Please type or select the requested information. Print completed forms, add appropriate paper attachments, and route through MSU's curricular process for recommendations and decisions.

**Proposal #** 101
**Effective Date of Change:**
**Academic Year:** 09-10

**College:** Science, Engineering and Technology
**Undergraduate**
**Department:** Mathematics and Statistics
**Graduate**
**Program:** Mathematics
**CIP #**

**Type of Change:** COURSE PROPOSALS
**Proposed:** Charge in Course—Other

**Title Current:** Numerical Analysis
**Title Proposed:**
**24-Char. Abbrev:**

Include a course or program description for the Bulletin (30-40 words maximum for courses, 100 for programs):

See attached sheet to amend the prerequisites. Delete reference to "familiarity with a programming language" and "FORTRAN"

**Rationale or Justification for change:**
Modern computer software allows more options for computer implementation. Familiarity with FORTRAN or C++ is no longer required for the course.

***For General Education or Cultural Diversity Courses Only***

**General Education Course:**

<table>
<thead>
<tr>
<th>GE Category #</th>
<th>GE Category Name (Maximum of 3 Categories)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

For Writing Intensive Courses, attach a description of the kind and quantity of writing.

For Upper Division Courses, include a description of the respects in which it is broad and general rather than narrow and specific, and so suitable as GE.

Attach paper copies of the following:

a. Syllabus or course outline.

b. Course's student learning outcomes associated with each GE competency or CD designation.

c. List of strategies to be used to assess students' achievement of each GE competency or CD designation.

***For New Courses***

<table>
<thead>
<tr>
<th>Instructional Type:</th>
<th>Grade</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Course will be offered:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Semester</td>
</tr>
<tr>
<td>Spring Semester</td>
</tr>
<tr>
<td>Summer Session</td>
</tr>
</tbody>
</table>

Course content or title is similar to courses in other departments. (Attach copy of letter of agreement with other program(s) contacted. Indicate the nature of the discussions and/or resolution of differences or potential conflicts.)

Attach paper copies of the following:

a. Syllabus or course outline.

b. Course's student learning outcomes.

c. A list of resources required to offer and support this course.

d. A description of how teaching this course will affect department staffing.

e. If 400/500 level course, an explanation of added expectations of graduate students.

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Received: NOV 5 2007

Revised September 2002
### Signature Page

**Department**
- **Recommended**
- **Not Recommended**

**Comments:**

**College Curriculum Committee**
- **Recommended**
- **Not Recommended**

**Comments:**

**College Dean**
- **Recommended**
- **Not Recommended**

**Comments:**

**General Education Subcommittee**
- **Recommended**
- **Not Recommended**

**Comments:**

**Undergraduate Curriculum and Academic Policy Committee**
- **Recommended**
- **Not Recommended**

**Comments:**

**Faculty Association Graduate Committee**
- **Recommended**
- **Not Recommended**

**Comments:**

**Graduate Dean**
- **Recommended**
- **Not Recommended**

**Comments:**

**Academic Affairs Council**
- **Recommended**
- **Not Recommended**

**Comments:**

**Senior Vice President and Vice President for Academic Affairs**
- **Approved**
- **Not Approved**

**Comments:**

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*Minnesota State University, Mankato*

*Curriculum Proposal*

*Department Chair*

*Date*

*Date*

*Date*

*Date*

*Date*

*Date*

*Date*

*Date*

*Date*

*Date*

*Date*

*Date*

*Date*
MATH 446 (4) Abstract Algebra II
A continuation of MATH 345. The course will include topics from groups, rings, and fields.
Pre: MATH 345 with "C" or better or consent
Spring

MATH 447 (3) Linear Algebra II
An in-depth study of linear operators and their related spaces, dimension, rank, matrix representation of linear operators, special matrices, determinants, eigenvectors and eigenvalues.
Pre: MATH 345 with "C" or better or consent
Fall

MATH 455 (4) Theory of Statistics I
A mathematical approach to statistics with derivation of theoretical results and of basic techniques used in applications. Includes probability, continuous probability distributions, multivariate distributions, functions of random variables, central limit theorem and statistical inference. Same as STAT 455.
Pre: MATH 223 with "C" or better or consent
Fall

MATH 456 (4) Theory of Statistics II
A mathematical approach to statistics with derivation of theoretical results and of basic techniques used in applications, including sufficient statistics, additional statistical inference, theory of statistical tests, inferences about normal models and nonparametric methods. Same as STAT 456
Pre: MATH 455 / STAT 455 with "C" or better or consent

MATH 470 (4) Numerical Analysis I
This course provides an introduction to techniques and analysis involved with solving mathematical problems using technology. Topics included are errors in computation, solutions of linear and nonlinear equations, numerical differentiation and integration, and interpolation.
Pre: MATH 122, MATH 247 with "C" or better or consent and familiarity with a programming language.
Spring

MATH 471 (4) Numerical Analysis II
This course is a continuation of MATH 470. Topics included are the algebraic eigenvalue problem, least-squares approximation, solutions of systems of nonlinear equations, numerical solutions of ordinary differential equations.
Pre: MATH 470 and MATH 223 with "C" or better or consent

MATH 480 (3) History of Mathematics
The development of selected topics from before the Hellenistic time period to the late twentieth century. Familiarity with the content of HIST 180W is beneficial.
Pre: MATH 345 with "C" or better or consent
Fall

MATH 483 (3) Advanced Viewpoint of 5-8 School Mathematics
Advanced viewpoint of mathematics content and learning theories, teaching strategies, reading strategies, assessments, and planning, teaching and reflecting on grades 5-8 mathematics. Field experiences in grades 5-8 mathematics classroom required.
Pre: MATH 290 with "C" or better or consent
Spring

