Math 113 – Intro to Applied Statistics
Summer 2015 Course Syllabus

James Jones, Professor of Mathematics

Mathematics & Sciences Division – Richland Community College

Course Meeting Information

This course meets Monday, Tuesday, Wednesday, and Thursday from 8:00 – 9:50 am, beginning June 1, 2015, and continuing through July 23, 2015. The class meets in room S137 on the main campus of Richland Community College in Decatur, IL.

Instructor Information

James Jones, Professor of Mathematics

Phone: 217-875-7211, ext 490

Email: james@richland.edu

Office: C223

Web: https://people.richland.edu/james/

Canvas: https://richland.instructure.com

The best way to contact the instructor outside of class is through Canvas or by email. Please do not leave a voice mail as it will not reach the instructor in time to help you.

Office Hours

Faculty are not required to hold office hourse during the summer term. However, the instructor has asked that the classroom be reserved at 10:00 am, immediately following our class, in case students need help. If you anticipate needing help, please let him know ahead of time so that he can make childcare arrangements.

Text

Most of the material in the course will be presented through lecture and web pages. For those who wish to have a book for reference purposes, here is one that will work (and is inexpensive).

The Complete Idiot's Guide to Statistics, 2nd edition. Robert A. Donnelly, Jr. Copyright 2007, Alpha Books. ISBN 978-1-59257-634-0 (Optional).

Student Audience

Transfer students in all disciplines. This is a general education course that meets the mathematics requirements for graduation, it does not lead to another course in statistics.

Prerequisite

All of the following: (1) Successful completion (C or better grade) in MATH 098 - Intermediate Algebra, an ACT mathematics score of at least 22, or a satisfactory score on the Mathematics placement exam, (2) successful completion (C or better grade) in MATH 095 - Geometry or one year

of high school geometry, and (3) eligibility for ENGL 101 - Composition 1.

Course Description

MATH 113 - Introduction to Applied Statistics
Hours: 4 lecture - 0 lab - 4 credit

Math 113 is a general education statistics course that uses current technology to allow focusing on mathematical understanding instead of routine calculations. Descriptive statistics covered include frequency tables, graphs, and measures of location and variation. Topics from probability include probability rules, counting techniques, and probability distributions. Inferential statistics will cover estimation, confidence intervals, hypothesis testing, and probability values. Statistical methods covered include the one and two sample t-tests, one and two proportion tests, chi-square goodness of fit and test for independence, correlation, regression, and analysis of variance. This course makes heavy use of technology to solve problems involving real data.

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 Illinois Articulation Initiative is a statewide transfer agreement. Their website is at http://www.itransfer.org.

Math 113, Introduction to Applied Statistics, satisfies the Illinois Articulation Initiative Definition of a General Education Mathematics Course. It corresponds to M1902, General Education Statistics.

Guidelines for Assessment and Instruction in Statistics Education (GAISE)

The GAISE College Report was written in 2005 and is endorsed by the American Statistical Association (ASA) and the American Mathematical Association of Two-Year Colleges (AMATYC). It presents a guideline of what should be contained in an introductory statistics course.

GAISE Recommendations

There are six recommendations of the GAISE report. This course follows these recommendations:

Emphasize statistical literacy and develop statistical thinking.
Use real data.
Stress conceptual understanding, rather than mere knowledge of procedures.
Foster active learning in the classroom.

Use technology for developing concepts and analyzing data.

Use assessments to improve and evaluate student learning.

GAISE Goals

In addition, there are 22 goals listed in the GAISE report. This course seeks to meet these goals:

Students should believe and understand why:

Data beat anecdotes

Variability is natural, predictable, and quantifiable

Random sampling allows results of surveys and experiments to be extended to the population from which the sample was taken

Random assignment in comparative experiments allows cause-and-effect conclusions to be drawn

Association is not causation

Statistical significance does not necessarily imply practical importance, especially for studies with large sample sizes

Finding no statistically significant difference or relationship does not necessarily mean there is no difference or no relationship in the population, especially for studies with small sample sizes

Students should recognize:

