Math 113 - Introduction to Applied Statistics
Spring 2007 Course Syllabus

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

Course Meeting Information

Section 01 meets from 10:30 am to 11:40 am on Monday, Wednesday, and Friday in room S137.
Section 02 meets from 1:00 pm to 2:10 pm on Monday, Wednesday, and Friday in room S137.

Instructor Information

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Office Hours

These are the times I'm scheduled to be in my office. I often spend portions of my office hour in the classroom helping students, so if I'm not in my office, check room S137. If these times are not convenient for you, please see me to make an appointment for some other time.

Mon:	10:00 - 10:20 am; 12:00 - 12:50 pm, 2:20 - 2:50 pm
Wed:	10:00 - 10:20 am; 12:00 - 12:50 pm, 2:20 - 2:50 pm
Fri:	12:00 - 12:50 pm

Text

Essentials of Statistics, 2nd edition. Mario F. Triola. Copyright 2005, Pearson Education, Inc.
ISBN 0-201-77129-2 (Required).

Student Audience

Students who want or need additional mathematics, but do not want to take Math 116, College Algebra. Nursing students who intend to transfer to a four year institution that requires statistics. Students in the business area who wish to increase their mathematical knowledge.

Prerequisite

Successful completion (C or better grade) in Math 098 or satisfactory score on the Mathematics placement exam.

Course Description

MATH 113 - Introduction to Applied Statistics
Hours: 4 lecture - 0 lab - 4 credit
Math 113 is a beginning level course for the student in elementary applied statistics. Topics include basic statistical principles; graphic presentation; descriptive measures of central tendency, dispersion, and location; inferential statistics and hypothesis testing; analysis and inference of linear correlation coefficient and slope of regression line. Students will apply statistical concepts to real world situations. Current technology will be utilized in examining statistical information. A graphing calculator is required.

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: Not applicable.

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 113, Introduction to Applied Statistics, satisfies the Illinois Articulation Initiative Definition of a General Education Mathematics Course. It corresponds to M1 902, General Education Statistics.*

The IAI course description for M1 902 follows.

M1 902: General Education Statistics (3-4 semester credits)
Focuses on mathematical reasoning and the solving of real-life problems, rather than on routine skills and appreciation. Descriptive methods (frequency distributions, graphing and measures of location and variation), basic probability theory (sample spaces, counting, factorials, combinations, permutations and probability laws), probability distributions (normal distributions and normal curve, binomial distribution, and random samples and sampling techniques), statistical inference (estimation, hypothesis testing, t-test and chi-square test, and errors), correlation and regression, and f-test and analysis of variance. Prerequisite: C or better in intermediate algebra and geometry.

For more information on the Illinois Articulation Initiative, visit their website at http://www.itransfer.org/

General Course Objectives

While learning statistics 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

In all of the following objectives, the student should be able to think, show, and tell what is happening. Concentration will not be on the memorization of formulas but on the conceptual understanding of the statistics. Technology will be heavily emphasized to obtain the results, but the emphasis is on the statistics, not the technology.

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

- describe a sample and know which statistics are appropriate for measuring center and spread of the data
- display categorical and quantitative data using pie charts, histograms, contingency tables, frequency distributions, scatter plots, and box plots as appropriate
- understand randomness, sampling techniques, and experiments
- determine probabilities using probability rules and simulation techniques
- find the mean and standard deviation of a probability distribution
- understand and use the binomial distribution
- work with the normal distributions and determine if populations are normally distributed
- understand the properties of the standard normal distribution
- understand the sampling distribution models for means and proportions
- find confidence intervals for proportions and means of one and two samples
- conduct hypothesis tests for proportions and means of one and two samples
- apply the classical approach, p-value approach, and confidence interval approach to hypothesis testing
- find and test the significance of the linear correlation coefficient
- find and use the regression equation
- compare different models in multiple regression (time permitting).
- perform chi-square goodness of fit tests and test for independence
- conduct one-way and two-way (time permitting) analysis of variance problems
- understand the workings of the analysis of variance table and its application to simple regression, multiple regression, one-way ANOVA, and two-way ANOVA situations.

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

Type of Instruction

Discussion, problem solving, activities, individual and group work, student questions, student participation, and lecture. Students are expected to have read the material before class and are strongly encouraged to come to class with a list of questions and to ask these questions.

Method of Evaluation
Could include any of the following: problem solving exams, objective exams, essays, research papers, oral presentations, group projects, individual projects, classroom participation, classroom activities, 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.

Special Projects
Several special projects may be included in the course requirements. These will be selected from videotape reviews, research papers, research projects, group projects, and a mathematics notebook.

There will be a major project the second half of the semester requiring a written paper and a classroom presentation.

Written Work
All written work should be in a typed (word processor) format. There should be a cover page with the title of the assignment and the student's name. All work should be double spaced. Papers are to be stapled together in the upper left hand corner. All reference works used, including books, videos, etc., are to be cited using APA (preferred) or MLA notation. All work is to utilize the English language correctly. It is suggested that the Student Learning Center be utilized for assistance in the preparation of written work. If written work is submitted late, the instructor may take appropriate deductions from the grade.

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. Under certain circumstances, arrangements can 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. At the instructor's discretion, the score on the final exam may be substituted for the missed exam.

Calculators

A calculator is required for this course. It does not have to be a graphing calculator, but it should be a scientific calculator with the ability to square a number and find the square root of a value. You are responsible for knowing how to use your calculator. If you do not know, then ask. Bring the calculator every day to class.

