Eastern Illinois University
REVISED COURSE PROPOSAL

Please check one: ☐ New course   ☒ Revised course

PART I: CATALOG DESCRIPTION

1. **Course prefix and number, such as ART 1000:** MAT 4920

2. **Title (may not exceed 30 characters, including spaces):** Algebra Elem/Mid Teachers

3. **Long title, if any (may not exceed 100 characters, including spaces):** Concepts of Algebra for Elementary and Middle Level Teachers

4. **Class hours per week, lab hours per week, and credit [e.g., (3-0-3)]:** 3-0-3

5. **Term(s) to be offered:** ☒ Fall   ☒ Spring   ☐ Summer   ☐ On demand

6. **Initial term of offering:** ☒ Fall   ☐ Spring   ☐ Summer   **Year:** 2009

7. **Course description (not to exceed four lines):** The investigation of the conceptual foundation of algebra relevant to elementary and middle level teaching. Algebraic reasoning, generalization of mathematical patterns, models for real world phenomena, representations of algebraic ideas, and algebraic tools for mathematical problem solving.

8. **Registration restrictions:**

    a. **Identify any equivalent courses** (e.g., cross-listed course, non-honors version of an honors course). None
    b. **Prerequisite(s),** including required test scores, courses, grades in courses, and technical skills. Indicate whether any prerequisite course(s) MAY be taken concurrently with the proposed/revised course.
         MAT 1420 and MAT 2420, both with a grade of C or better.
    c. **Who can waive the prerequisite(s)?**

         ☐ No one   ☐ Chair   ☐ Instructor   ☒ Advisor   ☐ Other (Please specify)

    d. **Co-requisites** (course(s) which MUST be taken concurrently with this one):

    e. **Repeat status:**   ☒ Course may not be repeated.

                 ☐ Course may be repeated to a maximum of   hours or   times.

    f. **Degree, college, major(s), level, or class** to which registration in the course is restricted, if any: None
    g. **Degree, college, major(s), level, or class** to be excluded from the course, if any: None

9. **Special course attributes** [cultural diversity, general education (indicate component), honors, remedial, writing centered or writing intensive]

10. **Grading methods** (check all that apply): ☒ Standard letter ☐ C/NC ☐ Audit   ☐ ABC/NC ("Standard letter"—i.e., ABCDF--is assumed to be the default grading method unless the course description indicates otherwise.)

11. Instructional delivery method: ☒ lecture ☐ lab ☐ lecture/lab combined ☐ independent study/research ☐ internship ☐ performance ☐ practicum or clinical ☐ study abroad ☐ other

PART II: ASSURANCE OF STUDENT LEARNING

1. **List the student learning objectives of this course:**
   - Compare, contrast, and classify functional relationships.
   - Represent algebraic relationships in multiple ways.
   - Investigate connections among representations of algebraic relationships.
   - Demonstrate appropriate connections of algebraic ideas to elementary/middle level mathematics content.
   - Identify a variety of uses of variables.
   - Demonstrate proficiency using symbols to generalize a pattern.
   - Formulate and justify algebraic generalizations symbolically and verbally.
   - Use algebraic generalizations to solve problems.

   a. **If this is a general education course, indicate which objectives are designed to help students achieve one or more of the following goals of general education and university-wide assessment:**
      - **EIU graduates will write and speak effectively.**
      - **EIU graduates will think critically.**
      - **EIU graduates will function as responsible citizens.**

   b. **If this is a graduate-level course, indicate which objectives are designed to help students achieve established goals for learning at the graduate level:**
      - **Depth of content knowledge**
      - **Effective critical thinking and problem solving**
      - **Effective oral and written communication**
      - **Advanced scholarship through research or creative activity**

2. **Identify the assignments/activities the instructor will use to determine how well students attained the learning objectives:**

	Explorations & Discussions	Homework	Quizzes & Tests	Pedagogical Explorations	Final Exam
Compare, contrast, and classify functional relationships.	X	X	X		X
Represent algebraic relationships in multiple ways.	X	X	X		X
Investigate connections among representations of algebraic relationships.	X	X	X	X	X

