

University Senate of Michigan Technological University

Proposal 9-94

New Option in Discrete Mathematics for the MS Degree in Mathematical Sciences

The use of discrete mathematics in business and industry has seen a remarkable increase over the last twenty years. Many problems in industry, such as allocation, distribution, and optimization problems, as well as problems in information and communication, fall within the area of discrete mathematics. At the same time, mathematical research activity has also seen a dramatic increase during this period.

To address this increase in activity, the Department of Mathematical Sciences has hired three new faculty in this area. These include: Dr. Donald Kreher, who was hired in the Fall of 1991. His area of expertise is Computational Combinatorics, Algorithms, and Design Theory. Dr. Kreher has received NSF/NSA support for his research for the last six years. He was promoted to the rank of professor this year. Dr. Vladimir Tonchev was also hired in the Fall of 1991. His area of expertise is Algebraic Coding Theory and Design Theory. Dr. Tonchev has over seventy publications in refereed journals, and he also was recently promoted to the rank of professor. Dr. Alphonse Baartmans was hired in the Fall of 1990 as Chair of the Department of Mathematical Sciences. His area of expertise is Design Theory, Geometrics, and Coding Theory.

Below is described a new area of concentration for the M.S. degree in mathematics: *The Discrete Mathematics Concentration*. This concentration reflects the expertise of recently acquired faculty and the growth of activity in Discrete Mathematics research and applications during the past several decades. This Discrete Mathematics Concentration was approved by the Department of Mathematical Sciences on October 1, 1992. It and the subsequent course changes affect no other degree program.

Changes to Degree Requirements:

*The first sentence of the second paragraph under the heading of **Degree Requirements** for the department of Mathematical Sciences should be changed to read:*

Students in the master's program must select one of four areas of concentration: pure mathematics, applied mathematics, statistics, or discrete mathematics.

The following concentration description should be included:

4. Discrete Mathematics Concentration

Core Courses (21 credits):

Algebra: MA536, MA537 (6 credits)

Combinatorial Structures: MA571, MA572 (6 credits)

Combinatorial Algorithms: MA503 (3 credits)

Applied Combinatorics: MA576, MA577 (6 credits)

Background Courses or equivalents (16 credits): MA450, MA459, MA408, MA409 and MA462

Changes to Graduate Courses:

ADDITIONS:

MA576 Error-correcting Codes

(0-3-0) (offered as demand warrants) 3

Basic concepts, optimal and near optimal codes, background on finite fields, linear and cyclic codes, MacWilliams' identities, Designs. Prerequisite: MA571 or permission of Instructor.

MA577 Cryptography

(0-3-0) (offered as demand warrants) 3

Classical, Public Key, Authentication codes, Threshold Schemes. Prerequisite: MA571 or permission of Instructor.

DELETIONS:

MA573: Error-correcting Codes

Remark: This is effectively replaced with MA576.

REVISIONS:

MA503 Combinatorial Algorithms

(0-3-0) (offered as demand warrants) 3

Basic algorithmic and computational Methods used in the solution of fundamental combinatorial problems. Topics may include but are not limited to: backtracking, hill climbing, combinatorial optimization, linear and integer programming, and network analysis. Prerequisite: MA571, knowledge of a programming language, or permission of Instructor.

Adopted by Senate: February 2, 1994

Approved by President: February 7, 1994