| LSC Use Only No: | LSC Action-Date: | UWUCC USE Only No. | UWUCC Action-Date: | Senate Action Date: |
|---|---|---|---|---|
| | | 09-24K | AP- 12/8/09 | App-4/20/10 |

## 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 | _____Course Number and/or Title Change | __X__Catalog Description Change |

MATH 151 Elements of Mathematics I

| *Current Course prefix, number and full title* | *Proposed course prefix, number and full title, if changing* |
|---|---|

**2. Additional Course Designations: check if appropriate**

__X__ 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

| | | Date |
|---|---|---|
| Department Curriculum Committee Chair(s) | *(signature)* | 3.26.9 |
| Department Chair(s) | *Gary Stoudt* | 3-27-09 |
| College Curriculum Committee Chair | *(signature)* | 04/05/09 |
| College Dean | *John B. Eck* | 6/8/11 |
| Director of Liberal Studies * | *(signature)* | |
| Director of Honors College * | | |
| Provost * | | |
| Additional signatures as appropriate: | *Joseph Domaracki* TECC | 4/28/09 |
| (include title) | *Mary Ann Rafoth* TECC | 4/28/09 |
| UWUCC Co-Chairs | *Gail Sechrist* | 1/22/10 |

* where applicable

Page 1

**Part II. Description of Curriculum Change**

**1. New Syllabus of Record**

## I. CATALOG DESCRIPTION

MATH 151 Elements of Mathematics I                                     3c-0l-3cr

**Prerequisite:** Appropriate Major:
  ELED: BSED in Elementary Education
  ECED: BSED in Early Childhood Education / PreK-Grade 6
  EDEX: BSED in Education of Exceptional Persons
  SPLP: BSED in Speech-Language Pathology and Audiology
  EDHL: BSED in Education of Deaf and Hard-of -Hearing Persons
  FCSE: BSED in Family and Consumer Sciences Education
  ARED: BSED in Art Education
  CDFR: BS in Child and Family Studies
  MIDL: BSED in Middle School Education

Topics included are sets, concepts of logic, mathematical systems, systems of numeration, developing the set of integers, rational numbers, and real numbers.

## II. COURSE OUTCOMES

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 151 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.

The student will:
1. develop and demonstrate knowledge of mathematical sets and logic related to elementary school content, concepts, and skills.
2. develop and demonstrate knowledge of mathematical and numeration systems related to elementary school content, concepts, and skills.
3. develop and demonstrate knowledge of integers, rational numbers, and real numbers related to elementary school 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 |
|---|---|---|---|---|
| 1 | 1a – Content & Pedagogy | 1, 4 | 2.3 Mathematics | Tests, Projects, and Quizzes |
| 2 | 1a – Content & Pedagogy | 1, 4 | 2.3 Mathematics | Tests, Projects, and Quizzes |
| 3 | 1a – Content & Pedagogy | 1, 4 | 2.3 Mathematics | **Key Assessment: Fractions Exam** |
| 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

A. Introduction to Problem Solving (*Objectives #4, #5*)        4.5 academic hours
   1. The Problem Solving Process and Strategies
   2. Three Additional Strategies

B. Sets, Whole Numbers, and Numeration (*Objectives #1, #2, #4, #5*)4.5 academic hours
   1. Sets As a Basis for Whole Numbers
   2. Whole Numbers and Numeration
   3. The Hindu-Arabic System
   4. Relations and Functions

C. Whole Numbers: Operations and Properties (*Objectives #2, #4*)    4 academic hours
   1. Addition and Subtraction
   2. Multiplication and Division
   3. Ordering and Exponents

D. Whole-Number Computation – Mental, Electronic and Written
                                    (*Objectives #2, #4, #5*)   2.5 academic hours
   1. Mental Math, Estimation, and Calculators
   2. Written Algorithms for Whole-Number Operations
   3. Algorithms in Other Bases

E. Number Theory (*Objectives #2, #4*)                4 academic hours
   1. Primes, Composites, and Tests for Divisibility
   2. Counting Factors, Greatest Common Factor, and Least Common Multiple

F. Fractions (*Objectives #3, #4*)                6 academic hours
   1. The Set of Fractions
   2. Fractions: Addition and Subtraction
   3. Fractions: Multiplication and Division

