



Minnesota State University, Mankato HOLD and CLEAR buttons only compatible with Acrobat V. 4 and 5
Curriculum Proposal

08-39



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.

(Check all that apply):		Proposal # <u>202</u>
College: <u>Science, Engineering and Technology</u>	<input checked="" type="checkbox"/> Undergraduate	Effective Date of Change:
Department: <u>Mathematics and Statistics</u>	<input type="checkbox"/> Graduate	Academic Year <u>07-08</u>
Program: <u>Mathematics</u>	CIP # _____	(For Office Use Only)
Type of Change: <u>COURSE PROPOSALS</u>		
Proposed: <u>Change in Credits and Title = Description</u>		
Title Current: <u>Finite Mathematics and its Applications</u>	Course Designator	Number of Credits
Title Proposed: <u>Finite Mathematics and Introductory Calculus</u>	Math 130	3
24-Char. Abbrev: <u>Finite Math & Intro Calc</u>	Math 130	4
		(if applicable)

Include a course or program description for the Bulletin (30-40 words maximum for courses, 100 for programs):
 This course develops concepts and skills in algebra and introductory calculus needed to model applications in business, economics, social sciences and life sciences, using polynomials, exponentials, logarithms, linear systems, linear programming, sequences, series, derivatives and integrals.

Rationale or Justification for change:
 The College of Business has requested this updated course to be used as the required course in their programs instead of Math 112. In the past years Math 130 has not been offered due to insufficient enrollment. With students majoring in the College of Business required to take this course there will be significant demand for it. The Department of Mathematics and Statistics is committed to offering a course designed to meet the needs of the College of Business.

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

General Education Course:		Cultural Diversity Course: (Please check one.) <input type="checkbox"/> Core (At least 75% devoted to topics of race, gender, sexual orientation, age, class, and disabilities as they occur in United States Society.) <input type="checkbox"/> Related (At least 25% devoted to the above topics or to a global perspective on topics related to African American, Asian, Hispanic, and Native American inhabitants of the United States.)
GE Category #	GE Category Name (Maximum of 3 Categories)	
<u>4</u>	<u>Mathematical/Logical Reasoning</u>	
<u>N/A</u>	<u></u>	

? 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.

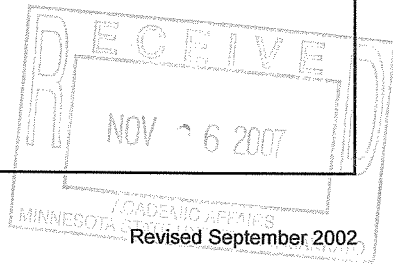
Attach paper copies of the following:
 a. Syllabus or course outline.
 b. Course's student learning outcomes associated with each GE competency or CD designation.
 c. List of strategies to be used to assess students' achievement of each GE competency or CD designation.

*****For New Courses*****

(Check all that apply):	Instructional Type: <u>Lecture/Lab</u>	Course will be offered:
<input checked="" type="checkbox"/> Course is an elective.	Grading Format: <input checked="" type="checkbox"/> Grade <input type="checkbox"/> P/N	<input checked="" type="checkbox"/> Fall Semester
<input checked="" type="checkbox"/> Course is required for program	College of Business	<input checked="" type="checkbox"/> Spring Semester
<input checked="" type="checkbox"/> Pre- or Co-requisites:	See attached sheets	<input type="checkbox"/> Summer Session
<input type="checkbox"/> Other courses are being changed or eliminated. (Explain.) _____		

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.)


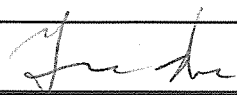
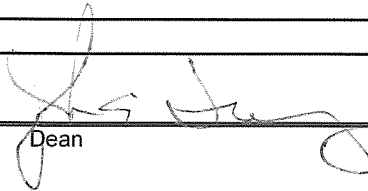

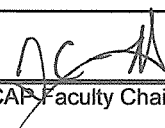
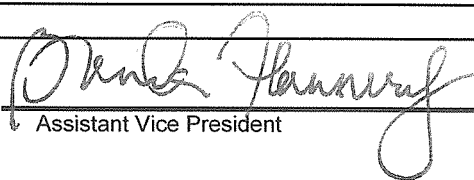
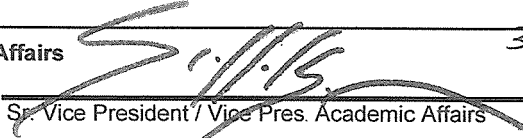
Attach paper copies of the following:
 a. Syllabus or course outline.
 b. Course's student learning outcomes.
 c. A list of resources required to offer and support this course.
 d. A description of how teaching this course will affect department staffing.
 e. If 400/500 level course, an explanation of added expectations of graduate students.





