

# Math 160 – Finite Mathematics

## Summer 2013 Course Syllabus

James Jones, Professor of Mathematics  
Mathematics & Sciences Division – Richland Community College

### Course Meeting Information

Section 01 meets from 8:00 to 9:50 a.m. on Monday, Tuesday, Wednesday, and Thursday in room S137.

### Instructor Information

James Jones, Professor of Mathematics.

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### Office Hours

Office hours are not required of faculty during the summer term. If you need help please email the instructor or see him before or after class.

### Text

*Finite Mathematics for Business, Economics, Life Sciences, and Social Sciences*, 12<sup>th</sup> edition. Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen. Copyright 2011, Pearson Education, Inc. ISBN 978-0-321-61401-8 (Required)

### Student Audience

Most students taking Finite Mathematics are business or accounting majors and are planning on taking introductory statistics. Most will transfer to another school.

### Prerequisite

The prerequisite is successful completion of Math 116, College Algebra, equivalent competencies, or the consent of the Dean of Mathematics and Sciences division.

### Course Description

#### *MATH 160 - Finite Mathematics*

Hours: 4 lecture - 0 lab - 4 credit

Mathematics 160, Finite Mathematics, is an introductory level course covering mathematical ideas needed by students of business management, social science, or biology. The topics include sets and counting, functions, introduction to probability and statistics, interest and annuities, matrix theory, linear systems, and linear programming.

Applicable toward graduation where program structure permits:

- Certificate or Degree - All Certificates, A.A.S., A.L.S., A.A., A.S.
- Group Requirement - Mathematics
- Area of Concentration - Mathematics

### Illinois Articulation Initiative (IAI)

The mathematics component of general education focuses on quantitative reasoning to provide a base for developing a quantitatively literate college graduate. Every college graduate should be able to apply simple mathematical methods to the solution of real-world problems. A quantitatively literate college graduate should be able to:

- interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them;
- represent mathematical information symbolically, visually, numerically, and verbally;
- use arithmetic, algebraic, geometric, and statistical methods to solve problems;
- estimate and check answers to mathematical problems in order to determine reasonableness, identify

alternatives, and select optimal results; and

- recognize the limitations of mathematical and statistical models.

Courses accepted in fulfilling the general education mathematics requirement emphasize the development of the student's capability to do mathematical reasoning and problem solving in settings the college graduate may encounter in the future. General education mathematics courses should not lead simply to an appreciation of the place of mathematics in society, nor should they be merely mechanical or computational in character.

To accomplish this purpose, students should have at least one course at the lower-division level that emphasizes the foundations of quantitative literacy and, preferably, a second course that solidifies and deepens this foundation to enable the student to internalize these habits of thought.

*Math 160, Finite Mathematics, satisfies the Illinois Articulation Initiative Definition of a General Education Mathematics Course. It corresponds to M1 906, Finite Mathematics.*

## General Course Objectives

While learning Finite Mathematics is certainly one of the goals of this course, it is not the only objective.

Upon completion of this course, the student should be able to ...

- demonstrate comprehension and understanding in the topics of the course through symbolic, numeric, and graphic methods
- demonstrate the use of proper mathematical notation
- use technology when appropriate and know the limitations of technology
- work with others towards the completion of a common goal
- use deductive reasoning and critical thinking to solve problems

## Specific Course Objectives

Upon completion of this course, the student should be able to ...

- solve finance problems involving compound interest, future value annuities, and present value annuities
- apply ordinary annuities to plan retirement or purchase of a house
- solve a system of linear equations having an unique solution, no solution, and many solutions
- transform between a system of linear equations and an augmented matrix
- read the solution to a system of linear equations from an augmented matrix
- use matrices to solve applied problems such as network flow, incidence matrices, and the Leontief input-output model
- graph a system of linear inequalities in two variables
- solve a linear programming problem with two decision variables graphically
- solve a linear programming problem using a table
- explain the simplex method
- apply the simplex method to solve a standard maximization problem
- apply the dual method to solve a standard minimization problem
- solve non-standard minimization and maximization problems
- understand basic logic
- find the union, intersection, complement of sets
- apply basic counting principles to determine the number of ways an event can occur
- use permutations and combinations
- find probabilities of simple and compound events
- find conditional probabilities including Bayesian probabilities
- find the expected value of a probability distribution
- apply the Bayesian (expected value), maximax, maximin, and minimax criteria to decision making
- solve regular Markov chain problems to find the long term probabilities of being in any state
- solve absorbing Markov chain problems to find the expected number of states encountered before exiting the system and find the long term probabilities of ending in any absorbing state
- solve strictly determined two player, zero sum games

- solve  $2 \times 2$  non-strictly determined games
- apply the simplex procedure to solve larger games

A detailed topical outline of the content covered in this course is at the end of this syllabus.