Demonstrate appropriate connections of algebraic ideas to elementary/middle level mathematics content.			X	X	X
Identify a variety of uses of variables.	X	X	X	X	X
Demonstrate proficiency using symbols to generalize a pattern.	X	X	X	X	X
Formulate and justify algebraic generalizations symbolically and verbally.	X	X	X		X
Use algebraic generalizations to solve problems.	X	X	X		X

3. **Explain how the instructor will determine students' grades for the course:**

Explorations & Discussions	15%
Homework	20%
Quizzes & Tests	25%
Pedagogical Explorations	15%
Final Exam	25%

4. **For technology-delivered and other nontraditional-delivered courses/sections, address the following:** N/A
    a. **Describe how the format/technology will be used to support and assess students' achievement of the specified learning objectives:**
    b. **Describe how the integrity of student work will be assured:**
    c. **Describe provisions for and requirements of instructor-student and student-student interaction, including the kinds of technologies that will be used to support the interaction (e.g., e-mail, web-based discussions, computer conferences, etc.):**

5. **For courses numbered 4750-4999, specify additional or more stringent requirements for students enrolling for graduate credit. These include:**
    a. **course objectives;**
        • Research and summarize a topic in algebra as it relates to elementary/middle school mathematics curriculum.

    b. **projects that require application and analysis of the course content; and**

Graduate students will be required to complete a research project that expands on one of the course objectives.

   c. **separate methods of evaluation for undergraduate and graduate students.**

Explorations & Discussions	5%
Homework	15%
Quizzes & Tests	25%
Pedagogical Explorations	15%
Final Exam	25%
Research Project	15%

6. If applicable, indicate whether this course is writing-active, writing-intensive, or writing-centered, and describe how the course satisfies the criteria for the type of writing course identified. (See Appendix *.) N/A

PART III: OUTLINE OF THE COURSE

Provide a week-by-week outline of the course's content. Specify units of time (e.g., for a 3-0-3 course, 45 fifty-minute class periods over 15 weeks) for each major topic in the outline. Provide clear and sufficient details about content and procedures so that possible questions of overlap with other courses can be addressed. For technology-delivered or other nontraditional-delivered courses/sections, explain how the course content "units" are sufficiently equivalent to the traditional on-campus semester hour units of time described above.

Week 1
Learning Algebra Through Problem Solving
Use and meaning of variables

Week 2
Meaningful use of algebraic symbolism
Relational Thinking
Solving Equations

Week 3
Repeating Patterns
Division Algorithm for Whole Numbers

Week 4
Growing Patterns
Recursive and explicit (functional) reasoning

Week 5
Sequences (e.g., arithmetic, geometric, Fibonacci)

Week 6
Representing Functional Relationships: Graphically, Verbally, Numerically, Symbolically

Week 7
Linear Functions

Week 8
Analyzing Change & Rates of Change

Week 9
Quadratic Functions

Week 10
Exponential Functions

Week 11
Modeling Phenomena with Functions
Data Collection and Functions of "best-fit"

Week 12
Generalizing numbers & operations
Developing Justifications for Number Relationships

Week 13
Focus on Operations and Properties
Algebraic Proof & Reasoning

Week 14
Working with Groups (e.g., symmetry of a triangle, symmetry of a square)

Week 15
Examining Students' Explanations, Reasoning, & Proof

PART IV: PURPOSE AND NEED

1. **Explain the department's rationale for developing and proposing the course.**
   MAT.4920 currently exists with Algebra and Geometry content. Instructors of the course report difficulties in adequately addressing material from both areas, algebra and geometry, in a single course. The proposed course will focus solely on algebra and strengthen future elementary and middle school teachers' understanding of algebra as it relates to Grades K-8. Elementary and middle school teachers must have a strong background in appropriate algebra concepts if they are to prepare their future students for success in high school algebra courses. This course is consistent with recommendations of the National Council of Teachers of Mathematics (2000), the Conference Board of the Mathematical Sciences (2001), and the National Mathematics Advisory Panel (2008) for the mathematical preparation of pre-service elementary and middle level teachers. Geometry will continue to be offered annually in an existing topics course (MAT 4810) for students seeking a concentration or endorsement for elementary/middle level teaching.