Common sources of bias in surveys and experiments

How to determine the population to which the results of statistical inference can be extended, if any, based on how the data were collected

How to determine when a cause-and-effect inference can be drawn from an association based on how the data were collected (e.g., the design of the study)

That words such as "normal," "random," and "correlation" have specific meanings in statistics that may differ from common usage

Students should understand the parts of the process through which statistics works to answer questions, namely:

How to obtain or generate data

How to graph the data as a first step in analyzing data, and how to know when that's enough to answer the question of interest

How to interpret numerical summaries and graphical displays of data—both to answer questions and to check conditions (to use statistical procedures correctly)

How to make appropriate use of statistical inference

How to communicate the results of a statistical analysis

Students should understand the basic ideas of statistical inference, including:

The concept of a sampling distribution and how it applies to making statistical inferences based on samples of data (including the idea of standard error)
The concept of statistical significance, including significance levels and p-values
The concept of confidence interval, including the interpretation of confidence level and margin of error

Finally, students should know:

How to interpret statistical results in context
How to critique news stories and journal articles that include statistical information, including identifying what's missing in the presentation and the flaws in the studies or methods used to generate the information
When to call for help from a statistician

Course Objectives

In addition to the goals and objects defined in the GAISE report, upon successful completion of this course, a student should be able to:

Create and interpret graphical representations of data.[3]
Use technology when appropriate and know the limitations of technology.[3]
Work collaboratively with others towards the completion of a common goal.[1,3,4]
Use deductive reasoning and critical thinking to solve problems.[2]
Apply common sense to mathematical problems.[2]
Determine whether a statement can be proved or must be assumed.[2]
Plan an experiment, gather and analyze the data, and interpret the results.[1,2,3]
Explain the statistical results using common language.[1,3]
Read a scenario and determine the proper statistical method for analyzing the data.[2,3]
Effectively communicate the student's understanding of the subject.[1,3]

The numbered superscripts refer to the Richland Cross-Disciplinary Outcomes addressed by that objective.

Topical Outline

This course is going to be data driven and fluid. Instead of having a textbook that defines how much time is spent on each topic, it will be the data that defines how much time is spent. We will take a data set and fully explore it, beginning with the context of the data, describing it visually and numerically, and then using inferential statistics to perform confidence intervals and hypothesis tests. When we have exhausted one set of data, we will move on to another and repeat the process to learn new material.

That makes defining how much time will be spent on each topic very difficult. The following topical outline is an estimate of how much time will be spent on each topic and is aligned with the chapters in the textbook. However, we won't be using learning the material in this order.

Descriptive Statistics – 14 hours
Introduction to statistics and data
Ways of classifying data, levels of measurement
Critical thinking skills
Charts and graphs: Frequency distributions, bar charts, stem and leaf plots
Describing a distribution: shape, center, spread
Measures of center: mean, median, mode, midrange
Measures of spread: range, variation, variance, standard deviation, interquartile range
Measures of shape: Empirical rule, Chebyshev's rule, skewness, kurtosis
Measures of relative position: quartiles, percentiles, midquartile

Probability – 14 hours
Fundamentals of probability
Probabilities from frequency tables
Unions and intersections
Addition rule for "or" and multiplication rule for "and"
Tree diagrams
Conditional probabilities
Counting techniques
Random variables
Mean, variance, and standard deviation of a discrete random variable
Binomial and multinomial distributions
Mean, variance, and standard deviation for binomial distribution
Standard normal distribution. Finding areas from z-scores and z-scores from areas.
Applications of the normal distribution. Converting from and to raw scores.

Inferential Statistics – 15 hours
Randomization testing
Types of sampling and sampling errors
Sampling distributions and the Central Limit Theorem
Student's t distribution
Sampling distributions for proportions
Confidence intervals for the population mean and population proportion
Hypothesis testing fundamentals

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 mean and proportion

Testing a claim about two population means and proportion

Paired samples t-test

Advanced Inferential Statistics – 18 hours

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)*

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 optional textbook. They will be covered in class if time permits.

