LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No.	UWUCC Action-Date:	Senate Action Date:
		09-27/9	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)

__X__ 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	*Proposed* course prefix, number and full title, if changing
	MATH 461 Discrete Mathematics for Elementary / Middle Level Teachers

2. Additional Course Designations: check if appropriate

_____ This course is also proposed as a Liberal Studies Course.

_____ This course is also proposed as an Honors College Course.

_____ Other: (e.g., Women's Studies, Pan-African)

3. Program Proposals

_____ Catalog Description Change _____ Program Revision

_____ New Degree Program _____ Program Title Change _____ Other

_____ New Minor Program _____ New Track

Current program name	*Proposed* program name, if changing

4. Approvals		**Date**
Department Curriculum Committee Chair(s)		3-26-9
Department Chair(s)		3-27-09
College Curriculum Committee Chair		04/03/09
College Dean		4/7/09
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate:	Joseph Demarrais (TECC)	9-2-09
(include title)	Mary Ann Rafoth (TECC)	9-1-09
UWUCC Co-Chairs		10-23-09

* where applicable

Received
OCT 23 2009
Liberal Studies

Received
SEP 01 2009
Liberal Studies

Part II. Description of Curricular Change

1. Syllabus of Record

I. Catalog Description

MATH 461 Discrete Mathematics for Elementary/Middle Level Teachers (3c-01-3cr)
Prerequisite: MATH 152

Topics in discrete mathematics, including systematic counting, graph coloring, networks, and their applications, as well as the historical background and the role of discrete mathematics in today's world. Uses a problem-solving, hands-on approach to content. Explores curricular materials, resources, and activities relevant to teaching discrete mathematics at the Elementary/Middle Level.

II. Course Outcomes

Students will:

1. develop skills and content related to discrete mathematics. PDE Guidelines: II.B.1, II.B.5.c, II.B.6
2. develop awareness of the historical development of these topics. PDE Guidelines: II.B.6.b, II.B.6.e
3. summarize literature and curricular content related to the teaching of discrete mathematics topics in grades 4-8. PDE Guidelines: II.B.1, II.B.5.c, II.B.6
4. formulate theorems in discrete mathematics using a problem solving approach and verify theorems, utilizing technology where it is appropriate. PDE Guidelines: II.B.1, II.B.5.c, II.B.6
5. communicate ideas about topics studied in written and oral formats. PDE Guidelines: II.B.1, II.B.5.c, II.B.6
6. construct practical applications of the discrete mathematics topics. PDE Guidelines: II.B.1, II.B.5.c, II.B.6

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, 13	**Key Assessment: Final Exam**
#2	1	1	4, 7, 13	Projects, Quizzes, and Midterm &Final Exam
#3	1	1	1, 2, 3, 4, 5, 6, 7, 8, 13	Projects, Quizzes, and Midterm &Final Exam
#4	1	1	1, 2, 6, 7, 13	Projects, Quizzes, Activities Midterm &Final Exam
#5	1	1	1, 2, 3, 4, 5, 13	Projects, Quizzes, and In-Class Activities
#6	1	1	4, 7, 13	Projects, Quizzes, and In-Class Activities

III. Course Outline

A. Why Discrete Mathematics in the Schools? *(Outcomes #2, #6)* 1 academic hour
   1. Historical development
   2. Role of discrete mathematics in the schools and in today's world

B. Coloring Mathematically *(Outcomes #1, #4, #5)* 6 academic hours
   1. Coloring Pictures and Maps
   2. An Introduction to Vertex-Edge Graphs
   3. Cycles, Wheels, Paths, and Complete Graphs
   4. Strategies for Coloring Graphs

C. Exploring Graphs *(Outcomes #1, #4, #5)* 6 academic hours
   1. Grab-bag Graphs and other regular Graphs
   2. Irregular Graphs
   3. Trees, Bipartite Graphs, Planar Graphs

D. Applications of Graphs *(Outcomes #1, #4, #5, #6)* 6 academic hours
   1. Cheapest Network, Best Circuit, Shortest Path
   2. Euler Paths and Circuits
   3. Utilizing technology in solution methods to graphs.

