NORTH CAROLINA STATE UNIVERSITY
GRADUATE COURSE ACTION FORM

NOTE: Click once on shaded fields to type data. To check boxes, right click at box, click "Properties", and click "Checked" under Default Values.

DEPARTMENT/PROGRAM
Elementary Education

COURSE PREFIX/NUMBER
ELM 558

PREVIOUS PREFIX/NUMBER

COURSE TITLE
Algebraic Reasoning: K-5 Discourse & Questioning

ABBREVIATED TITLE
ALGEBRAIC REASONING: K-5 DISCOURSE AND QUESTIONING

SCHEDULING
Fall ☐ Spring ☒ Summer ☒
Every Year ☐ Alt. Year Odd ☐ Alt. Year Even ☐ Other ☐

COURSE OFFERED
By DISTANCE EDUCATION ONLY ☐ ON CAMPUS ONLY ☐ BOTH ON CAMPUS AND BY DISTANCE EDUCATION ☒

CREDIT HOURS
3

GRADING
ABCDF ☒ S/U ☐

CONTACT HOURS:
Lecture/Seminar ☐ Laboratory/Studio ☒ Research/Independent Study ☐

REPEAT FOR CREDIT:
YES ☐ NO ☒

INSTRUCTOR NAME:
Valerie Faulkner

TITLE:
Teaching Assistant Professor

GRADUATE FACULTY STATUS:
Associate ☒ Full ☐

ANTICIPATED ENROLLMENT
On Campus: Per semester 25 Multiple sections Yes ☐ No ☒ Max. per Section 25
Distance Ed: Anticipated Enrollment 25 Maximum Enrollment 25

PREREQUISITE(S)
None

COREQUISITE(S)
None

PRE/COREQUISITE FOR

REQUIRED
Certificate for Elementary Mathematics Education

PROPOSED EFFECTIVE DATE
Summer 2012

APPROVED EFFECTIVE DATE

CATALOG DESCRIPTION IN CONCISE FORM MEANINGFUL TO STUDENT (INCLUDE RESTRICTIVE STATEMENT AT END OF DESCRIPTION; LIMIT TO TOTAL OF 80 WORDS): Focus on the early algebra concepts of functional thinking and generalized arithmetic in relationship to pedagogical practices centered on questioning in the mathematics classroom.

VERIFICATION/REQUEST BY:
The course syllabus has been developed and is in conformance with the requirements of the Provost's website.

Instructor or Preparer

Date

Department Head/Director of Graduate Programs

Date

ENDORSED BY:

Chair, College Graduate Studies Committee

Date

College Dean(s)

APPROVED:

Date

Dean of the Graduate School

Date
INSTRUCTIONS

Provide the following information. If additional table rows are needed place cursor at location, select Table, Insert, Rows Above or Rows Below. Please limit your submission to 4 pages using 10-point font.

I. Course Justification (Explain the need for the course and its place in the curriculum in terms of the educational needs and interests of the students for whom the course is intended):

This course is part of the 18-hour North Carolina K-5 Mathematics Add-on License. The course focuses on the analysis and construction of effective mathematical tasks in teaching number systems and operations at the K-5 level; attention is also given to the expansion of content knowledge. Course is based on Standards from the North Carolina Board of Professional Teaching Advanced Standards (NCPTSA) and the Mathematics Specialist Standards from the Association of Mathematics Teacher Educators (AMTE).

The Elementary Mathematics Add-on License is a coordinated effort between the North Carolina Department of Public Instruction (NCDPI), the University of North Carolina General Administration (UNCGA), statewide LEA representation at the school and district levels, and university faculty representation from colleges of education and arts and sciences. On July 9, 2009, the North Carolina State Board of Education approved a program of study for a new Elementary Mathematics Add-on License. The required program of study included six graduate-level courses totaling 18 hours focused on the mathematical knowledge needed for successfully teaching mathematics at the elementary level. The six courses were designed under the guidance of the UNC-GA, who was charged with the establishment of a system-wide program of study to support this K-6 Mathematics Add-on License. A consortium of seven UNC universities worked on the design and pilot of the program of study and these courses, as designed, were approved by the Department of Public Instruction as constituting the requirements for the add-on mathematics licensure.

II. Proposed Revisions with Justification (Briefly list the changes and the justification for each):

<table>
<thead>
<tr>
<th>Revision</th>
<th>Justification</th>
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<tbody>
<tr>
<td>None; this is a new course</td>
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III. Enrollment for Last Five Years (Enter data – look up at R&R website for either existing course number or special topics number as applicable. If not offered, indicate n/a. If previously offered as special topic, indicate designation after number enrolled [e.g. 17 - XX 592B]):

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
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<tbody>
<tr>
<td>None; this is a new course</td>
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IV. Consultation with Other Departments (Consultation is needed whenever there is a possibility of content duplication or when establishment or dropping would affect other programs. List all departments and individuals contacted, and a summary of any statements of objection, non-objection, or support. Consultation should include Program Director or Department Head. A copy of the entire document/communication should also be sent to the Graduate School as a separate document.)

