathematical content course, though we will also examine curriculum and pedagogy. Not all of the mathematical content your study will be directly appropriate for students you currently teach or students you will teach in the future. Some of the mathematical content presented will be challenging to you.

II.   Special Projects
   There will be two or three short projects (3 to 6 pages each) during the semester. The projects will be based on supplementary materials, and may involve the creation of teaching, or a deeper study of logic concepts presented in class. There will be flexibility for choosing your own topics. Generally, the projects must go beyond being a report of what goes on in class.

III. Presentations
   Each student will give one short presentation to the class on one of the special projects.

RESOURCES
1. Harry Stottlemeier's Discovery, Matthew Lipman, Institute for the Advancement of Philosophy for Children (IAPC).
2. Elfie Books 1,2,&3 (IAPC).
3. Other materials from the Institute for the Advancement of Philosophy for children.

4. Research articles (Journal for Research in Mathematics Education, and others) on the learning of logic.

5. Readings in psychology about children's development of logical thinking.

6. _Aha! Gotcha_, Martin Gardner; paradoxes and puzzles

7. _Aha! Insight_, Martin Gardner; paradoxes and puzzles

8. Critical Thinking Press and Software Materials Including:

    a. _Critical Thinking_ Book One

    b. _Critical Thinking_ Book Two

    c. _Building Thinking Skills_ Book 3 Figural

9. _Elements of Mathematics_ Book 1 Introductory Logic, Comprehensive School Mathematics Program (CSMP)

10. _Relearning Mathematics: A Different Third R -- Radical Maths_, Vol. 1, Marilyn Frankenstein, Free Association Books, London, 1989. (Critical Thinking)

11. Mathematical Games in other Cultures
    a. Marina Krause

    b. Claudia Zaslavsky

    c. _Africa Counts_

12. Reasoning Games and Puzzles such as "Mastermind," "Sets," "Nim," and "Tower of Hanoi."