Minnesota State University, Mankato
Curriculum Proposal

Signature Page

Department <input checked="" type="checkbox"/> Recommended (Category/ies _____) <input type="checkbox"/> Not Recommended (Category/ies _____) Comments:	 Ernest Boyd Department Chair 16 Oct 07 Date
College Curriculum Committee <input checked="" type="checkbox"/> Recommended (Category/ies _____) <input type="checkbox"/> Not Recommended (Category/ies _____) Comments:	 Julie Committee Chair Nov. 9, 2007 Date
College Dean <input checked="" type="checkbox"/> Recommended (Category/ies _____) <input type="checkbox"/> Not Recommended (Category/ies _____) Comments:	 Dean 11/20/07 Date
General Education Subcommittee <input checked="" type="checkbox"/> Recommended (Category/ies <u>4</u>) <input type="checkbox"/> Not Recommended (Category/ies _____) Comments:	 Ronald A. Neuber General Education Subcommittee Chair 12/20/07 Date
Undergraduate Curriculum and Academic Policy Committee <input checked="" type="checkbox"/> Recommended (Category/ies _____) <input type="checkbox"/> Not Recommended (Category/ies _____) Comments:	 UCAP Faculty Chair 3/7/08 Date
Faculty Association Graduate Committee <input type="checkbox"/> Recommended <input type="checkbox"/> Not Recommended Comments:	Faculty Association Graduate Chair Date
Graduate Dean <input type="checkbox"/> Recommended <input type="checkbox"/> Not Recommended Comments:	Graduate Dean Date
Academic Affairs Council <input checked="" type="checkbox"/> Recommended (Category/ies _____) <input type="checkbox"/> Not Recommended (Category/ies _____) Comments:	 David Flannery Assistant Vice President 3/14/08 Date
Senior Vice President and Vice President for Academic Affairs <input checked="" type="checkbox"/> Approved (Category/ies _____) <input type="checkbox"/> Not Approved (Category/ies _____) Comments:	 Sr. Vice President / Vice Pres. Academic Affairs 3/14/08 Date

08-38



MINNESOTA STATE
UNIVERSITY
MANKATO

November 7, 2007

To Whom It May Concern:

The College of Business Curriculum Committee has voted to replace MATH 112 College Algebra with MATH 130 Finite Mathematics and Introductory Calculus as a required course for all College of Business students. All departments in the College of Business have approved this request.

Sincerely,

Ann Kuzma
Chairperson
College of Business Curriculum Committee

DEPARTMENT OF MARKETING AND INTERNATIONAL BUSINESS
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An Affirmative Action/Equal Opportunity University.



New Syllabus
Math 130 – Finite Mathematics and Introductory Calculus
4 Credits – 3 lectures and 1 computer lab using *Excel* each week

Prerequisite

Knowledge of college algebra including exponentials and logarithms.

Satisfy one of the following three conditions:

- (1) Pass Math 112 or 115 with grade of C or better;
- (2) Score 20 or better on the ACT Math Subscore, or
- (3) Score 8 or better on the Functions and Graphs Placement Test (algebra functions)

Catalogue Description

This course develops concepts and skills in algebra and introductory calculus needed to model applications in business, economics, social sciences and life sciences, using polynomials, exponentials, logarithms, linear systems, linear programming, sequences, series, derivatives and integrals.

Textbook

Mathematics Alive and Applied for Business, Economics, and Life by Sherman Chottiner,
ISBN: 0-9759145-0-2

Content

The course will use technology to model problems with functions (polynomial, exponential and logarithmic), systems of linear equations, linear programming, summation formulae for fundamental sequences in calculating present and future values, derivatives for marginal rates of change and integrals for continuous income streams with finite time horizons and discounted payoffs.