   a. **If this is a general education course, you also must indicate the segment of the general education program into which it will be placed, and describe how the course meets the requirements of that segment.**
   b. **If the course or some sections of the course may be technology delivered, explain why.**

2. **Justify the level of the course and any course prerequisites, co-requisites, or registration restrictions.**

   This course is subsequent to the introductory MAT 1420 and MAT 2420 sequence. It builds on ideas and concepts introduced in those courses. The course level is best suited to those students because of the maturity in mathematical reasoning needed to deal with algebraic concepts in this course. The completion or participation in practicum experiences will provide a basis for relating algebraic concepts to teaching practice.

3. **If the course is similar to an existing course or courses, justify its development and offering.**

   No other courses at EIU are similar to this course. The scope, content, intent, and audience for the course are different from MAT 1270, MAT 1271, and MAT 3530. MAT 1271 is a more traditional algebra course that serves the general population. MAT 3530 is a course for mathematics majors and future secondary teachers. MAT 4920 is focused on conceptual understanding and issues related to promoting algebraic reasoning for teaching at the elementary and middle levels.

   a. **If the contents substantially duplicate those of an existing course, the new proposal should be discussed with the appropriate chairpersons, deans, or curriculum committees and their responses noted in the proposal.** N/A

   b. **Cite course(s) to be deleted if the new course is approved. If no deletions are planned, note the exceptional need to be met or the curricular gap to be filled.**
      This course is a revision to the previous MAT 4920 course.

4. **Impact on Program(s):**

   a. **For undergraduate programs, specify whether this course will be required for a major or minor or used as an approved elective.**
      This course will be strongly recommended for all Elementary Education majors with a mathematics concentration and required for all students seeking a middle level mathematics endorsement.

   b. **For graduate programs, specify whether this course will be a core requirement for all candidates in a degree or certificate program or an approved elective.**

   If the proposed course changes a major, minor, or certificate program in or outside of the department, you must submit a separate proposal requesting that change along with the course proposal. Provide a copy of the existing program in the current catalog with the requested changes noted.

PART V: IMPLEMENTATION

1. **Faculty member(s) to whom the course may be assigned:** Initial assignment of the course will be to any qualified mathematics education faculty in the Department of Mathematics and Computer Science (e.g., Anderson, Bishop, White, Wiles).

   If this is a graduate course and the department does not currently offer a graduate program, it must document that it employs faculty qualified to teach graduate courses.

2. **Additional costs to students:** NONE

Include those for supplemental packets, hardware/software, or any other additional instructional, technical, or technological requirements. (Course fees must be approved by the President's Council.)

3. **Text and supplementary materials to be used (Include publication dates):**

Algebra for Elementary & Middle School Teachers: An Inquiry Approach. S. Stump, K. Roebuck, & J. Bishop. New York: Pearson, 2008.

Algebra & the Elementary Classroom: Transforming Thinking, Transforming Practice. M. L. Blanton. Portsmouth, NH: Heinemann, 2008.

Fostering Algebraic Thinking: A Guide for Teachers Grades 6 – 10. M. Driscoll. Portsmouth, NH: Heinemann, 1999.

Readings from *Teaching Children Mathematics* and *Mathematics Teaching in the Middle School*.

PART VI: COMMUNITY COLLEGE TRANSFER

A community college course will not be accepted as a substitute for this course.

PART VII: APPROVALS

Date approved by the department or school: March 2, 2009

Date approved by the college curriculum committee:

Date approved by the Honors Council *(if this is an honors course):*

Date approved by CAA: CGS: