ITT Technical Institute

MA3110

Statistics

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 45 (45 Theory Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisites: EN1320 Composition I or equivalent, MA1210 College Mathematics I or equivalent

Course Description:

This course introduces descriptive and inferential statistics. Topics include probability and probability distributions, confidence intervals, hypothesis testing and linear regression.

Where Does This Course Belong?

Program Information

Program Scope and Core Content Areas

General Education courses include courses in the humanities, composition, mathematics, the sciences, and the social sciences.

Program Goals and Objectives

General Education courses are designed to provide ITT Tech students with a well-rounded education in the context of their technical programs. Each course emphasizes one or more of ITT Tech's General Education Student Learning Outcomes.

1. The student will be able to demonstrate personal responsibilities
2. The student will be able to analyze information.
3. The student will be able to solve complex problems.
4. The student will be able to communicate effectively in oral, written and visual forms.
5. The student will be able to contribute as a member of a team.
6. The student will be able to pursue lifelong learning opportunities.

Career Impact

General Education courses provide breadth to a core technical program. Courses in General Education are intended to broaden a student's educational experience, and therefore, broaden his/her perspective.

Course Summary

Major Instructional Areas

1. Describing data
2. Probability distributions
3. Hypothesis testing
4. Correlation and regression
5. Contingency tables
6. Statistical process control

Course Objectives

1. Explain the fundamentals of a statistical study.
2. Use statistics to conduct and summarize an observation that has both qualitative and quantitative components with graphs and charts and in writing.
3. Calculate probabilities by using counting principles.
4. Interpret a normal distribution and make calculations using standard scores.
5. Construct confidence intervals and use them to interpret population means.
6. Formulate null and alternative hypotheses for claims made about population means.
7. Use an appropriate statistical technique to test a hypothesis.
8. Describe the linear association for a set of paired data.
9. Use linear regression for prediction.
10. Use Excel to create visual summaries of data and for inferential statistical testing.
11. Create a statistical process control chart.
12. Interpret a contingency table and conduct the corresponding test of goodness-of-fit.
13. Make a presentation of a problem solution.
14. Use the ITT Tech Virtual Library to research statistical topics as assigned.

Learning Materials and References

Required Resources

Textbook Package	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
Triola, M. F. (2010). *Elementary statistics using Excel* (4th ed.). Boston: Addison-Wesley.	■		
Other Items	**New to this Course**	**Carried over from Previous Course(s)**	**Required for Subsequent Course(s)**
Microsoft Excel 2010		■	

Recommended Resources

ITT Tech Virtual Library (accessed via Student Portal)

- Research Help Tab
  - How to Use a Periodical Database
- EbscoHost Academic Search Elite (accessed by selecting the Periodicals tab)

Books, Professional Journals

- *Chance:* http://chance.amstat.org/
- *Journal of Business & Economic Statistics:* http://www.amstat.org/publications/jbes.cfm
- *Journal of Marketing Research*

http://www.marketingpower.com/AboutAMA/Pp./AMA%20Publications/AMA%20Journals/Journal%20of%20Marketing%20research/JournalofMarketingresearch.aspx

- *Management Science:* http://www.informs.org/Pubs/ManSci
- *Operations Research:* http://www.informs.org/Pubs/OR
- *The Journal of the American Statistical Association*

http://www.amstat.org/publications/jasa.cfm

Professional Associations

- American Marketing Association: www.marketingpower.com
  Professional organization for marketing professionals with a subgroup focused on market research
- American Statistical Association: www.amstat.org
  Professional organization encompassing all statistical disciplines
- Informs: www.informs.org
  An organization that uses statistics to improve an organization's ability to make decisions; the

group is divided into operations research and management science branches and both use statistics heavily

Other References

- Bureau of Justice Statistics: http://bjs.ojp.usdoj.gov
  Maintained by the U.S. Dept. of Justice, this is a primary source for criminal justice statistics and published reports.
- Bureau of Labor Statistics: www.bls.gov
  This site provides many publications with data.
- National Center for Health Statistics: www.cdc.gov/nchs
  This government site is a primary source for health data and studies.
- The World Fact Book: www.cia.gov/library/publications/the-world-factbook/index.html
  This is a great place to start when doing international comparative research. This site maintains reports on almost every country in the world.
- U.S. Census: www.census.gov
  An essential site for demographic, economic, and business data, this is the main portal for government reports and data. Of particular interest is the *Special Topics* section at the bottom of the home page.