G. Decimals, Ratio, Proportion, and Percent *(Objectives #3, #4)*       5 academic hours
   1. Decimals
   2. Operations with Decimals
   3. Ration and Proportion
   4. Percent

H. Integers *(Objectives #3, #4)*       1.5 academic hours
   1. Addition and Subtraction
   2. Multiplication, Division, and Order

I. Rational Numbers, Real Numbers, and Algebra *(Objectives #3, #4)*    4 academic hours
   1. The Rational Numbers
   2. The Real Numbers
   3. Functions and Their Graphs
   4. Solving Equations with One Variable

This syllabus covers 36 academic hours, leaving 6 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., Fractions Exam to cover fractions*). 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

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.

Burns, M. (2000). About teaching mathematics: A K-8 resource. Sausalito, CA: Math Solutions Publications.

Driscoll, M. J. Research within Reach. Reston, Virginia: The National Council of Teachers of Mathematics.

Cooney, T. & Hirsch, C. R. (Eds.) (1990). Teaching and learning mathematics. Reston, Virginia: The National Council of Teachers of Mathematics.

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.

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

National Council of Teachers of Mathematics. Curriculum and Evaluation Standards for School Mathematics, Addenda Series. Reston, Virginia

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.

National Council of Teachers of Mathematics. (1995) Assessment standards. Reston, Virginia: The National Council of Teachers of Mathematics.

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. (2004). Elementary and middle school mathematics: Teaching developmentally. New York: Pearson.

## 2. Summary of the Revision

We propose to change the prerequisites and establish a current syllabus of record.

*Current* – MATH 151 Elements of Mathematics I        3c-0l-3cr

    Prerequisites:     None

    Topics included are sets, concepts of logic, mathematical systems, systems of numeration, developing the set of integers, rational numbers, and real numbers.

*Proposed* – MATH 151 Elements of Mathematics I        3c-0l-3cr

    **Prerequisite:** Appropriate Major:
                 ELED:   BSED in Elementary Education
                 ECED:   BSED in Early Childhood Education
                 EDEX:   BSED in Education of Exceptional Persons
                 SPLP:   BSED in Speech-Language Pathology and Audiology
                 EDHL:   BSED in Education of Deaf and Hard-of -Hearing Persons
                 CNSV:   BSED in Family and Consumer Sciences Education
                 ARED:   BSED in Art Education
                 CDFR:   BS in Child and Family Studies
                 MIDL: BSED in Middle School Education

    Topics included are sets, concepts of logic, mathematical systems, systems of numeration, developing the set of integers, rational numbers, and real numbers.

## 3. Rationale for the Revision

1.      "Appropriate major" was added as a prerequisite.

    ***Rationale***: MATH 151 has been limited to selected majors for many years. The content of this course is not appropriate for all majors. The limitation has been recognized under the liberal studies requirements, but not in the catalog description. This change formalizes this limitation to specific majors.

2.      Course Revision - Syllabus of Record

    ***Rationale***: The last syllabus in our files is from 1989 and this revision is consistent with the content prescribed in the new state guidelines.

## 4. Old Syllabus of Record

    Next page

INDIANA UNIVERSITY OF PENNSYLVANIA
MATHEMATICS DEPARTMENT

COURSE NUMBER:     MA 151

COURSE TITLE:      Mathematics for Elementary Teachers I

CREDITS:           3 Semester Hours

PREREQUISITES:     none

CATALOG DESCRIPTION:

Topics included are sets, concepts of logic, mathematical
systems, systems of numeration, developing the set of
integers, rational numbers, and real numbers.

COURSE OUTLINE:

I.     Problem Solving
       A.  Polya's Four-Step Process
       B.  Problem-Solving Strategies and Additional Problems

II.    Sets, Whole Numbers, and Numeration
       A.  Sets as a Basis for Whole Numbers
       B.  Whole Numbers and Numeration

III.   Whole Numbers - Operations and Properties
       A.  Addition, Subtraction, and Ordering
       B.  Multiplication, Division, and Exponents

IV.    Whole-Number Computations
       A.  Algorithms for the Addition and Subtraction of
           Whole Numbers
       B.  Algorithms for the Multiplication and Division of
           Whole Numbers
       C.  Algorithms in Other Bases

V.     Number Theory
       A.  Primes, Composites, and Tests for Divisibility
       B.  Counting Factors, Greatest Common Factor, and Least
           Common Multiple

VI.    Fractions
       A.  The Set of Fractions
       B.  Fractions - Operations and Properties

VII.   Decimals, Percent, Ratio, and Proportion
       A.  Decimals and Their Operations
       B.  Percent
       C.  Ratio and Proportion

X.     Statistics

A. Organizing and Picturing Information
B. Analyzing Data

XIII. Measurement
A. Measurement with Nonstandard and Standard Units

Special Section 2: Programming in BASIC


* Need to caution about integrating working with different
ses throughout development of numeration systems and
mputational algorithms.