Introduction (1 day)

Sequences and series with mathematics of finance

(8 days, Chapters 3 & 4)

Arithmetic and geometric sequences

Summation formulae for fundamental sequences

Intuition on convergence of sequences and series

Computer Lab #1: Plotting graphs and calculating sums using *Excel*

Mathematics for simple and compound interest

Mathematics for future value of increasing annuities

Mathematics for present value of decreasing annuities for amortization of loans

Computer Lab #2: Calculating with formulae in *Excel*

Linear Functions and Equations

(4 days, Chapter Sections 6.1-6.3 & 7.1-7.3)

Understanding slope and intercept

Applications using linear models to extrapolate data

Computer Lab #3: Plot lines and find regression lines for scatter plots of data in *Excel*

Review and Test (2 days)

Polynomial Functions

(4 days, Chapter Sections 6.4-6.5 & 7.7)

Understanding quadratic functions for vertex and concavity via completing the square

Factoring polynomial functions with increasing, decreasing, concave up, and concave down

Applications using quadratic functions for maxima and minima

Computer Lab #4: Plot polynomials and fitting data with polynomials for scatter plots in *Excel*

Exponential and Logarithmic Functions

(8 days, Chapter Sections 6.6-6.6.12 & 7.4-7.5)

Algebra of exponents and logarithms

Computer Lab #5: Plot exponential and logarithmic functions in *Excel* plus semi-log and log-log scales

Applications for exponential growth, decay and discounting

Computer Lab #6: Fitting data with power functions or exponential functions for scatter plots in *Excel* via linear regression on semi-log and log-log plots

Linear Systems

(8 days, Chapters 8-11 omit Cramer's Rule and matrix inverse)

Systems of two linear equations in two variables by elimination and substitution

Finding the solution set to linear inequalities in two variables

Matrix algebra for 2D and 3D with Gaussian elimination

Leontief Input-Output models

Computer Lab #7: Plot 2D feasible sets in *Excel*

Solve 2D and 3D linear programming problems via simplex algorithm

Computer Lab #8: Solve linear programming problems with *Excel Solver*

Review and Test (2 days)

Differential Calculus

(12 days, Chapters 12-15 omit Sections 13.12-13.13, 14.6-14.8, 15.8-15.12)

Concept of rate of change in terms of average rate versus instantaneous rate

Concept of marginal rates

Definition of derivative as limit of difference quotient

Computer Lab #9: Calculating difference quotients and graphing them as $\Delta x \rightarrow 0$

Derivatives of polynomial functions

Basic rules of differentiation

Derivatives of power functions, exponential functions and logarithmic functions
Applications for finding maxima and minima
Computer Lab #10: Solving applications in optimization using *Excel*

Integral Calculus

(8 days, Chapters 16 & 17)

Concept of antiderivative

Concept of cumulative sums over functions with finite time horizons and discounted payoffs

Definition of integral as limit of Riemann sums

Computer Lab #11: Calculating Riemann sums and graphing them as $\Delta x \rightarrow 0$

Basic rules of integration (polynomials, power rule and simple substitutions for exponential and logarithmic functions)

Fundamental Theorem of Calculus

Computer Lab #12: Applications of integrals for continuous income streams and consumer – producer surpluses using *Excel*

Review and Test (2 days)

Review for Final (1 day)

Grading

Three hour tests each counting 20% of the course grade.

Weekly computer labs and quizzes using *Excel* and *Desire2Learn* with graduate assistants providing tutorials. Total of all labs and quizzes counts 20% of the course grade.

Final exam counts 20% of the course grade.

Math 130 – Finite Mathematics and Introductory Calculus Student Learning Outcomes

1. Students will be able to apply higher-order problem solving skills and modeling strategies in applications taken from historical and contemporary studies in business, economics, the life sciences and the social sciences.
2. Students will gain knowledge and skill in using mathematical models for analyzing trends in economics, finance, management, marketing, population dynamics, ecosystems and social behavior.
3. Students will gain knowledge and skill in presenting written logical arguments for the validity of the mathematical model.
4. Students will be able to present a valid proof that the mathematical model satisfies the hypotheses and that the conclusion is a consequence of the model.
5. Students will be able to recognize the difference between a mathematical model based on a power function and one based on an exponential function. This includes understanding their rates of change and what assumptions lead to these rates of change.
6. Students will be able to distinguish between average rates of change and instantaneous rates of change. This includes being able to use the slope of the secant line and/or the derivative to analyze trends.
7. Students will gain knowledge and skill in using sequences, series and summation formulae to analyze the accumulative effects of different trends, life cycles and strategies.
8. Students will understand the definition of an integral as a limit of Riemann sums, and the Fundamental Theorem of Calculus.
9. Students will gain knowledge and skill in using linear programming in modeling constrained optimization along with methods for solving such problems.
10. Students will gain knowledge and skill in using derivatives and integrals in modeling unconstrained optimization along with methods to find the extrema.

