



## COURSE OUTLINE

**MAT138**  
Course Number

**Finite Mathematics**  
Course Title

**3**  
Credits

**3 lecture hours**  
Hours

**Catalog description:** An overview of topics in finite mathematics with applications. Topics include systems of equations, matrices, linear programming, probability and statistics.

*(This course is intended primarily for students in non-scientific / non-technical majors. Rutgers accepts this course as equivalent to their course for liberal arts majors.)*

**Prerequisite:** MAT135 or MAT141 or appropriate College Level Math placement test score.

**Corequisite:** None

**Required texts/other materials:**

1. Tan, S.T., Finite Mathematics for the Managerial, Life, and Social Sciences, 8<sup>th</sup> ed., Pacific Grove, CA: Brooks/Cole, 2006.
2. Scientific calculator

**Last revised:** N/A

**Course coordinator:** Prof. Paul Toppo

**Information resources:**

**1. Instructor's Solution Manual:** This publication gives detailed solutions to even-numbered exercises from the text.

**2. Student's Solution Manual:** This publication gives detailed solutions to odd-numbered exercises from the text.

Students are also highly encouraged to go to the Learning Center for additional information and/or tutoring.

**3. The Mercer County Community College Library** provides reference books that students may use.

**4. Information contained in the web pages cited below may be of use:**

a). <http://www.zweigmedia.com/ThirdEdSite/tcfinitep.html>  
*Stefan Waner and Steven R. Costenoble* On-Line Resources.

b). <http://www.langara.bc.ca/mathstats/resource/onWeb/rawlist.htm#Finite&Discrete>  
General resource link. Includes tutorials and practice exams.

c). <http://mathforum.org/discrete/discrete.html>  
A Math forum sponsored by Drexel University. Includes exercises, internet projects and a discussion forum.

d). <http://myweb.cwpost.liu.edu/aroCKETT/TextBook/FM-2nd.htm>  
This site provides access to the latest versions of the six Texas Instruments Graphing Calculator Programs and the nine Microsoft Excel worksheets for *Finite Mathematics* (2nd edition) by Geoffrey C. Berresford and Andrew M. Rockett

e). [http://infotrac.thomsonlearning.com/pdf/HS\\_Mathematics.pdf](http://infotrac.thomsonlearning.com/pdf/HS_Mathematics.pdf)  
Free database, resource center and mathematical writing tutorial offered by Thomson.

## Course Goals:

Upon completion of this course, the student will be able to:

1. Understand and use to good effect the interplay between geometry and algebra in mathematics.
2. Recognize and utilize the logical underpinnings in mathematics.
3. Acquire and develop a mathematical sense, or intuition.
4. Analyze, model and interpret “real-world” problems in mathematical terms.
5. Solve systems of linear equations, using algebraic and matrix methods.
6. Maximize and minimize functions subject to constraints, using geometrical and analytical methods.
7. Understand and apply the theory of sets.
8. Use counting methods (permutations and combinations) to solve combinatorial problems.
9. Use probabilistic and statistical methods to solve mathematical and “real-world” problems.

## Course-specific General Education goals and objectives

- ***Critical thinking, problem solving and information literacy:***

Students will use critical thinking and problem solving skills in analyzing information gathered through different media and from a variety of sources.

Through the study of equations, graphs and matrices of relations in data, the student will practice organizing and analyzing data in a way that can lead to valid conclusions.

"Internet Exercises" are provided on the companion website to the text and require searching for data or other information on the web. The authors of the text have provided a comprehensive list of web links and associated exercises to accompany each topic.

- ***Communication: Students will communicate effectively in writing:***

"Explore and Discuss" questions in the text take the concepts in each unit further and ask students to communicate with each other about how to answer the questions.

Group participation fosters evaluation, revision and editing of solutions.

Written assignments in the course:

- a project that includes an essay of at least 1100 words,
- homework assignments which include short essay questions in addition to some application and exploration problems,
- exam questions that require explanation and/or justification, in full sentences, of solutions.

- ***Quantitative skills: Students will apply appropriate mathematical concepts and operations to interpret data and to solve problems.***

Students will demonstrate competence in the use of numerical, graphical, and algebraic representations.

Students will demonstrate the ability to interpret data, analyze graphical information, and communicate solutions in written and oral form.

Students will demonstrate proficiency in the use of mathematics and algebra to formulate and solve problems.

- ***Science and technology:***

The main thrust of this and other mathematics courses is to take what is given and, by the use of the scientific method, to arrive at a valid conclusion.

Students will demonstrate proficiency in using handheld calculators to support their use of mathematics.

### **General Course Structure:**

**The method of instruction is primarily lecture, but may include some collaborative in and out of class work, at the discretion of the instructor. The basic evaluation instrument will consist of four tests and a comprehensive final but may well include group assignments, short projects, and a final project, again, at the discretion of the instructor. A suggested grading scheme appears at the end of the course outline. A suggested day-to-day schedule based on a 45 hour semester course are available from the course coordinator. This includes a test bank and suggested exercises from the text as well as a set of short projects.**

**The general course outline consists of five units:**

**Unit I:**

**(12 hours) System of Equations and Matrices (2.1-2.7)**

- A. Solving Systems of Linear Equations**
- B. Underdetermined and overdetermined systems**
- C. Solving Systems of Linear Equations using technology**
- D. Arithmetic of matrices**
- E. Determinants**
- F. Inverse matrices**
- G. Row and column vectors**
- F. The Leontief Input-Output Model**