Type of Instruction

Instruction in this course will primarily occur through project-based learning. Along with this, we will use discussion, problem solving, activities, individual and group work, student questions, student participation, reading, interactive quizzing, 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. A substantial portion of this class will involve collaborative work with other students.

Method of Evaluation

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.

Concepts (50%)

This course will use a non-traditional approach to evaluation. There will be no exams. Instead, the course will be project-based with near-daily assessment of your progress. These regular assessments will, for the most part, be incorporated into the class presentation. The instructor will ask questions; you will provide feedback, and that will be used to help determine your grade. You will provide your responses electronically so that you can get immediate feedback on whether or not you understand the material and the instructor can get a sense of where the class is. The instructor can then use this information to make adjustments in the schedule. Because these are incorporated into the course, there is no way to make up these assessments if you miss class.

Other times the feedback will be used to assess how well you have learned and can apply the concepts being taught. In these cases, you will be awarded points for providing the correct answers to the questions. Some instructors drop the lowest quiz (or two), but because these assessments will be worth different amounts of points, that becomes difficult to do. Instead, there will be a 10% grace factor applied to these in-class assessments. That means that if you take a 10 point quiz, it will get recorded in the grade book as being a 9 point quiz. If you happen to score 10 points on it, then you have a little extra to help your grade. These points cannot be made up if you miss class.

Quizzes within Canvas may be used to assess concepts as well. These are usually untimed with multiple-attempts and are open for more than one day. The answers become available after the quiz closes, so quizzes cannot be made up or completed after the due date. There is no 10% discount applied to the Canvas quizzes.

Both in-class interactive assessments and Canvas quizzes make up Conceptual understanding will compose 50% of your overall grade in the course.

Projects (40%)

The other main component of the course will be projects. Some of these projects will be individual and some of them will involve group work. Projects will compose 40% of your overall grade in the course. Projects are due at 5:00 pm on the due date. For the mini-projects, which are essentially quick group projects worked over 1–2 days in class, lack of attendance will lower your grade proportional to the amount of class you missed. Projects may be turned in late, but they will lose 20% of their value for each class period they are late.

Participation (10%)

Sometimes your responses to quizzes will be used as a participation grade. When this happens, you are awarded points for being in class and providing feedback. It doesn't matter whether or not you get the right answer and sometimes there won't even be a right answer.

Other times we will be gathering data to use and your participation is needed to help obtain the information.

Participation will compose 10% of your overall grade in the course. These points cannot be made up if you miss class.

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%

Normal rounding will occur, so a 79.5% will round up to 80% and be considered a "B".

The final score will be weighted according to these three categories:

Concepts: 50%   Projects: 40%   Participation: 10%

All grades will be entered into the Canvas learning management system. Canvas has a What-If feature that allows you to play around with your grades. If you are concerned about your grades, see the instructor.

Scoring is subject to revision if mistakes are found in the grading. This is especially true with Canvas quizzes. Your grade may increase or decrease when this happens. For this reason, you should strive to do better than the minimum needed.

There is no rounding of grades or extra credit in this course beyond the 10% grace factor on the in-class concept assessments. The course is a marathon, not a sprint at the end. You must perform consistently throughout the semester to earn a good grade. If you are one point short of the next higher grade at the end of the semester, you will get the lower grade.

Concept grades and participation points cannot be made up.

Projects will be due at 5 pm on the due date unless otherwise noted. Late projects lose 20% of their original value per class period. The student must notify the instructor that late work has been submitted.

No late work will be accepted after the final.

Written Work

All written work should be submitted in electronic form. There should be a cover page with the title of the assignment and the student's name. Headings should be used appropriately to mark-up the document. All reference works used, including books, videos, etc., are to be cited using APA style – do not use MLA. All work is to utilize the English language correctly. It is suggested that the Academic Success 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

If you miss the first day of class or any two consecutive days after that without communicating with the instructor, you may be dropped.

Attendance is recorded every class period. Since the course does not directly follow a textbook, attendance is the primary method of obtaining the information in the course. Statistics is a cumulative subject and each day builds on the previous day's material.

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.