Strategies to be used to assess students' achievement

Weekly homework, quizzes and computer labs will be graded and used as part of the course grade. Regularly scheduled hour tests and a comprehensive final examination will be part of the course grade. All assignments will require students to present written formal proof of the validity of the argument. All assignments will require higher-order problem solving and modeling.

Math 130 – Finite Mathematics and Introductory Calculus

Resources required to offer and support this course

A large lecture classroom with level 2 multimedia technology will be needed for one hour on three days per week for each section. The computer lab component of this class will be conducted in ACC 116 with 25 students per section for one hour per week. We anticipate 4-5 lab sections for each lecture section. Requests for classrooms will follow the normal procedures. The Department of Mathematics and Statistics already has priority scheduling in ACC 116.

Departmental staffing to teach this course

One instructor and one graduate assistant will be assigned to each section of this course. The course will count as four credit hours as part of the instructor's normal load. The instructor will handle the three lectures, the preparation of D2L materials, design of assessment tools, and coordination of the computer labs. The graduate assistant will conduct four computer labs and assist in grading the assessment tools. Since this course will be required of students majoring in the College of Business instead of Math 112, the enrollment in Math 112 will drop. Therefore, we will be able to reduce the number of sections in Math 112 and re-assign those instructors and graduate teaching assistants to Math 130.

Bulletin Copy

This course develops concepts and skills in algebra and introductory calculus needed to model applications in business, economics, social sciences and life sciences, using polynomials, exponentials, logarithms, linear systems, linear programming, sequences, series, derivatives and integrals.

Pre: Must achieve a score of 19 or better on the MnSCU Math Readiness Test, or have achieved an ACT Math subscore of 20 or higher, or have passed Math 112 with "C" or better.

Fall, Spring

GE-4

Old Syllabus
Math 130 – Finite Mathematics and its Applications
3 Credits

Prerequisite

Knowledge of college algebra including exponentials and logarithms.

Satisfy one of the following three conditions:

- (1) Pass Math 098;
- (2) Score 19 or better on the ACT Math Subscore, or
- (3) Score 18 or better on the Math Readiness Test (algebra functions)

Catalogue Description

This course is an introduction to the mathematical concepts needed in business, the social sciences, and the life sciences including problem solving and linear models, linear algebra, linear programming, consumer mathematics, probability and statistics, and decision making.

Content

The course will solve mathematical problems using functions (polynomial, exponential and logarithmic), systems of linear equations, linear programming, summation formulae for fundamental sequences in calculating present and future values, counting methods and probabilities for independent events. The course will make use of scientific calculators.

Introduction (1 day)

Sequences and series with mathematics of finance

(8 days)

Arithmetic and geometric sequences

Summation formulae for fundamental sequences

Intuition on convergence of sequences and series

Mathematics for simple and compound interest

Mathematics for future value of increasing annuities

Mathematics for present value of decreasing annuities for amortization of loans

Linear Functions and Equations

(4 days)

Understanding slope and intercept

Applications using linear models to extrapolate data

Review and Test (2 days)

Polynomial Functions

(4 days)

Understanding quadratic functions for vertex and concavity via completing the square

Factoring polynomial functions with increasing, decreasing, concave up, and concave down

Applications using quadratic functions for maxima and minima

Exponential and Logarithmic Functions

(8 days)

Algebra of exponents and logarithms

Applications for exponential growth, decay and discounting

Curves of best fit

Review and Test (2 days)

Linear Systems

(8 days)

Systems of two linear equations in two variables by elimination and substitution

Finding the solution set to linear inequalities in two variables

Matrix algebra for 2D and 3D with Gaussian elimination

Leontief Input-Output models

Solve 2D and 3D linear programming problems via simplex algorithm

Counting and Probability

(5 days)

Fundamental Principle of Multiplication

Fundamental Principle of Addition

Permutations and Combinations

Definition of Probability Space

Computing probabilities for simple events

Review and Test (2 days)

Review for Final (1 day)

Grading

Three hour tests each counting 20% of the course grade.

Homework and quizzes counts 20% of the course grade.

Final exam counts 20% of the course grade.

Mathematics and Statistics Department
Meeting Minutes
October 12, 2007

Present: Boyd, Guy, Harper, Haskins, Hermann, Kim, Kitsul, W. Lee,
Pearson, Rahman, Regas, Singer, Stehr, Tsao,, Waters, Wiest, Yin, Zuiker.

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.