** Packets from BASIC Discoveries are available as
pplementary activities for integrating the computer.

*** Calculator usuage is integrated throughout the text.

Students should have:
1. text
2. blank computer disk
3. calculator

# Part III. Letters/Emails of Support or Acknowledgement

1.　　ELED & ECED – George Bieger

**IUP** Indiana University of Pennsylvania
*www.iup.edu*

**Department of Professional Studies
in Education**
Davis Hall, Room 303
570 South Eleventh Street
Indiana, Pennsylvania 15705-1050

**P** 724-357-2400
**F** 724-357-2961
*www.iup.edu/pse*

February 27, 2009

To Whom It May Concern:
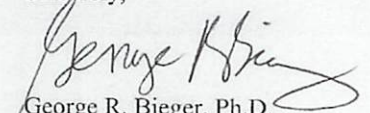
I am writing in reference to the proposed changes in several courses (i.e., MATH 151, MATH 152, MATH 320, and MATH 313) in the Department of Mathematics that will affect undergraduate students in Elementary Education and Early Childhood Education in our department.

The Professional Studies in Education faculty has collaborated successfully for many years with faculty in the Department of Mathematics and we are very familiar with the courses and the proposed changes. The proposed revisions are being made to make these courses, and therefore our programs, consistent with the standards dictated by the Pennsylvania Department of Education (PDE). The proposed revisions are necessary for IUP's teacher education programs to remain fully accredited by the PDE as approved teacher certification programs.

The proposed changes have the full and unqualified support of the Department of Professional Studies in Education, and we encourage all relevant entities (i.e., UWUCC and the University Senate) to approve the proposed revisions.

Please contact me if you have a need for additional information, or if you have any questions.

Sincerely,

George R. Bieger, Ph.D.
Professor and Acting Chairperson

2. EDEX, SPLP, & EDHL - Joseph Domaracki

Joseph W. Domaracki ,Ph.D. wrote:
> Dr. Baker,
>    I a writing in support of the proposed changes to MATH 151 and MATH
> 152. The changes made particularly in MATH 151 are welcomed changes that
> will facilitate a smoother registration process for education majors.
>
> Joseph Domaracki
> Chair
> Department of Special Education and Clinical Services.
>
> John Baker wrote:
>> To:   George Bieger for ELED & ECED
>>    Joe Domaracki for EDEX, SPLP, & EDHL
>>    Sally McCombie for CNSV
>>    Bob Sweeney for ARED
>>    Fredalene Bowers for CDFR
>>
>> I am looking for letters or emails of support from your department for
>> the proposed changes to MATH 151 & MATH 152 (attached).  I do not
>> believe that there are any significant changes that affects your
>> program.  If you are not the contact person, please forward.
>>
>> For MATH 151, we propose adding as a prerequisite the majors that are
>> already in effect for the liberal studies limitation.
>>
>> For MATH 152, we propose a change in the catalog description of the
>> course to fit what is already taught.
>>
>> Thanks,
>> John
>>
>

--

Dr. John D. Baker
Mathematics Department
Indiana University of Pennsylvania
Indiana, PA 15705