E. Applications of Coloring *(Outcomes #1, #4, #5, #6)* 6 academic hours
   1. Conflict Resolution: Scheduling
   2. Edge Coloring
   3. Directed Graphs

F. Number Patterns *(Outcomes #1, #4, #5)* 3 academic hours
   1. The handshake problem, and other special patterns
   2. Recursive Number Patterns

G. Systematic Listing and Counting *(Outcomes #1, #4, #5)* 6 academic hours
   1. Systematic Listing and Counting
   2. Permutations and Combinations
   3. Pascal's Triangle

H. Investigation of Curricular Materials, and State and National Standards *(Outcomes #2, #3)* 5 academic hours
   1. Grades 3 to 5
   2. Grades 6 to 8

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 / assignments	30%
Presentations / projects / portfolios	30%
Midterm	20%
Final (***Key Assessments***)	20%

The Final is the Key Assessment and shall be required of all instructors.

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 Textbooks

DeBellis, V. A. and Rosenstein, J. G. (2005). *Making Math Engaging: Discrete Mathematics for K-8 Teachers*. Draft, supported by NSF-DUE #0443317.

DeBellis, V. A. and Rosenstein, J. G. (2005). *Making Math Engaging: Discrete Mathematics for K-8 Teachers Activity Book.* Draft, supported by NSF-DUE #0443317.

DeBellis, V. A. and Rosenstein, J. G. (2005). *Making Math Engaging: Discrete Mathematics for K-8 Teachers Classroom Guide.* Draft, supported by NSF-DUE #0443317.

VIII. Special Resource Requirements

None.

IX. Bibliography

Chavey, D. (1989). *Drawing Pictures With One Line.* Arlington, MA: COMAP, Inc.

Cozzens, M. and Porter, R. (1989). *Problem Solving Using Graphs.* Arlington, MA: COMAP, Inc.

Francis, R. (1989). *The Mathematician's Coloring Book.* Arlington, MA: COMAP, Inc.

Jacobs, H. R. (1994). *Mathematics: A Human Endeavor.* New York: W. H. Freeman.

Kohl, H. (1995). *Insides, Outsides, Loops and Lines.* New York: W. H. Freeman.

Marcus, D. (2008). *Graph Theory: A Problem Oriented Approach.* Washington, DC: Mathematical Association of America.

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 (1991). *Discrete Mathematics Across the Curriculum.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (2008). *Navigating through Discrete Mathematics in Grades 6-12.* 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.

Rosenstein, J. G.; Franzblau, D. S.; & Roberts, F. S.; Eds (1998). *Discrete Mathematics in the Schools.* Reston, VA: American Mathematical Society and National Council of Teachers of Mathematics.

Sobel, M. and Maletsky, E. (1998). *Teaching Mathematics: A Sourcebook of Aids, Activities, and Strategies.* Englewood Cliffs, NJ: Prentice-Hall

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

2. Course Analysis Questionnaire

Section A: Details of the Course

A1 How does this course fit into the programs of the department? For what students is the course designed? (majors, students in other majors, liberal studies). Explain why this content cannot be incorporated into an existing course.

This course is one of the Professional Core courses for the Middle Level Grade 4-8 certification program. All students in this course should be seeking certification as a middle level teacher. This course includes substantial coverage of graph theory, which does not fit in with the topics of other courses in this program.

A2 Does this course require changes in the content of existing courses or requirements for a program? If catalog descriptions of other courses or department programs must be changed as a result of the adoption of this course, please submit as separate proposals all other changes in courses and/or program requirements.

This is a newly-developed course to satisfy the PDE requirements for middle level teachers.

A3 Has this course ever been offered at IUP on a trial basis (e.g. as a special topic) If so, explain the details of the offering (semester/year and number of students).

This course was offered as a dual level special topics class, MATH 481 (undergraduate level) / ELMA 581 (graduate level) during the Fall 2007 semester (17 undergraduate students / 5 graduate students), and during the Spring 2009 semester (10 undergraduate students / 6 graduate students).

A4 Is this course to be a dual-level course? If so, please note that the graduate approval occurs after the undergraduate.

Not at this time.