Additional Supplies

The student should bring a pencil, paper, and calculator to class each day. You may occasionally want a ruler or graph paper. There will be a paper punch and stapler in the classroom.

Homework

Homework out of the book may be collected for a grade. Even if it is not, the student should work as many problems as necessary to ensure a good understanding of the concepts.

Classroom Activities

This is an *applied* statistics course. We will be doing many hands-on activities during the course of the semester that require the student's presence to help gather data. If a student misses a day that is scheduled for a classroom activity, the student may request the activity sheet from the instructor, but it will not be worth more than 50% of its value. Classroom activities lose 20% of its original value for each class period late. It is the responsibility of the student to request the activity from the instructor.

Computer Software

In this course, we will concentrate on understanding the statistics and relegate the roll of finding the statistics to technology. Here is a list of the computer packages we will be using in this course.

Minitab

Minitab is the statistical software package of choice for this class. It is powerful and makes nice graphs.

However, you may not take Minitab home, it must be used here at Richland. It is installed on the computers in your classroom and the machines in the open computer lab, C239. There is a 30 day trial version of Minitab available on the web for downloading at http://www.minitab.com/. You may also purchase a five month copy that will last the entire semester. If you want to download the trial version, you may want to wait until the last month of the semester when we are using it more heavily. Minitab is fairly easy to use if you are familiar with a spreadsheet like Excel.

Statdisk

Statdisk is software that was written by the author of the textbook and comes free with the textbook. There may be updated versions available online at http://www.aw-bc.com/triola/

This is a small, easy to use program that you can use at home to perform statistical analysis. It is not as powerful as Minitab but it is free to use since we have adopted the textbook.

Semester Projects

This is an *applied* statistics course. We will be doing a several projects in this course that require group work. Some time will be allocated in-class for participation, but there will be time outside of class required, also. Computer software will be used for analysis of the data.

Some of these projects will be designed by the instructor and involve the entire class. One of the projects will be a small group project designed by each individual group and approved by the instructor.

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.

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.

Video tapes
There is a video tape series called "The High Stakes World of Statistics" that is on reserve in the Learning Resources Center. While not specifically tailored for our text, they do present an overview of statistics in a non-classroom setting. Celebrity guests and college students make statistics exciting and understandable. Sometimes there are problems with the accuracy of the videos, but generally speaking, they are a good resource.

Student Learning Center
The Student Learning Center is located in rooms S116, S117, and S118. There is mathematics tutoring available in room S116. The Student Learning Center and the tutoring is a service that Richland Community College offers you free of charge.

Learning Accommodation Services
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 C136.
If you request an accommodation, you will be required to provide documentation that you need that accommodation.

Some of you will need additional time on tests. There is no need to go to learning accommodation services to request that. If you need additional time, just let me know and in most cases, I'll allow you to continue working past the allotted time. You may need to move to another room as there may be another class coming into your room. If you're unable to finish the test by staying late, it may be possible to start the test earlier to gain additional time. There may be circumstances where extra time is not allowed.

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

Hours	Topic
2	**Introduction to Statistics** • Introduction to statistics and data • Ways of classifying data, levels of measurement • Critical thinking skills • Types of sampling, design of experiments
9	**Describing, Exploring, and Comparing Data** • Frequency distributions • Visualizing categorical data, frequency distributions, bar charts, contingency tables • Visualizing quantitative data, histograms, dot plots, stem and leaf plots • Describing a distribution: shape, center, spread • Measures of center: mean, median, mode, midrange • Measures of variation: range, variation, variance, standard deviation; empirical rule, Chebyshev's rule • Measures of relative standing: z-scores, quartiles, percentiles, interquartile range • Exploratory data analysis: box plots, five number summary, outliers
8	**Probability** • Fundamentals • Addition rule for "or" and multiplication rule for "and" • Tree diagrams • Conditional probabilities • Counting techniques
4	**Probability Distributions** • Random variables • Mean, variance, and standard deviation of a random variable • Binomial distributions • Mean, variance, and standard deviation for binomial distribution

Hours	Topic
6	**Normal Probability Distributions** • Standard normal distribution. Finding areas from z-scores and z-scores from areas. • Applications of the normal distribution. Converting from and to raw scores. • Sampling distributions and estimators • Central Limit Theorem
4	**Estimates and Sample Sizes** • Estimating a population proportion including confidence intervals • Estimating a population mean including confidence intervals • Student's t distribution
8	**Hypothesis Testing** • Fundamentals • Classical approach comparing test statistic to critical value • Probability value approach comparing p-value to significance level • Confidence interval approach comparing claimed value to confidence interval • Types of errors, significance level, p-value • Decisions vs conclusions • Testing a claim about a single population proportion • Testing a claim about a single population mean
5	**Inferences from Two Samples** • Testing a claim about two independent population proportions • Testing a claim about two independent population means, including pooling variance • Testing a claim using two dependent or paired samples
6	**Correlation and Regression** • Linear correlation • Hypothesis test for correlation • Regression analysis, finding regression equation from summary statistics and correlation coefficient • Explained, unexplained, and total deviations • Coefficient of determination • Table of coefficients and Analysis of Variance. F distribution. • Multiple regression, adjusted R squared (time permitting)*
9	**Chi-Square and Analysis of Variance** • Chi-square distributions • Chi-square goodness of fit test (multinomial experiments) • Chi-square test for independence, test for homogeneity • One-Way Analysis of Variance • Two-Way Analysis of Variance (time permitting)*

The multiple regression and two-way ANOVA sections are not covered in the textbook. They will be covered in class if time permits.