Information Search

Use the following keywords to search for additional online resources that may be used for supporting your work on the course assignments:

- Probability distribution
- Statistical analysis
- Sample design
- Statistical design of experiment
- Analysis of variance
- Correlation and causation
- Regression analysis
- Statistical quality control
- Categorical data analysis
- Sample size and power
- Visualizing data (graphing)

NOTE: All links are subject to change without prior notice.

Course Plan

Suggested Learning Approach

In this course, you will be studying individually and within a group of your peers. As you work on the course deliverables, you are encouraged to share ideas with your peers and instructor, work collaboratively on projects and team assignments, raise critical questions, and provide constructive feedback.

Use the following advice to receive maximum learning benefits from your participation in this course:

DO	DON'T
▪ Do take a proactive learning approach. ▪ Do share your thoughts on critical issues and potential problem solutions. ▪ Do plan your course work in advance. ▪ Do explore a variety of learning resources in addition to the textbook. ▪ Do offer relevant examples from your experience. ▪ Do make an effort to understand different points of view. ▪ Do connect concepts explored in this course to real-life professional situations and your own experiences.	▪ Don't assume there is only one correct answer to a question. ▪ Don't be afraid to share your perspective on the issues analyzed in the course. ▪ Don't be negative about the points of view that are different from yours. ▪ Don't underestimate the impact of collaboration on your learning. ▪ Don't limit your course experience to reading the textbook. ▪ Don't postpone your work on the course deliverables – work on small assignment components every day.

Course Outline

Unit 1: STATISTICAL THINKING AND SUMMARIZING DATA

Upon completion of this unit, students are expected to:

- Summarize the principles of statistical thinking as they apply to decision-making.
- Analyze sample data in terms of type, level of measurement, context, source, and measures of central tendency.
- Determine whether a sampling method is random.
- Create a well-defined frequency distribution from a given dataset.
- Analyze a histogram to determine the structure of a frequency distribution.
- Use the course content map to write a course learning goals reflection.

Out-of-class work:
10 hours

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapters 1 & 2 • Unit 1 Handout	Problem Set	Unit 1 Problem Set 1: Using Statistical Thinking and Summarizing Data	2%
		Unit 1 Problem Set 2: Excel Tutorial	1%

Unit 2: DESCRIPTIVE STATISTICS AND PROBABILITY

Upon completion of this unit, students are expected to:

- Using the range, variance, and standard deviation, apply the “range rule of thumb” to determine whether a particular value is “unusual.”
- Create a boxplot from a sample dataset.
- Analyze the probability of events.
- Select the proper counting rule (fundamental counting, factorial, permutations, or combinations) to determine the total number of possible outcomes for a probability problem.
- Construct a basic Excel report with histogram, frequency chart, and measures of center and variation.

Out-of-class work:
6 hours

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapters 3 & 4 • Unit 2 Handouts	Quiz	Unit 2 Quiz 1	2%
	Problem Set	Unit 2 Problem Set 1: Descriptive Statistics and Probability	2%
		Unit 2 Problem Set 2: Excel Tutorial	1%

Unit 3: DISCRETE AND NORMAL DISTRIBUTIONS

Upon completion of this unit, students are expected to:

- Analyze for "unusual" results using the mean and standard deviation of a given probability distribution.
- Describe a binomial probability distribution.
- Determine the probability of some range of values in a standard normal distribution.

Out-of-class work:
6 hours

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapter 5 • Triola, Chapter 6, Section 6-2, pp. 262-277 • Unit 3 Handouts	Quiz	Unit 3 Quiz 2	2%
	Problem Set	Unit 3 Problem Set 1: Discrete and Normal Distributions	2%
		Unit 3 Problem Set 2: Excel Tutorial	1%
	Project	Unit 3 Project Part 1: Course Learning Goals and Reflection	2%

Unit 4: USING THE NORMAL DISTRIBUTION

Upon completion of this unit, students are expected to:

- Determine the x-scores corresponding to regions under the curve representing a normal distribution.
- Determine whether a statistic serves as a good estimator of the corresponding population parameter.
- Analyze a sample mean by applying the central limit theorem.
- Analyze using histograms, outliers, and normal quantile plots to determine whether sample data are from a distribution that is approximately normal.