## **Type of Instruction**

Lecture, discussion, problem solving, and group work will be used. Students should come to class with a prepared list of questions.

## **Method of Evaluation**

Could include any of the following: problem solving exams, objective exams, essays, written papers, oral presentations, group and individual projects, quizzes, and homework.

## **Grading Policy**

Letter grades will be assigned to final adjusted scores as follows:

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

Consideration may be given to such qualities as attendance, class participation, attentiveness, attitude in class, and cooperation to produce the maximum learning situation for everyone.

The instructor will give you a grade sheet so that you can record your scores and keep track of your progress in the course. There is also a web page that you can use to check your grades throughout the semester. If you are concerned about your grades, see the instructor.

Assignments are due at the beginning of the class period on the date they are due. The instructor may be gracious and allow you to turn them in later that day without counting them late, but do not count on his graciousness. Late assignments lose 20% of their value per class period. The instructor reserves the right to apply this rule to missed exams as well as regular assignments.

## **Attendance Policy**

Regular attendance is essential for satisfactory completion of this course. Mathematics is a cumulative subject and each day builds on the previous day's material. If you have excessive absences, you cannot develop to your fullest potential in the course.

Students who, because of excessive absences, cannot complete the course successfully, are required to be administratively dropped from the class at midterm. If a student stops attending after midterm, it is the student's responsibility to withdraw to avoid an "F". Do not stop attending and assume that you will be withdrawn from the class by the instructor.

Although dropping students for non-attendance at midterm is required, students whose attendance is occasional or sporadic may be dropped from the class at any point during the semester at the instructor's discretion. The safest way to make sure you're not dropped for non-attendance is to continue to attend classes.

The student is responsible for all assignments, changes in assignments, or other verbal information given in the class, whether in attendance or not.

If a student must miss class, a call to the instructor (RCC's phone system has an answering system) should be made or an email message sent. When a test is going to be missed, the student should contact the instructor ahead of time if at all possible. Arrangements can usually be made to take the test before the scheduled time. If circumstances arise where arrangements cannot be made ahead of time, the instructor should be notified and a brief explanation of why given by either voice or email. This notification must occur before the next class period begins.

## **Calculators**

The Texas Instruments TI-83 or TI-84 graphing calculators will be heavily incorporated into the course .

Use of these calculators will allow the student to concentrate on the concepts being taught instead of the mechanical steps to solving the problems. It will allow the student to solve more problems in less time, and more difficult problems which would be too time consuming by hand. Calculators may be used to do homework. Calculators may be used on exams and/or quizzes in class unless otherwise announced.

The instructor has written several programs for the TI-82, TI-83, TI-84, TI-85, and TI-86 calculators that will be used in this course. These programs are not available for other Texas Instrument calculators or for any other brand of graphing calculator. It is expected that you will have a suitable calculator and bring it every day to class.

## **Homework**

Homework is crucial to your success in this course. There is a correlation between doing your homework and success in the course. Not only does the homework count towards your grade, but it also prepares you for the tests. Studies show that the average student will need to spend two hours outside of class for each hour in class. Do not expect to master the subject without doing homework.

## **Additional Supplies**

The student should bring paper, pencil, and their graphing calculator to class every day. In addition, colored pens/pencils and graphing (grid) paper will be useful at certain times. There will be a paper punch and stapler in the classroom.

## **Additional Help**

The student is encouraged to seek additional help when the material is not comprehended. Mathematics is a cumulative subject; therefore, getting behind is a very difficult situation for the student. There are several places where you can seek additional help in your classes.

You may use a recording device to record the lectures. Feel free to use a camera or cell phone to take pictures of the boards if you have trouble getting all of the information into your notes.