**The student will be able to:**

- 1. Solve systems of linear equations using algebraic techniques.**
- 2. Learn and apply the arithmetic of matrices.**
- 3. Use matrix mechanics to solve systems.**
- 4. Predict the nature, and analyze and interpret the solutions of systems of linear equations.**
- 5. Decide whether a system is overdetermined or underdetermined.**
- 6. Apply systems of equations to “real-world” problems.**
- 7. Use determinants to find inverses of matrices.**
- 8. Apply the Leontief method of inputs and outputs to solve problems in economic.**

**Exercises from the text selected to reinforce and apply the above concepts to real-world situations should be completed. Applications include, but are not limited to, topics in the natural and social sciences.**

*A project exploring the Leontief economic model of inputs and outputs is provided in the day to day syllabus.*

**Specific applications which facilitate student goals include:**

- revenue from gasoline sales**
- mixtures**
- investments**
- diet planning**
- Inputs and outputs (Leontief Model)**

## **Unit II:**

**(10 hours) Linear Programming (3.1-3.3 and 4.1-4.2)**

- A. Graphing Systems of Linear Inequalities in Two Variables**
- B. The feasible region**
- C. Linear Programming Problems**
- D. The Simplex Method**

**The student will be able to:**

- 1. Define and determine corner points and feasible regions.**
- 2. Graph feasible regions.**
- 3. Optimize functions over feasible regions.**
- 4. Define and determine the simplex tableau.**
- 5. Use the simplex method to maximize functions.**
- 6. Use the simplex method to minimize functions.**
- 7. Solve “real-world applications.**

**Exercises from the text selected to reinforce and apply the above concepts to real-world situations should be completed. Applications include, but are not limited to, finance, agriculture, mining and advertising.**

**Specific applications which facilitate student goals include:**

- shipping schedules and costs**
- crop planning**
- allocation of funds**
- mining production**

### **Unit III:**

**(11 hours) Counting Techniques (Chapter 6)**

- A. Basic Set theory**
- B. Set operations**
- C. Venn Diagrams**
- D. Fundamental theorem of counting**
- E. Permutations**
- F. Combinations**
- G. Applications**

**The student will be able to:**

- 1. Define sets, set operations, and the cardinality of a set.**
- 2. Use set theory to solve mathematical and real-world problems.**
- 3. Define and apply counting arguments.**
- 4. Define and apply the multiplication principle.**
- 5. Define permutation.**
- 6. Define combination and distinguish it from a permutation.**
- 7. Apply permutations and combinations to solve counting problems.**

**Exercises from the text selected to reinforce and apply the above concepts to real-world situations should be completed. Applications include, but are not limited to topics such as games of chance, management, voting and sports.**

**Specific applications which facilitate student goals include:**

- surveys**
- combination locks**
- investment options**
- committee selection**
- blood typing**
- quality control**

## **Unit IV:**

**(12 hours) Probability and Statistics (Chapters 7 and 8)**

- A. Basic concepts**
- B. Addition rule**
- C. Multiplication rule**
- D. Independent events**
- E. Conditional probability**
- F. Bayes' theorem**
- G. Binomial probability**
- H. Applications**
- I. Samples and populations**
- J. Organizing data**
- K. Measures of central tendency**
- L. Measures of dispersion**
- M. Continuous random variables and the Normal Distribution**
- N. The Normal approximation to the Binomial Distribution**

**The student will be able to:**

- 1. Define and analyze sample spaces and events in the context of set theory.**
- 2. Define probability and enunciate the rules of probability.**
- 3. Use counting techniques to solve problems in probability.**
- 4. Define conditional probabilities.**
- 5. Define independence of events.**
- 6. Interpret conditional probabilities using probability trees.**
- 7. Apply the ideas of events, independence and conditional probabilities to solve mathematical problems.**
- 8. Learn and use Bayes' Theorem.**
- 9. Apply probabilistic techniques to "real-world" situations.**
- 10. Define and interpret distributions and random variables.**
- 11. Interpret data geometrically using a histogram.**
- 12. Determine and interpret the significance of the expected value of a random variable.**
- 13. Define and interpret expected value.**
- 14. Discuss in more detail the significance of distributions.**
- 15. Define, interpret and analyze the binomial and normal distributions.**
- 16. Apply statistical methods to "real-world" situations.**

Exercises from the text selected to reinforce and apply the above concepts to real-world situations should be completed. Applications include, but are not limited to topics in the natural and social sciences.

*A project on the “birthday problem” is included in the day to day syllabus.*

Specific applications which facilitate student goals include:

- investment analysis
- odds in games of chance
- sales, premiums and profits
- wage, age, grade and weight distributions

**Evaluation Of Student Progress:**

The following suggested grading scheme may be modified, at the discretion of the instructor.

Tests:

Unit I	10%
Units II and III	10%
Unit IV	10%
Collected Projects (3)	25%
In-class Quizzes, group work, etc.	15%
Final Exam	30%

**Academic Integrity Statement:**

Under no circumstance should students knowingly represent the work of another as one’s own. Students may not use any unauthorized assistance to complete assignments or exams, including but not limited to cheat-sheets, cell phones, text messaging and copying from another student. Violations should be reported to the Academic Integrity Committee and will be penalized. Please refer to pages 53-54 of the 2005-2006 Student Handbook.