LSC Use Only
Number: _____
Submission Date: _____
Action-Date: _____

RECEIVED
DEC - 2 1997
LIBERAL STUDIES

UWUCC USE Only
Number: 97-35j
Submission Date: _____
Action-Date: App. 12/16/97
Senate App. 2/3/98

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. CONTACT

Contact Person Gerald Buriok Phone 2608

Department Mathematics

II. PROPOSAL TYPE (Check All Appropriate Lines)

X COURSE MA 476 Abstract Algebra I
Suggested 20 character title

___ New Course* _____
Course Number and Full Title

X Course Revision MA 476 Abstract Algebra I
Course Number and Full Title

___ Liberal Studies Approval ÷ for new or existing course _____
Course Number and Full Title

___ Course Deletion _____
Course Number and Full Title

___ Number and/or Title Change _____
Old Number and/or Full Old Title

_____
New Number and/or Full New Title

___ Course or Catalog Description Change _____
Course Number and Full Title

___ PROGRAM: ___ Major ___ Minor ___ Track

___ New Program* _____
Program Name

___ Program Revision* _____
Program Name

___ Program Deletion* _____
Program Name

___ Title Change _____
Old Program Name

_____
New Program Name

III. Approvals (signatures and date)

Daniel A. Burkett 9/14/97
Department Curriculum Committee

Gerald Buriok 9/14/97
Department Chair

[signature] 10/15/97
College Curriculum Committee

John D. Eck 10/15/97
College Dean

÷ Director of Liberal Studies (where

Provost (where applicable)

Part II. Description of Curriculum Change.

1. New syllabus of record - attached.

2. A summary of the proposed revision:

The current prerequisite for MA476 Abstract Algebra I is "MA 171, 271 with a C or better grade." The proposed revision would change the prerequisite to "MA 272 with a C or better grade."

3. Justification/rationale for the revision:

The Mathematics Department is proposing a change in the core for all three undergraduate programs offered by the department, namely Mathematics, Applied Mathematics, and Secondary Mathematics Education. One aspect of this change is to extend MA271 Algebraic Structures to a two semester sequence, MA271 and MA272. MA271 will be renamed MA271 Introduction to Mathematical Proofs I, while the second course will be titled MA272 Introduction to Mathematical Proofs II. The prerequisite of MA421 will be changed to "C or higher in MA272." Faculty of the Mathematics Department have determined that the background in mathematical proofs that students acquire in MA271 is inadequate for upper level mathematics courses. Extending MA271 to a two semester sequence will provide an opportunity for students to gain a stronger background before being exposed to upper level theory oriented mathematics courses where there is an emphasis on proofs. The prerequisite change for MA476 will ensure students have the background necessary for succeeding in this course.

MA 171 was deleted as a prerequisite for MA 476 because MA 171 is a prerequisite for MA 271. The way the current prerequisite is stated is redundant. In order to meet the new prerequisite, MA 272, a student must complete MA 171, MA 271 and MA 272. That is, MA 171 is a prerequisite for MA 271, which in turn is a prerequisite for MA 272.

4. Old syllabus of record - attached.

5. Liberal Studies course approval form and checklist.

Not applicable.

Part III. Letters of Support.

No other department is affected by this change.

I Catalog Description

MA 476/576 Abstract Algebra I

3 credits
3 lecture hours
(3c-0l-3sh)

Prerequisites: MA 272 with a C or better grade.
Development of the theory of integral domains, fields, rings, and groups; designed to develop student's power to think for himself or herself and to improve ability to construct formal proofs.

II Course Objectives

1. Students will review and extend their knowledge of sets theory and functions and proofs involving these topics.

2. Students will study the integers modulo n, Z_n , as typical examples of rings, integral domains and fields, and be expected to give examples and prove results about Z_n.

3. Students will study rings, integral domains and fields in general, and be expected to give examples and prove results about these algebraic structures.

4. Students will study the basic theory of groups and be expected to give examples and prove results about these algebraic structures.

