

**LIB 112: Mathematics for Survival
January Term 2008**

A. Course Identification

Program Code & Course Number:	LIB 112
Course Title:	Mathematics for Survival
Meeting Days, Times & Location:	9-11am, 1-3pm, MTWThF, Hennessy 250
Dates when students will be off campus:	None
Prerequisite(s):	3 years of h.s. mathematics incl. one year of Algebra II or a grade of C- or better in MAT 091
Course Fee:	None

B. Instructor Information

Name:	Robert S. Keller, PhD
Office Number and Location:	Hennessy 209
Office Phone Number/Extension:	(588) - 7015
E-mail address:	Robert.keller@loras.edu
Best Way to Reach Me Outside of Class Time:	email or phone, please

C. Course Materials and Resources

Mathematics All Around, 3rd edition, T. Pirnot, Addison-Wesley, 2006

Additional resources may be required; these will be provided or made available to students during the course.

D. Course Objectives

By completing this course you will

- a. Gain skills and conceptual understanding from areas of mathematics encountered regularly in daily life, in particular the mathematics of personal finance, voting, and graph theory,
- b. Learn to appreciate the utility of mathematics for the human experience,
- c. Improve your competencies in problem solving, critical thinking, and teamwork, and
- d. Acquire knowledge of the use of Excel as a tool for describing financial transactions.

In addition, because this course satisfies the *Modeling with Mathematics* general education requirement, the course will fulfill additional objectives. In particular, upon completion of the course each student will

- a. Understand the mathematical modeling process and appreciate its value in representing and analyzing real world problems.
- b. Assess the “fit” of a model to a given problem by recognizing the strengths and limitations of the model.
- c. Analyze problems from a variety of disciplines and apply suitable models to situations similar to those studied in the course.
- d. Investigate the use of mathematical modeling in an area of interest or provide an in-depth analysis of a mathematical modeling problem.
- e. Use written and oral communication as tools to deepen his/her understanding of mathematical concepts and to interpret the modeling process in a given situation.
- f. Appreciate the role of mathematics in a liberal arts education and its contribution to life-long learning.
- g. Select and use appropriate technology tools including notebook computers and software packages such as EXCEL, DERIVE, and MATLAB.

E. Learning Outcomes, Assessment, and Grading

In this course students will actively learn and directly apply mathematics to model and explain real life problems. Students will often work in teams to solve problems posed in “case studies.” These will form the primary method by which students will learn the mathematical concepts covered in the course. Below are the learning outcomes of the course; in brackets after each are listed the way(s) by which each student’s level of understanding will be evaluated.

Students will

1. know the meanings of basic notions of graph theory (including circuits, paths, degree, etc) and be able to apply techniques to find circuits and paths in routing problems and know conditions under which these do not exist. [evaluation: exam 1]
2. be able to apply graph theoretic techniques to real world problems such as routing situations, networks, scheduling problems, and cartography. [evaluation: case studies 1-4]
3. know methods to solve linear, quadratic, and exponential equations, as well as create, use, and interpret graphs of linear, quadratic, and exponential functions [evaluation: exam 2]
4. be able to use algebra with technology (Excel) to model real world data using linear, quadratic, and exponential functions, judge the “fit” of these models, and interpret the meanings of numerical answers within the context of the problem [evaluation: case studies 5 and 6]
5. know and be able to use various voting methods (including Borda count, plurality, plurality with elimination, and pairwise comparison) given various voting schemes [evaluation: exam 2]
6. be able to discuss advantages and disadvantages to each voting method, argue for the one they believe is the ‘best’ choice of a method in a given situation and understand that no ‘perfect’ method exists (hence the term ‘winner’ will always remain subjective). [evaluation: case studies 7 and 8]
7. know how to use the various exponential models that describe investments in interest-bearing accounts, annuities, consumer loans, credit calculations, and mortgage and car loan amortizations in real-life situations, interpreting numerical answers to these models appropriately in terms of the situation. [evaluation: exam 3 and case studies 9-11]

Each learning outcome will also be evaluated via daily graded homework. Homework problems will be graded on a 0,1, or 2 point scale where 0 = “not done,” 1 = “good start,” or 2 = “more or less completely correct.” Daily informal “journaling” will also be used to help the instructor gain insight into each student’s level of conceptual understanding. Journal entries will also be graded on a 0,1, or 2 point scale. Case studies will be graded on a 20-point scale using a rubric that will be shared with students.

Each student’s final grade will be determined according to the following method:

30%	average of grades on the three exams
30%	average of grades on the case studies
15%	average of grades on assigned homework
15%	attendance and <i>active</i> participation
10%	average of grades on journal entries

F. Course Policies

Expectations for Class Participation and Attendance

Participation is critical for you to succeed in this course! You must be present and actively take part in each and every class meeting. If not, your grade will suffer. After each class session, I will assign a participation grade to each student (0 = “below average participation”, 1 = “average participation”, and 2 = “above average participation”). Inappropriate laptop usage will count against your participation grade.