### ***Instructor***

I try to make myself as available to the students as I can. My office hours are listed at the beginning of this syllabus, but those are just the times I'm scheduled to be in my office. Grab me and ask me questions if you see me in the hallway. Ask questions before or after class. If I'm in my office and it's not my scheduled office hours, go ahead and stop in.

The instructor should be considered the authoritative source for material related to this class. If a tutor or other student says something that disagrees with the instructor, believe the instructor.

### ***Study Groups***

Probably the best thing you can do for outside help is to form a study group with other students in your class. Work with those students and hold them accountable. You will understand things much better if you explain it to someone else and study groups will also keep you focused, involved, and current in the course.

### ***Academic Success Center***

The Academic Success Center consolidates several student services into one area. It is located in the south wing of the first floor next to the Kitty Lindsay Learning Resources Center (library).

## **Testing**

The testing center is located in room S116. You must provide a photo identification and know the name of your instructor to use this service.

Quality tutors for the upper level mathematics are difficult to find. Please consider forming a study group among your classmates.

## **Tutoring**

The tutoring center provides tutoring on a walk-in or appointment basis in room S118. They also have computers with the mathematical software loaded on it.

## **Accommodations**

There are accommodations available for students who need extended time on tests, note takers, readers, adaptive computer equipment, braille, enlarged print, accessible seating, sign language interpreters, books on tape, taped classroom lectures, writers, or tutoring. If you need one of these services, then you should see Learning Accommodation Services in room C148. If you request an accommodation, you will be required to provide documentation that you need that accommodation.

## **Academic Dishonesty**

Each student is expected to be honest in his/her class work or in the submission of information to the College. Richland regards dishonesty in classroom and laboratories, on assignments and examinations, and the submission of false and misleading information to the College as a serious offense.

A student who cheats, plagiarizes, or furnishes false, misleading information to the College is subject to disciplinary action up to and including failure of a class or suspension/expulsion from the College.

## **Non-Discrimination Policy**

Richland Community College policy prohibits discrimination on the basis of race, color, religion, sex, marital or parental status, national origin or ancestry, age, mental or physical disability (except where it is a bonafide occupational qualification), sexual orientation, military status, status as a disabled or Vietnam-era veteran.

## **Electronic Communication Devices**

The Mathematics and Sciences Division prohibits the use of cell phones, pagers, and other non-learning electronic communication equipment within the classroom. All equipment must be turned off to avoid disturbances to the learning environment. If a student uses these devices during an examination, quiz, or any graded activity, the instructor reserves the right to issue no credit for these assignments. The instructor needs to approve any exceptions to this policy.

## **Topical Outline**

### ***Finance – 7 hours***

- Simple interest
- Compound interest
- Future value annuities
- Present value annuities

### ***Systems of Linear Equations and Matrices – 9 hours***

- Review of solving systems of linear equations
- Augmented matrices
- Gauss-Jordan elimination
- Equality, addition, subtraction, and multiplication of matrices
- Matrix equations and systems of equations
- Leontief Input-Output analysis

### ***Linear Programming – 18 hours***

- Systems of linear inequalities
- Geometric approach to linear programming
- Geometric approach to the Simplex method
- Standard maximization problems using Simplex
- Standard minimization problems using the Dual problem
- Non-standard maximization and minimization problems

### ***Logic, Sets, and Counting – 6 hours***

- Logic
- Sets
- Basic counting principles

- Permutations, combinations, and distinguishable permutations

### ***Probability – 8 hours***

- Sample spaces, events, and probability
- Joint frequency tables, Venn diagrams
- Unions, intersections, complements, odds, mutually exclusive events
- Conditional probability, intersections, independence
- Bayesian type problems
- Random variables, probability distributions, expected values
- Decision theory: expected value, maximax, maximin, minimax criteria

### ***Markov Chains – 6 hours***

- Properties of Markov chains
- Regular Markov chains
- Absorbing Markov chains

### ***Two-Player, Zero-Sum Games – 8 hours***

- Strictly determined games
- Mixed strategy games
- Geometric approach to  $2 \times 2$  games using linear programming
- Simplex approach to  $2 \times 2$  games using linear programming
- Extension of simplex method to  $m \times n$  games