The student is responsible for all assignments, changes in assignments, or other verbal or written information given in the class, whether in attendance or not. There will be some kind of assessment almost nearly every day as part of the classroom presentation. These may not be made up if you miss class (you may attend the other section of the course on the same day provided that there are available seats).

If a student must miss class, the student should notify the instructor by email (preferred) or phone.

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 how to use your calculator, then ask. Bring the calculator every day to class.

Most of you will have a smartphone that has a suitable calculator app. The official Mathematics & Sciences division policy is to not allow the use of "non-learning electronic devices" within the classroom. While a calculator is preferred, you may use your smartphone as long as it does not become a distraction or impediment to learning.

Collaborative Work

This is an *applied* statistics course. We will be doing several activities and projects in this course that require group work. Much of this time will be spent in the classroom, but there will also be time outside of class required. 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 capstone project designed by each individual group and approved by the instructor. This project will include a written paper and oral presentation of the results to the class of

their findings.

Technology

The use of technology in this course is consistent with the Technology Statement in the Illinois Mathematics & Computer Science Articulation Guide (IMACC, 2013, p. 4). Technology is used to enhance the learning of Statistics, but it is not the focus of the instruction.

This course makes heavy use of technology. It is highly recommended that students be familiar with the following software before attempting this course: e-mail, internet web browser, word processor, spreadsheet, and presentation software. In addition, students should be able to perform file navigation and understand the different types of files and the role of file extensions in naming. Richland offers free workshops for students who need additional computer literacy skills. Students who have weak technology skills may feel overwhelmed by the technology used in the class.

Most of the technology we're going to use is free, open source, or web-based so that there is no additional cost to the students and you can use them after you leave this course. Some software is commercial, but in those cases, Richland Community College has a license to use them. Here is a list of some of the computer packages we may use in this course.

Canvas

Instructure's Canvas project is the learning management system used by Richland Community College.

If there are non-technical issues inside Canvas, like content not appearing or wrong answers on a quiz, please contact the instructor.

If you are experiencing technical issues with Canvas, please click the "Help" button at the top right of the screen and "Report a Problem". The reporting of problems by users is a vital part of how Canvas becomes aware of issues with the system.

It is available at https://richland.instructure.com

Minitab

Minitab, version 17, is the statistical software package of choice for this class. It is powerful and makes decent graphs. Minitab is fairly easy to use if you are familiar with a spreadsheet like Excel.

Minitab is installed on the computers in S137, the Academic Success Center, and the Open Computer Lab. Richland's license for Minitab does not allow for home use, but students will be able to get most of their work done at school. There is a 30 day trial version of Minitab available on the web for downloading at http://www.onthehub.com/minitab. You may also purchase a six month copy that will last the entire semester. Minitab 17 is available only for Windows.

You might see a program called Minitab Express. Although it works with both Windows and

Macintosh, it is not as full-featured and they have simplified the interface to the point that it becomes unable to do all that we need it to do.

Google Drive

This class is very collaborative in nature; there will be a lot of group work. In previous semesters, we've used MediaWiki as a collaboration tool, but the learning curve on it was pretty steep and students began to feel the class was about the technology rather than about statistics. Google Drive is very easy for most students to use and so time can be spent on the statistics rather than the technology.

Google has an online system called "Google Drive" (*formerly called Google Docs*) that provides access to documents, spreadsheets, presentations, forms, and drawings. With the exception of the forms, these can be shared and edited by more than one user at a time.

Google Docs also integrates directly with Canvas, so that you can start a Google Doc collaboration from within Canvas and pick the classmates you would like to work with. For this to work, you need a Gmail address and to perform a one-time integration between Canvas and Google Docs.

Google Drive is available at https://drive.google.com

Question Press

Question Press is a web-based classroom and audience response system. It allows for interactive quizzing, feedback, and participation. It works from desktop computers and mobile devices and will be the main instrument used for assessing classroom performance.

The instructor's Question Press page is at http://www.questionpress.com/james

StatKey

StatKey is an online statistics package written by Lock, Lock, Lock, Lock, and Lock. Although we're not using their textbook, they've made the tool freely available over the Web. We will use this package for randomization testing.