III Course Outline/Time Schedule:

A. Set Theory and Proof Methods (4 hours)
   1. Sets and Operations (union, intersection, complement)
   2. Products of Sets and Indexed Families of Sets
   3. Proofs by induction
   4. Direct Proofs and Proofs by Contradiction

B. Integers Modulo n (Z_n) (8 hours)
   1. Properties of the Integers, Division Algorithm, Prime and unique factorization
   2. Congruences and Congruence Classes
   2. Properties of Z_n
   3. Ideals in Z_n
   4. Introduction to fields (properties of Z_p for p prime)

C. Rings (13 hours)

1. Definition and Examples of Rings
2. Elementary Properties of Rings
3. Subrings, Ideals and Direct Sums
4. Homomorphisms and Isomorphisms
5. Quotient Rings
6. Polynomial Rings and Divisibility
7. Roots and Irreducibility
8. Integral Domains, Principal Ideal Domains and Unique Factorization Domains

D. Fields (8 hours)

1. Examples of Fields and Elementary Properties
2. Fields of Quotients
3. Extension Fields
4. Finite Fields
5. Congruences in F[x]

E. Groups (9 hours)

1. Definitions and Examples
2. Elementary Properties of Groups
3. Homomorphisms, Isomorphisms and Cyclic Groups
4. Congruence and Normal Subgroups
4. Groups of permutations
5. Quotient Groups

IV Evaluation Methods

There is variation in the weight given to evaluation methods used, but typically 25 % of the grade will be determined by hand-in assignments emphasizing the writing of proofs. The rest of the grade is determined by quizzes, tests and a comprehensive final examination. A suggested distribution for the weights is:

Homework	25%
Three Exams (15% each)	45%
Quizzes	10%
Comprehensive Final Exam	20%

The final grades are assigned based on the total percentage of the points accumulated in the entire semester. The scale suggested is:

A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	below 60%

V Required Textbook

Hungerford, Thomas: Abstract Algebra: An Introduction. Philadelphia, Saunders College Publishing 1990.

VI Special Resource Requirements

None

VII Bibliography

Dubinsky, Ed and Leron, Uri: Teaching Abstract Algebra with ISETL. New York, Springer Verlag, 1994.
Fraleigh, John B.: A First Course in Abstract Algebra. Reading MA, Addison-Wesley, 1994.
Herstein, Israel: Abstract Algebra. Upper Saddle River, Prentice Hall, 1996.
Spence, Lawrence and Vanden Eynden, Charles: Elementary Abstract Algebra. Harper Collins, 1993.

I Catalog Description

MA 476/576 Abstract Algebra I

3 credits
3 lecture hours
(3c-0l-3sh)

Prerequisites: MA 171, MA 271 with a C or better grade.
Development of the theory of integral domains, fields, rings, and groups; designed to develop student's power to think for himself or herself and to improve ability to construct formal proofs.

II Course Objectives

1. Students will review and extend their knowledge of sets theory and functions and proofs involving these topics.

2. Students will study the integers modulo n, Z_n , as typical examples of rings, integral domains and fields, and be expected to give examples and prove results about Z_n.

3. Students will study rings, integral domains and fields in general, and be expected to give examples and prove results about these algebraic structures.

4. Students will study the basic theory of groups and be expected to give examples and prove results about these algebraic structures.

III Course Outline/Time Schedule:

A. Set Theory and Proof Methods (4 hours)
   1. Sets and Operations (union, intersection, complement)
   2. Products of Sets and Indexed Families of Sets
   3. Proofs by induction
   4. Direct Proofs and Proofs by Contradiction

B. Integers Modulo n (Z_n) (8 hours)
   1. Properties of the Integers, Division Algorithm, Prime and unique factorization
   2. Congruences and Congruence Classes
   2. Properties of Z_n
   3. Ideals in Z_n
   4. Introduction to fields (properties of Z_p for p prime)

C. Rings (13 hours)

1. Definition and Examples of Rings
2. Elementary Properties of Rings
3. Subrings, Ideals and Direct Sums
4. Homomorphisms and Isomorphisms
5. Quotient Rings
6. Polynomial Rings and Divisibility
7. Roots and Irreducibility
8. Integral Domains, Principal Ideal Domains and Unique Factorization Domains

D. Fields (8 hours)

1. Examples of Fields and Elementary Properties
2. Fields of Quotients
3. Extension Fields
4. Finite Fields
5. Congruences in F[x]

E. Groups (9 hours)

1. Definitions and Examples
2. Elementary Properties of Groups
3. Homomorphisms, Isomorphisms and Cyclic Groups
4. Congruence and Normal Subgroups
4. Groups of permutations
5. Quotient Groups

IV Evaluation Methods

There is variation in the weight given to evaluation methods used, but typically 25-35% of the grade will be determined by hand-in assignments emphasizing the writing of proofs. The rest of the grade is determined by quizzes, tests and a comprehensive final examination. A suggested distribution for the weights is:

Homework	25%
Three Exams (15% each)	45%
Quizzes	10%
Comprehensive Final Exam	20%

The final grades are assigned based on the total percentage of the points accumulated in the entire semester. The scale suggested is:

A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	below 60%

V Required Textbook

Hungerford, Thomas: Abstract Algebra: An Introduction. Philadelphia, Saunders College Publishing 1990.

VI Special Resource Requirements

None