MATH 484 (3) Technology in 5-12 School Mathematics
Numerical, verbal, symbolic and graphical representations of quantitative relationships, concatenations in written mathematics, problem solving, dynamic geometry, perspective drawing, parametric equations, geometric probability, transition matrices, statistics and calculus using technology.
Pre: MATH 290 with "C" or better or consent
Fall

Graduate Bulletin
MATH 556 (4) Theory of Statistics II
A mathematical approach to statistics with derivation of theoretical results and
of basic techniques used in applications, including sufficient statistics, additional
statistical inference, theory of statistical tests, inferences about normal models, and
non-parametric methods. Same as STAT 556.
Prerequisite: MATH/STAT 555

MATH 570 (4) Numerical Analysis I
This course provides an introduction to techniques and analysis involved with
solving mathematical problems using technology. Topics included are errors in
computation, solutions of linear and nonlinear equations, numerical differentiation
and integration, and interpolation.
Prerequisite: MATH 122, 247, and FORTRAN

DELETE

MATH 571 (4) Numerical Analysis II
This course is a continuation of MATH 470. Topics included are the algebraic ei-
genvalue problem, least-squares approximation, solutions of systems of nonlinear
equations, and numerical solutions of ordinary differential equations.
Prerequisite: MATH 470 and 223

MATH 580 (3) History of Mathematics
The development of selected topics from before the Hellenistic time period to the
late twentieth century. Familiarity with the content of HIST 180 is beneficial.
Prerequisite: MATH 345

MATH 583 (3) Viewpoint of 5-8 School Mathematics

MATH 584 (3) Technology in 5-12 School Mathematics
This course is designed to inform secondary mathematics teachers about effective
utilization of technology in the mathematics curriculum.
Prerequisite: MATH 345 and CI 447

MATH 588 (1-3) Seminar
A course of study in which a group of students study a topic by examining results
through reports and discussions. May be repeated for credit on each new topic.

MATH 590 (1-4) Workshop
A short course devoted to a specific mathematical topic. May be repeated for credit
on each new topic.

MATH 591 (1-4) In-Service
A course designed to upgrade the qualifications of persons on-the-job. May be
repeated on each new topic.

MATH 595 (1-4) Selected Topics
A course in an area of mathematics not regularly offered. May be repeated on each new topic.

MATH 596 (3) Mathematical Logic
Propositional logic, first and second order logic, completeness, consistency, models
of theories, and Gödel's Incompleteness theorem.
Prerequisite: MATH 345 and PHIL 411

MATH 598 (1-12) Internship
Provides students the opportunity to gain expertise and experience in a special field
under the supervision of a qualified person.

MATH 605 (3) Graphs and Algorithms
Mathematical concepts of graph theory applied to problems that have algorithmic
solutions.
Prerequisite: MATH 417, 375, and 447

MATH 606 (3) Topics in Discrete Mathematics
Can be used for any graduate level discrete mathematics course not offered as a
general course. Distinct offerings may be repeated for credit.
Prerequisite: MATH 375 and 447

MATH 608 (1-4) Seminar in Elementary Mathematics
An opportunity for a group of elementary teachers to study a mutual problem in
mathematics.

MATH 611 (3) Real Analysis
Measure theory, integration, metric spaces, and Banach spaces.
Prerequisite: MATH 417

2007-2009 Grac

1. Minutes of the August 23, 2007 meeting were approved.

2. Singer moved and Zuiker seconded the following Math 130 motion. Motion passed

   Motion: Whereas the College of Business desires to replace its requirement of Math 112 College Algebra (4 credits) by a new course called Finite Mathematics and Introductory Calculus (4 credits) designed in cooperation with the Department of Mathematics and Statistics, we move to change the title and number of credits of Math 130 from Finite Mathematics and Its Applications (3 credits) to Finite Mathematics and Introductory Calculus (4 credits) and submit a course redesign application to the CSET Curriculum Committee.

3. Singer moved and Waters seconded the following Math 470 motion. Motion passed

   Motion: Whereas few students who enroll in Math 470 Numerical Analysis I (4 credits) have a programming background, and the course is taught without requiring a programming background, we move to change the description of Math 470 to eliminate the prerequisite for a formal programming language, and submit a course description change application to the CSET Curriculum Committee.

Proposed Bulletin Description

This course provides an introduction to techniques and analysis involved with solving mathematical problems using technology. Topics included are errors in computation, solutions of linear and nonlinear equations, numerical differentiation and integration, and interpolation. Pre: Math 122 and Math 247.

4. Singer moved and Herman seconded the following motion changing the prerequisite for Math113 from Math 098 to Math 112. Motion passed.

   Motion: Where are currently advising students to take Math 112 before taking Math 113, and whereas the Curriculum Committee feels that Math 112 is better preparation for Math 113 than Math 098, we move to change the wording of the prerequisites for Math 113 Trigonometry (4 credits) from “or successful completion of Math 098” to “or Math 112 with “C” or better.”

5. Singer moved and Zuiker seconded the motion regarding Math 181.
6. Zuiker moved and Singer seconded an amendment to reword the motion. Amendment passed.

7. The following motion passed.

*Motion: Whereas the Curriculum Committee was charged with developing a calculus course that will meet the needs of students seeking middle school licensure, we move that the Department of Mathematics and Statistics request that the registrar's office place a note in the Fall course schedule indicating that the 10 am section of Math 181 (3 credits) will admit Elementary Education Majors only.*

8. Singer moved and Zuiker seconded the following motion to withdraw Math 184. Motion passed.

*Motion: Whereas Math 184 Mathematical Reasoning (3 credits) is no longer offered, we move that it be withdrawn, and an application for withdrawal be submitted to the CSET Curriculum Committee.*