<table>
<thead>
<tr>
<th>Department</th>
<th>Contact Name</th>
<th>Statement</th>
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</thead>
<tbody>
<tr>
<td>Science Technology Engineering Mathematics Education</td>
<td>Dr. Patricia Simmons</td>
<td>&quot;Our faculty were sent the information about the new Elementary Mathematics Certificate two weeks ago. There were no objections or concerns expressed about the Dept of Elementary Education offering the courses listed below for the EM Certificate.&quot;</td>
</tr>
<tr>
<td>Department of Mathematics</td>
<td>Dr. Loek Helminck</td>
<td>&quot;We have no conflict with elementary education offering these courses.&quot;</td>
</tr>
</tbody>
</table>

V. Student Learning Outcomes. By the end of the course, the students will be able to:
1. Implement a variety of developmentally appropriate instructional strategies to assist elementary children in constructing algebraic ideas (AMTE 2; NCPTS 4)

2. Demonstrate content knowledge in K-8 algebraic thinking based upon national standards (i.e. NCSCS – North Carolina Standard Course of Study, NCTM – National Council of Teachers of Mathematics) (AMTE 1a; NCPTS 3)

3. Demonstrate an understanding of patterns, relations, and functions from a variety of perspectives (AMTE 1a; NCPTS 3)

4. Represent mathematical situations and structures using algebraic symbols (AMTE 1a; NCPTS 3)

5. Prove mathematical conjectures (AMTE 1a; NCPTS 3)

6. Use mathematical models to represent quantitative relationships (AMTE 1a; NCPTS 3)

7. Facilitate discourse to elicit algebraic reasoning in elementary classrooms (AMTE 1b; NCPTS 2)

8. Demonstrate an understanding of the assessment of algebraic reasoning in elementary classrooms through questioning and listening to students, analyzing students’ written work, documenting patterns of students’ thinking and planning appropriate student/teacher interactions (AMTE 1b; NCPTS 2)

9. Develop a plan to support teachers’ use of higher-order questions (AMTE 3; NCPTS 1)

VI. Student Evaluation Methods (List types of evaluation [tests, exam, papers, homework, etc.] and % weighting normally anticipated):

<table>
<thead>
<tr>
<th>Evaluation Method</th>
<th>Weighting for Graduate Course (%)</th>
<th>Weighting for Undergraduate Version – if Dual Level (%)</th>
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</thead>
<tbody>
<tr>
<td>Weekly Homework Assignments</td>
<td>15%</td>
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<tr>
<td>Class Participation/Attendance</td>
<td>10%</td>
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<td>Midcourse Exam</td>
<td>20%</td>
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<td>Questioning &amp; Discourse Assessment</td>
<td>25%</td>
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<tr>
<td>Final Assessment (content exam/ course portfolio)</td>
<td>30%</td>
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VII. Explanation of Differences for Dual-Level Course (Explain differences in content, expectations, and outcomes for graduate level version of dual-level course and indicate evaluation above):

None

VIII. Resource Statement (New courses only. Indicate the resource requirements of this course and the source(s) of those resources.)

No new resources needed. The department hired two new mathematics educators, one tenure track (Walkowiak) and one non-tenure-track (Faulkner) in 2010. The senior faculty member (Sztajn) and the new faculty members will staff the courses.

IX. Topical Outline of Course and Time Devoted to Each Topic (Definition should be adequate to allow understanding of the course content. Indicate time measure used, e.g. weeks, 50 min. lectures, 75 min. lectures, etc.):

Week 1 – Building a discussion based mathematics community
Week 2 – Algebra as generalized arithmetic/encouraging students to make and test mathematical conjectures
Week 3 – Generalizations and arithmetic properties including number systems
Week 4 – Making a known quantity unknown/varying a known quantity
Week 5 – The equal sign/finding missing numbers
Week 6 – Thinking algebraically with the hundred chart
Week 7 – Patterns from K through 6th Grade- What is developmentally appropriate?
Week 8 – Algebra as functional thinking through discourse and questioning
Week 9 – Developing representational tools
Week 10 – Keeping the independent variable explicit
Week 11 – Transitioning from recursive patterns to functional relationships
Week 12 – Moving from words to symbols/ Transforming arithmetic tasks into opportunities for algebraic thinking
Week 13 – Graphing Algebraic Relationships
Week 14 – Graphing Algebraic Relationships
Week 15- Final Project