For each class session (morning and afternoon count as separate sessions) for which you are absent, I reserve the right to lower your final course grade by one mark (for example B+ to B). Tardiness beyond 15 minutes will be treated as an absence. You will not be allowed to make up missing exams or case studies

due to absence unless you have contacted me and made arrangements before the day you will be gone. Late assignments will not be collected unless they have not yet been graded.

Occasionally, during a semester other College sponsored events conflict with scheduled classes or required course activities. College sponsored events covered by this policy include: intercollegiate athletic competitions, theater and choral performances, and debate. This policy does not cover the following types of activities: course field trips, practice for any college sponsored event, or academic/co-curricular conferences.

As a student you must:

1. Submit a copy of your team/organization's schedule to your instructors no later than the first week of class with all specific course conflicts highlighted.
2. Through oral and email notification, communicate with your instructor(s) at least one class prior to each class that you are scheduled to miss to coordinate how you will make up and turn in missed work. Your course syllabus may require greater advance notice of a pending absence. You are expected to make up coursework missed (or an appropriate equivalent) by the original due date.
3. Forward all relevant changes to the schedule to your instructors as soon as you are notified.
4. Submit all course syllabi and schedule of course commitments to coach/moderator as soon as possible.
5. It is a privilege to participate in college sponsored events. Students found to be intentionally abusing this policy will lose the opportunity to participate in college sponsored events.

The remainder of the College policy can be found at

<http://depts.loras.edu/academics/catalog/Programsandpolicies.html#attendance>

Statement on Academic Dishonesty

The College (including its students, faculty and staff) expects you to perform your academic duties sincerely. The policy is available online at

<http://inside.loras.edu/Academics/IQ/Documents/Academic%20Honesty%20Policy.doc>

Statement on Learning Disabilities

If you have a documented disability requiring academic adjustments for this class, please contact the Learning Disabilities Center at x7134 and make an appointment with a staff member to review your documentation and to determine appropriate, reasonable accommodations. Following the meeting, please make an appointment with me to discuss your accommodation request in light of the course requirements. You may self-disclose and request an academic adjustment any time during the semester. However, I strongly recommend that you do so as soon as possible because accommodations are not provided retroactively and adequate lead-time is required.

Statement on utilizing the Counseling Center

Having problems with classes, life, love or whatever? Call 588-7085 for an appointment or visit <http://inside.loras.edu/sites/counseling/default.aspx> for more information. When should you seek counseling? Often students enter the counseling process by saying, "I don't know if I really need to be here, but ..."

Here are some of the reasons that people come to counseling:

We work with students who are having problems with school, from specific problems such as difficulty with certain types of classes to lack of motivation; insecurity about what to choose for a career; difficulties with college life, such as conflict with roommates, feeling lonely or having trouble "fitting in"; problems with romantic relationships or questions concerning sexuality; troubles at home that cause stress at school; as well as more common emotional issues like feeling tense, stressed, anxious, irritable, or depressed. We help students who are having current difficulties because of past problems like sexual or physical abuse or incest. We also help with

students who are concerned about alcohol or drug use, dealing with eating problems, are experiencing difficulty grieving about a loss or are dealing with a crisis in their lives such as experiencing sexual harassment or other kinds of discrimination.

G. Course Calendar

Unit 1: Graph Theory – Chapter 3

Thursday January 3:

Introduction to Course expectations; basic graph theory (§3.1)

Case Study 1: a campus tour problem

Friday January 4:

Map coloring and scheduling problems (§3.1)

Case Study 2: a coloring or scheduling problem (these vary by group)

Monday January 7:

Traveling Salesperson problems (§3.2)

Case Study 3: return to the campus tour problem now with time constraints

Tuesday January 8:

Directed graphs (§3.3)

Case Study 4: a network/scheduling problem

Wednesday January 9:

Case study work and exam on graph theory material

Unit 2: Modeling with Algebra and Voting Theories – Chapters 6 and 10

Thursday January 10:

Modeling with Linear Equations (§6.1)

Case Study 5: Olympic High Jump Records (and others)

Friday January 11:

Modeling with Quadratic and Exponential Equations (§§6.2-3)

Case Study 6: Modeling CO₂ levels in the Atmosphere (and others)

Monday January 14:

Voting Methods (§10.1)

Case Study 7: the BCS ranking system (and others)

Tuesday January 15:

Defects in Voting Methods (§10.2)

Case Study 8: TBD (perhaps 2004 presidential election revisited)

Wednesday January 16:

Case study work and exam on algebra/voting theory material

Week 3: Consumer Mathematics – Chapter 11

Thursday January 17:

Interest (simple/compound), work with percents (§§11.1-2)

Case Study 9: your “Family” – Finance Simulation

Friday January 18:

Consumer Loans (§11.3)

Case Study 10: Buying on Credit

Monday January 21:

Annuities (§11.4)

Case Study 11: Bob and Bill Save for Retirement

Tuesday January 22:

Amortization (§11.5)

Case Study 9: continued work on family case study

Wednesday January 23:

Case study work and exam on consumer mathematics material

H. Bibliography or Supplemental Material

None

I. Disclaimer

Changes to the above syllabus may be made at the discretion of the instructor. However students will be be apprised of changes with as much advance notice as possible.