Out-of-class work:
6 hours

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapter 6, p. 277-339 • Unit 4 Handout	Quiz	Unit 4 Quiz 3	2%
	Problem Set	Unit 4 Problem Set 1: Normal Probability Distributions	2%
		Unit 4 Problem Set 2: Excel Tutorial	1%

Unit 5: CONFIDENCE INTERVALS AND INTRODUCTION TO HYPOTHESIS TESTING

Out-of-class work:
11 hours

Upon completion of this unit, students are expected to:

- Analyze a confidence interval estimate of a population proportion.
- Analyze a confidence interval estimate of a population mean.
- Analyze a confidence interval estimate of a population standard deviation or variance.
- Design a hypothesis test by specifying the null and alternative hypotheses when given some claim about a population proportion, mean, standard deviation, or variance.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapter 7 • Triola, Chapter 8, pp. 404-425 • Unit 5 Handout	Quiz	Unit 5 Quiz 4	2%
	Problem Set	Unit 5 Problem Set 1: Estimates and Sample Sizes	2%
		Unit 5 Problem Set 2: Excel Tutorial	1%

Unit 6: HYPOTHESIS TESTING

Out-of-class work:
11 hours

Upon completion of this unit, students are expected to:

- Design a hypothesis test by specifying the null and alternative hypotheses when given some claim about a population proportion, mean, standard deviation, or variance.
- Analyze a hypothesis test of a claim made about a population proportion.
- Analyze a hypothesis test of a claim made about a population mean.
- Analyze a hypothesis test of a claim made about a population standard deviation.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapter 8 • Unit 6 Handout	Quiz	Unit 6 Quiz 5	2%
	Problem Set	Unit 6 Problem Set 1: Hypothesis Testing	2%
		Unit 6 Problem Set 2: Excel Tutorial	1%
	Exam	Exam 1 (Submit Take-Home Exam Assigned in Unit 4)	10%

Unit 7: HYPOTHESIS TESTING AND RESEARCH PROJECT COLLABORATION

Out-of-class work:
6 hours

Upon completion of this unit, students are expected to:

- Analyze a hypothesis test of a claim made about two population proportions.
- Analyze a hypothesis test of a claim made about two means from independent populations.
- Analyze a hypothesis test of a claim made about the mean of the differences between matched pairs.
- Evaluate a data analysis approach and initial output in research teams.
- Collaborate with research team members.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapter 9, pp. 489-533 • Unit 7 Handout	Quiz	Unit 7 Quiz 6	2%
	Problem Set	Unit 7 Problem Set 1: Hypothesis Testing and Research Collaboration	2%
		Unit 7 Problem Set 2: Excel Tutorial	1%
	Project	Unit 7 Project Part 2: Understanding Data	3%

Unit 8: ANOVA

Out-of-class work:
11 hours

Upon completion of this unit, students are expected to:

- Analyze a one-way ANOVA, using results from Excel, to test the equality of three or more population means.
- Analyze a two-way ANOVA, using results from Excel, to test the row, column, and interaction factors of sample data.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapter 12 • Unit 8 Handout	Quiz	Unit 8 Quiz 7	2%
	Problem Set	Unit 8 Problem Set 1: ANOVA	2%
		Unit 8 Problem Set 2: Excel Tutorial	1%
	Exam	Exam 2 (Submit Take-Home Exam Assigned in Unit 6)	10%

Unit 9: CORRELATION, REGRESSION, GOODNESS-OF-FIT, AND CONTINGENCY TABLES

Out-of-class work:
11 hours

Upon completion of this unit, students are expected to:

- Analyze the linear correlation between two variables.
- Construct a simple regression equation.
- Analyze a goodness-of-fit hypothesis test to determine whether sample data fits a claimed distribution.
- Analyze a contingency table to test a claim that different populations have the same proportions.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapters 10 &11 • Unit 9 Handouts	Quiz	Unit 9 Quiz 8	2%
	Problem Set	Unit 9 Problem Set 1: Correlation, Regression, Goodness-of-Fit, and Contingency Tables	2%
		Unit 9 Problem Set 2: Excel Tutorial	1%

Unit 10: PROCESS CONTROL, PROJECT PRESENTATION, AND EXAM PREPARATION

Out-of-class work:
6 hours

Upon completion of this unit, students are expected to:

- Analyze a control chart for R to identify an out-of-control process.
- Analyze a control chart for p to identify an out-of-control process.
- Deliver a 5-minute group presentation of final project.
- Complete a practice final exam.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Triola, Chapter 14	Project	Unit 10 Project Part 3: Testing Statistics	10%
	Project	Unit 10 Project Part 4: Research Proposal Presentation	5%

Unit 11: COURSE REVIEW AND FINAL EXAM

Upon completion of this unit, students are expected to:

- Participate in course review discussion.
- Complete final exam.
- Submit final project.