A5 If this course may be taken for variable credit, what criteria will be used to relate the credits to the learning experience of each student? Who will make this determination and by what procedures?

This is a three-credit course that cannot be taken for variable credit.

A6 Do other higher education institutions currently offer this course? If so, please list examples (institution, course title).

Other higher education institutions may be offering in the future a similar math content course to meet the PDE requirements for teacher certification.

A7 Is the content, or are the skills, of the proposed course recommended or required by a professional society, accrediting authority, law or other external agency? If so, please provide documentation.

The Pennsylvania Department of Education is changing the requirements for certification. This course would prepare teachers to assist learners in grades 4-8 with math skills.

Section B: Interdisciplinary Implications

B1 Will this course be taught by instructors from more than one department? If so, explain the teaching plan, its rationale, and how the team will adhere to the syllabus of record.

This course will be delivered by instructors from the Mathematics Department.

B2 What is the relationship between the content of this course and the content of courses offered by other departments? Summarize your discussions (with other departments) concerning the proposed changes and indicate how any conflicts have been resolved. Please attach relevant memoranda from these departments that clarify their attitudes toward the proposed change(s).

This course does not conflict with any other math methods or content course offered by any other department.

B3 Will this course be cross-listed with other departments? If so, please summarize the department representatives' discussions concerning the course and indicate how consistency will be maintained across departments.

This course will not be cross-listed with any other department. The course will only be taken by undergraduate students pursuing a teaching certification in Middle Level Grades 4-8.

Section C: Implementation

C1 Are faculty resources adequate? If you are not requesting or have not been authorized to hire additional faculty, demonstrate how this course will fit into the schedule(s) of current faculty. What will be taught less frequently or in fewer sections to make this possible? Please specify how preparation and equated workload will be assigned for this course.

Faculty resources to teach this course are adequate.

Currently the Mathematics Department offers six Elementary Education "Mathematics Concentrate" courses per year (three per semester). Under the proposed Middle School Mathematics Certification program, students are required to take six of these concentrate courses, along with two new courses, MATH 153 and MATH 413, during their last five semesters of study (not including the student teaching semester). By offering four concentrate courses per year (including this new course, MATH 461), along with MATH 153 and MATH 413 once per year, Middle School Certification students can meet their requirements, and so can our current M.Ed. in Elementary and Middle School students. This rotation plan should also ensure adequate enrollment in the concentrate courses. It is anticipated that there would be no more than 60 Middle School Mathematics Certification students at IUP at any given time, although if this number should increase significantly, additional resources would be required. This plan to substitute six concentrate courses per year with four concentrate courses plus the two new courses keeps the resources needed the same as we use now.

C2 What other resources will be needed to teach this course and how adequate are the current resources? If not adequate, what plans exist for achieving adequacy? Reply in terms of the following:

*Space
*Equipment
*Laboratory Supplies and other Consumable Goods
*Library Materials
*Travel Funds

No other resources would be needed to teach this course.

C3 Are any of the resources for this course funded by a grant? If so, what provisions have been made to continue support for this course once the grant has expired? (Attach letters of support from Dean, Provost, etc.)

There are no grant resources allocated for this course.

C4 How frequently do you expect this course to be offered? Is this course particularly designed for or restricted to certain seasonal semesters?

This course will be offered in rotation with other MATH content courses for Middle School Mathematics Education.

C5 How many sections of this course do you anticipate offering in any single semester?

One section of the course will be offered in any one semester that the course is offered.

C6 How many students do you plan to accommodate in a section of this course? What is the justification for this planned number of students?

It is anticipated that there would be 10-20 undergraduate students and an additional 5-10 graduate students in one section of the course. For hands-on activities and other interactive learning, 20 to 30 students is ideal.

C7 Does any professional society recommend enrollment limits or parameters for a course of this nature? If they do, please quote from the appropriate documents.

There is no professional society that limits the enrollment of this course.

C8 If this course is a distance education course, see the Implementation of Distance Education Agreement and the Undergraduate Distance Education Review Form in Appendix D and respond to the questions listed.

This course is not a distance-education course.

Section D: Miscellaneous

Part III. Letters of Support or Acknowledgement

None Needed.