(724)357-3795
jdbaker@iup.edu

3.      FCSE - Sally McCombie:

On Fri, 27 Feb 2009 09:54:30 -0500
"Sally M McCombie" <smccomb@iup.edu> wrote:
> Hello John,
> I support the changes. You are correct in that my majors are
>required to take both MATH 151 and 152;  however, my majors are not
>CNSV they are FCSE.
> Thank you.
> Sally
>
> Sally M. McCombie, Ph.D.,Certified Family Life Educator
> President-Elect -Pennsylvania Association of FCS
> Indiana University of PA
> Human Development & Environmental Studies
> 207 Ackerman Hall
> Indiana, PA 15705
> (724)357-2336
>
> On Fri, 27 Feb 2009 09:46:40 -0500
> John Baker <jdbaker@iup.edu> wrote:
>>To: George Bieger for ELED & ECED
>>      Joe Domaracki for EDEX, SPLP, & EDHL
>>      Sally McCombie for CNSV
>>      Bob Sweeney for ARED
>>      Fredalene Bowers for CDFR
>>
>>I am looking for letters or emails of support from your department
>>for the proposed changes to MATH 151 & MATH 152 (attached). I do not
>>believe that there are any significant changes that affects your
>>program. If you are not the contact person, please forward.
>>
>>For MATH 151, we propose adding as a prerequisite the majors that are
>>already in effect for the liberal studies limitation.
>>
>>For MATH 152, we propose a change in the catalog description of the
>>course to fit what is already taught.
>>
>>Thanks,
>>John
>>
>>--
>>
>>Dr. John D. Baker
>>Mathematics Department
>>Indiana University of Pennsylvania
>>Indiana, PA 15705
>>
>>(724)357-3795
>>jdbaker@iup.edu

4.    ARED - Robert Sweeney

March 13, 2009

Dr. John D. Baker
Mathematics Department
Indiana University of Pennsylvania
Indiana, PA 15705

Dr. Baker,

I have reviewed your proposal for proposed changes to MATH 151 & MATH 152. As I see no significant changes that affect the Art Education program, I am in support of these changes. I appreciate the opportunity to review these revisions. Please feel free to contact me if you require further input, and good luck with your program changes.

Sincerely,

Bob Sweeny

Bob Sweeny, PhD
Assistant Professor, Art and Art Education
Coordinator of Art Education
College of Fine Arts
115 Sprowls Hall
Indiana University of Pennsylvania
Indiana, PA 15701
sweeny@iup.edu

5.     CDFR - Fredalene Bowers

Fredalene B Bowers wrote:
> John,
>
> The proposed course charges seem appropriate.  These courses will meet
> the needs of our majors.  Good luck.
>
> Freddie
>
> Fredalene B. Bowers, Ph.D., Professor
> Program Coordinator, Child & Family Studies Programn
>
>
>
>
>
> Fredalene B. Bowers, Ph.D., Professor
> Coordinator, Child & Family Studies Program
> Department of Human Development and Environmental Studies
> Ackerman Hall, Room 112B
> Indiana University of Pennsylvania
> Indiana, Pennsylvania  15705
> Office Phone:  724 357-4046
> Fax:  724 357-5941

## LIBERAL STUDIES COURSE APPROVAL, PARTS I-III: GENERAL INFORMATION CHECK-LIST

I.     **Please indicate the LS category(ies) for which you are applying:**

LEARNING SKILLS:
_____ First Composition Course     _____ Second Composition Course
_X_ Mathematics

KNOWLEDGE AREAS:

| | |
|---|---|
| _____ Humanities: History | _____ Fine Arts |
| _____ Humanities: Philos/Rel Studies | _____ Social Sciences |
| _____ Humanities: Literature | _____ Non-Western Cultures |
| _____ Natural Sci: Laboratory | _____ Health & Wellness |
| _____ Natural Sci: Non-laboratory | _____ Liberal Studies Elective |

II.     **Please use check marks to indicate which LS goals are primary, secondary, incidental, or not applicable.** When you meet with the LSC to discuss the course, you may be asked to explain how these will be achieved.

Prim Sec Incid N/A

| Prim | Sec | Incid | N/A | | |
|------|-----|-------|-----|---|---|
| | | | | A. | **Intellectual Skills and Modes of Thinking:** |
| X | | | | 1. | Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process. |
| | X | | | 2. | Literacy--writing, reading, speaking, listening. |
| X | | | | 3. | Understanding numerical data. |
| | | X | | 4. | Historical consciousness. |
| | | X | | 5. | Scientific Inquiry. |
| | | | X | 6. | Values (Ethical mode of thinking or application of ethical perception). |
| | X | | | 7. | Aesthetic mode of thinking. |
| X | | | | B. | **Acquiring a Body of Knowledge or Understanding Essential to an Educated Person** |
| | | | X | C. | **Understanding the Physical Nature of Human Beings** |
| | | | | D. | **Collateral Skills:** |
| | | | X | 1. | Use of the library. |
| | X | | | 2. | Use of computing technology. |

III.     **The LS criteria indicate six ways that courses should contribute to students' abilities. Please check all that apply.** When you meet with the LSC, you may be asked to explain your check marks.