Out-of-class work:
12 hours

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
	Project	Unit 11 Project Part 5: Final Project Submission	7%
• None	Exam	Final Exam	10%

Evaluation and Grading

Evaluation Criteria

The graded assignments will be evaluated using the following weighted categories:

Category	Weight
Problem Set	27%
Project	27%
Quiz	16%
Exam	30%
TOTAL	**100%**

Grade Conversion

The final grades will be calculated from the percentages earned in the course, as follows:

Grade	Percentage	Credit
A	90–100%	4.0
B+	85–89%	3.5
B	80–84%	3.0
C+	75–79%	2.5
C	70–74%	2.0
D+	65–69%	1.5
D	60–64%	1.0
F	<60%	0.0

Academic Integrity

All students must comply with the policies that regulate all forms of academic dishonesty, or academic misconduct, including plagiarism, self-plagiarism, fabrication, deception, cheating, and sabotage. For more information on the academic honesty policies, refer to the Student Handbook and the Course Catalog.

Out-of-Class Work

Unit Number	Title of Activity	Type of Activity	Estimated Time of Activity (minutes)
1	Triola Chapters 1& 2; Unit 1 Handout	Reading	120
1	Problem Set 1: Using Statistical Thinking and Summarizing Data	Problem Set	120
1	Problem Set 2: Excel Tutorial	Problem Set	105
1	Project Part 1: Course Learning Goals and Reflection	Project	240
2	Triola Chapters 3 & 4; Unit 2 Handouts: Quiz Prep	Reading	120
2	Problem Set 1: Descriptive Statistics and Probability	Problem Set	120
2	Problem Set 2: Excel Tutorial	Problem Set	105
3	Triola Chapters 5 & 6-2 pg. 262-277; Unit 3 Handouts; Quiz Prep	Reading	120
3	Problem Set 1: Discrete and Normal Distributions	Problem Set	120
3	Problem Set 2: Excel Tutorial	Problem Set	105
4	Triola Chapter 6, p.277-339; Unit 4 Handout; Quiz Prep	Reading	120
4	Problem Set 1: Normal Probability Distributions	Problem Set	120
4	Problem Set 2: Excel Tutorial	Problem Set	105
5	Triola Chapter 7 & 8 p. 404-425; Unit 5 Handout; Quiz Prep	Reading	120
5	Problem Set 1: Estimates and Sample Sizes	Problem Set	120
5	Problem Set 2: Excel Tutorial	Problem Set	105
5	Project Part 2: Understanding Data	Project	300
6	Triola Chapter 8; Unit 6 Handout; Quiz Prep	Reading	120
6	Problem Set 1: Hypothesis Testing	Problem Set	120
6	Problem Set 2: Excel Tutorial	Problem Set	105
6	Exam 1 (Take-Home)	Exam Prep	300
7	Triola Chapter 9, p. 489-533; Unit 7 Handout; Quiz Prep	Reading	120
7	Problem Set 1: Hypothesis Testing and Research Collaboration	Problem Set	120
7	Problem Set 2: Excel Tutorial	Problem Set	105
8	Triola Chapter 12; Unit 8 Handout; Quiz Prep	Reading	120
8	Problem Set 1: ANOVA	Problem Set	120
8	Problem Set 2: Excel Tutorial	Problem Set	105
8	Exam 2 (Take-Home)	Exam Prep	300
9	Triola Chapters 10&11; Unit 9 Handouts; Quiz Prep	Reading	120

9	Problem Set 1: Correlation, Regression, Goodness of Fit	Problem Set	120
9	Problem Set 2: Excel Tutorial	Problem Set	105
9	Project Part 3: Testing Statistics	Project	300
10	Trilola Chapter 14; Final Exam Prep	Reading	120
10	Project Part 4: Research Project Presentation	Project	240
11	Project Part 5: Final Project Paper Submission	Project	435
11	Final Exam	Exam Prep	300

(End of Syllabus)