The StatKey software is at http://lock5stat.com/statkey/

Microsoft Excel

Microsoft Excel is a spreadsheet. Since Minitab is commercial software and not widely available, we'll do some work in Excel. Once you leave this class, you are much more likely to use Excel than Minitab or StatKey.

Microsoft Office 365, which includes Word, Excel, PowerPoint, Access, and Publisher, is available free to students enrolled in credit courses at Richland through the Microsoft Student Advantage program. More information is available at https://jics.richland.edu/MicrosoftStudentAdvantage/

Other Software and Websites

This course is fluid and other software packages or websites may be incorporated into the 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.

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. Ask questions before or after class. Grab me and ask me questions if you see me in the hallway.

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.

Mathematics Enrichment Center

The Mathematics Enrichment Center, located in W117, provides free walk-in tutoring for mathematics courses. There are additional locations available at the Clinton and Fairview extension centers.

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.

Tutoring

The tutoring center provides tutoring on a walk-in or appointment basis in room S118. Students seeking mathematics tutoring should visit the Mathematics Enrichment Center.

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.

Online Learning

Despite the title, Online Learning provides help with much more than just your online courses. They provide technical support for students including answering questions about Canvas, myRichland, e-mail, cell phones, tablets, and laptops. They can also help troubleshoot your computer issues and make sure your computer is ready for course work.

They are located in room W143, but the best way to contact them is through the "Help" link in the upper-right corner of Canvas or at http://www.richland.edu/online/helpdesk.

Open Computer Labs

Students often wish to know where, besides the classroom, they can go to use the software. There are computers located in the Learning Resources Center and in the Academic Success Center that you may use.

College & Division Policies

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.

College Services

There are some additional services that Richland provides to its students. While they may not directly pertain to this class, you may benefit from them.

Learning Feedback System

At the end of each semester, students are invited to provide feedback to their instructors about the course. This includes things that went well and opportunities for improvement. This online feedback is anonymous and the instructor won't see it until grades have been turned in.

The Learning Feedback System (LFS) is primarily intended to provide feedback to the instructor. However, if you have a issues or concerns, you should not wait until the end of the semester to talk to your instructor. Please come to me at any time. The feedback system is available at https://people.richland.edu/feedback.

myRichland

myRichland is the student information system portal and is located at https://my.richland.edu.

You may use it to find the course schedule, register for classes, check your grades, obtain unofficial transcripts, review financial aid, and other student services.

Library

The Learning Resources Center (LRC) has print and electronic resources available. They offer research assistance and information literacy sessions; they also have individual and group study areas.

Student Success Center

Temporarily located in the Workforce Development Institute (WDI) building, the Student Success Center is designed to be a one-stop shop for most student services. These include advising and registration, career services, counseling services, financial aid, veteran affairs, student records, and the transfer center.

There are a few other student services that are still in the main building. These include Campus Life, which supports new student orientation, clubs, organizations, and student leadership, and the TriO program that offers academic and personal support to first-generation, low-income, and students with disabilities.

Directory of Student Services

The main phone number for Richland Community College is 217-875-7211. This is an automated system available 24 hours a day. If you would like to speak to an operator, then call 217-875-7200 during normal business hours.

Student Service	Location	Extension
Accommodations	C148	379
Advising and Registration	WDI	267
Campus Life	C131	243
Career Services	WDI	305, 243
Counseling Services	WDI	252
Financial Aid and Veteran Affairs	WDI	274
Library	C152	303
Online Learning Support	W143	376
Mathematics Enrichment Center	W117	383
Student Employment	WDI	205
Student Records	WDI	257
Student Support Services/TRiO Program	C143	440
Testing	S116	238
Transfer Center	WDI	222
Tutoring	S118	419
Veteran Services	WDI	307, 205

Richland Cross-Disciplinary Outcomes

The course objectives listed in this document make reference to these items.

1. The degree-seeking student will be able to communicate effectively (read, write, speak and listen).
2. The degree-seeking student will think critically and creatively.
3. The degree-seeking student will act professionally and responsibly.
4. The degree-seeking student will manage technology and evaluate information in various research and applied contexts.