_____ 1.     Confront the major ethical issues that pertain to the subject matter; realize that although "suspended judgment" is a necessity of intellectual inquiry, one cannot live forever in suspension; and make ethical choices and take responsibility for them.

_X_ 2.     Define and analyze problems, frame questions, evaluate available solutions and make choices.

_X_ 3.     Communicate knowledge and exchange ideas by various forms of expression, in most cases writing and speaking.

_____ 4.     Recognize creativity and engage in creative thinking.

_____ 5.     Continue learning even after the completion of their formal education.

_____ 6.     Recognize relationships between what is being studied and current issues, thoughts, institutions, and/or events.

A. Intellectual Skills and Modes of Thinking:

1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process.

   The study of mathematics requires the student to use these categories to collect data (the given, known quantities), clearly state the problem under study, apply the methods known to arrive at a solution to the problem, and analyze and interpret the solution in the context of the problem. These concepts are especially important for those students who will someday be instructing young children in elementary and middle schools.

2. Literacy--writing, reading, speaking, listening.

   All of these can be applied and improved in this course. Reading skills are necessary for a clear understanding of the material; the writing of and orally explaining solutions to a mathematical problem requires clarity of mind and organization of thought; the requirement of discussing mathematics in the classroom shows the student the importance of clear patterns of thinking and of the importance of the expression of those thought orally; listening skills are very important in the understanding of mathematics. These skills will be improved through the writing on homework and tests, through the oral response to classroom questions, and through the reading of assignments. In this course, students are often asked to explain solutions to problems in writing and orally.

3. Understanding numerical data.

   No data is meaningful without interpretation and the study of mathematics attempts to train the student in the methods and skills needed to interpret data correctly.

4. Historical consciousness.

   Student will become aware of the historical development of strategies, algorithms, and methods of recording mathematics in western and non-western civilizations and their relationship to the education of children in elementary and middle schools. Textbooks used for this course contain references to historical developments. Instructors include activities from historical sources to highlight concepts of study.

5. Scientific Inquiry.

   Students will be made aware of the importance of informal mathematical logic and the role it plays in developing more formal, scientific inquiry and problem solving techniques used throughout science. Of interest is the manner in which people use the structure of mathematics to construct problem solving techniques, and improve methods of decision making and deductive reasoning.

7. Aesthetic mode of thinking.

   Mathematics is a beautiful art form. An effort will be made to develop in the student a sense of this beauty and an appreciation for its power at utility.

B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person

   Although mastery of a specific area of mathematics is not required of all students, it is important that all students develop a sense of the importance of mathematics to society. In addition, the course of study should develop in the student a feeling of confidence in their ability to use the mathematical skills learned in their particular mathematics course.

D. Collateral Skills:

2. Use of computing technology.
   Students need to be aware of the importance of computers and calculators in the educational process. Students will make use of hand-held calculators, observe demonstrations of web technologies, and where appropriate, take part in lab or homework assignments that utilize commercially-available or web-based programs.

## IV. LIBERAL STUDIES COURSE APPROVAL, PART IV:

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 to discuss implementation of a recent textbook.

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.

# CHECK LIST -- MATHEMATICS
### (Learning Skills Area)

------

**Mathematics Criteria which the Course must meet:**

__X__ Introduce students to deductive reasoning

__X__ Develop in the student problem solving techniques appropriate for the course

__X__ Enable the student to understand the underlying principle of formulas

__X__ Enable the student to use and interpret numerical information


**Courses appropriate to the Mathematics Learning Skills Area must be either:**

__X__ **A.** Mathematics courses that develop significant mathematical skills required by a major discipline

_____ **B.** Mathematics courses designed for Liberal Studies

### Additional criteria which courses in Category B must meet:

_____ Develop the student's confidence in handling numerical problems and data.

_____ Be sensitive to the diverse background characteristics of the student

_____ Include elements on the history or appreciation of mathematics

_____ Introduce the hand-held calculator or the computer as a tool