SCHOOL OF FINANCE AND APPLIED STATISTICS

INTRODUCTORY MATHEMATICAL STATISTICS

STAT2001 and STAT6039

Text Guide for 7th Edition

The two books required for this course are:

Wackerly, D.D., Mendenhall III, W., and Scheaffer, R.L. (2008).
Mathematical Statistics with Applications, Seventh edition.
Duxbury, Thomson, Brooks/Cole.

Owen, W.J. (2008). *Student Solutions Manual for*
Wackerly, Mendenhall, and Scheaffer's
Mathematical Statistics with Applications, Seventh Edition.
Duxbury, Thomson, Brooks/Cole.

These books are available as a bundle from the University Cooperative Bookshop at ANU.

All sections in Chapter 1-11 are listed below, with notes about which particular topics are assessable, corrections to exercises, etc. Chapter 11 is assessable for STAT6039 students only, i.e. not for STAT2001 students. Students should attempt most, if not all, of the relevant odd-numbered exercises, except for the Applet Exercises. Check your answers in the student solutions manual. The more difficult exercises are starred (marked by an asterisk, *).

As discussed in the Preface (pages xiii-xx), the textbook features computer applets and the R programming language. In this course these tools are non-assessable and exercises which require them may be ignored.

However, students may use applets and R to aid their understanding if they wish. To access the applets, go to http://www.thomsonedu.com/ Then select: Mathematics & Sciences; Statistics; Mathematical Statistics; About This Book (under "Mathematical Statistics with Applications, 7th Edition"); Student Companion Site; Applets. You may need to install Java first before using the applets. The R program can be obtained from http://www.r-project.org/

Chapter 1 What is Statistics?

1.1 Introduction
1.2 Characterizing a Set of Measurements: Graphical Methods
1.3 Characterizing a Set of Measurements: Numerical Methods
1.4 How Inferences Are Made
1.5 Theory and Reality
1.6 Summary

NOTES: All topics in this chapter are assessable.

Chapter 2 Probability

2.1 Introduction
2.2 Probability and Inference
2.3 A Review of Set Notation
2.4 A Probabilistic Model for an Experiment: The Discrete Case
2.5 Calculating the Probability of an Event: The Sample-Point Method
2.6 Tools for Counting Sample Points
2.7 Conditional Probability and the Independence of Events
2.8 Two Laws of Probability
2.9 Calculating the Probability of an Event: The Event-Composition Method
2.10 The Law of Total Probability and Bayes' Rule
2.11 Numerical Events and Random Variables
2.12 Random Sampling
2.13 Summary

NOTES: All topics in this chapter are assessable.
In Exercise 2.79, "$P(B) < 1$" should read "$P(B) > 0$".

Chapter 3 Discrete Random Variables and Their Probability Distributions

3.1 Basic Definition
3.2 The Probability Distribution for a Discrete Random Variable
3.3 The Expected Value of a Random Variable or a Function of a Random Variable
3.4 The Binomial Probability Distribution
3.5 The Geometric Probability Distribution
3.6 The Negative Binomial Distribution (Optional)
3.7 The Hypergeometric Probability Distribution
3.8 The Poisson Probability Distribution
3.9 Moments and Moment-Generating Functions
3.10 Probability-generating Functions (Optional)
3.11 Tchebysheff's Theorem
3.12 Summary

NOTES: All topics in this chapter are assessable, except Section 3.10.
The correct solution to Exercise 3.55 is $EY^3 = 3n(n-1)p^2 + n(n-1)(n-2)p^3 + np$.
Both "85 to 115" and "86 to 114" are correct solutions to Exercise 3.171.

Chapter 4 Continuous Random Variables and Their Probability Distributions

4.1 Introduction
4.2 The Probability Distribution for a Continuous Random Variable
4.3 Expected Values for Continuous Random Variables
4.4 The Uniform Probability Distribution
4.5 The Normal Probability Distribution
4.6 The Gamma Probability Distribution
4.7 The Beta Probability Distribution
4.8 Some General Comments
4.9 Other Expected Values
4.10 Tchebysheff's Theorem
4.11 Expectations of Discontinuous Functions and Mixed Probability Distributions (Optional)
4.12 Summary

NOTES: All topics in this chapter are assessable, except Section 4.11.

Chapter 5 Multivariate Probability Distributions

5.1 Introduction
5.2 Bivariate and Multivariate Probability Distributions
5.3 Marginal and Conditional Probability Distributions
5.4 Independent Random Variables
5.5 The Expected Value of a Function of Random Variables
5.6 Special Theorems
5.7 The Covariance of Two Random Variables
5.8 The Expected Value and Variance of Linear Functions of Random Variables
5.9 The Multinomial Probability Distribution
5.10 The Bivariate Normal Distribution (Optional)
5.11 Conditional Expectations
5.12 Summary

NOTES: All topics in this chapter are assessable, except Section 5.10.

Chapter 6 Functions of Random Variables

6.1 Introduction
6.2 Finding the Probability Distribution of a Function of Random Variables
6.3 The Method of Distribution Functions
6.4 The Method of Transformations
6.5 The Method of Moment-Generating Functions
6.6 Multivariate Transformations Using Jacobians (Optional)
6.7 Order Statistics
6.8 Summary

NOTES: All topics in this chapter are assessable, except Section 6.6.

Chapter 7 Sampling Distributions and the Central Limit Theorem

7.1 Introduction
7.2 Sampling Distributions Related to the Normal Distributions
7.3 The Central Limit Theorem
7.4 Proof of the Central Limit Theorem (Optional)
7.5 The Normal Approximation to the Binomial Distribution
7.6 Summary

NOTES: All topics in this chapter are assessable, except Section 7.4.

Chapter 8 Estimation

8.1 Introduction
8.2 The Bias and Mean Square Error of Point Estimators
8.3 Some Common Unbiased Point Estimators
8.4 Evaluating the Goodness of a Point Estimator
8.5 Confidence Intervals
8.6 Large-Sample Confidence Intervals
8.7 Selecting the Sample Size
8.8 Small Sample Confidence-Intervals for μ and $\mu_1 - \mu_2$
8.9 Confidence Intervals for σ^2
8.10 Summary

NOTES: All topics in this chapter are assessable.

Chapter 9 Properties of Point Estimators and Methods of Estimation

9.1 Introduction
9.2 Relative Efficiency
9.3 Consistency
9.4 Sufficiency
9.5 The Rao-Blackwell Theorem and Minimum-Variance Unbiased Estimation
9.6 The Method of Moments
9.7 The Method of Maximum Likelihood
9.8 Some Large-Sample Properties of Maximum-Likelihood Estimators (Optional)
9.9 Summary

NOTES: All topics in this chapter are assessable, except Sections 9.4, 9.5 and 9.8.

Chapter 10 Hypothesis Testing

10.1 Introduction
10.2 Elements of a Statistical Test
10.3 Common Large Sample Tests
10.4 Calculating Type II Error Probabilities and Finding the Sample Size for *Z* Tests
10.5 Relationships Between Hypothesis-Testing procedures and Confidence Intervals
10.6 Another Way to Report the Results of a Statistical Test: Attained Significance Levels or, *p*-Values
10.7 Some Comments on the Theory of Hypothesis Testing
10.8 Small-Sample Hypothesis Testing for μ and $\mu_1 - \mu_2$
10.9 Testing Hypotheses Concerning Variances
10.10. Power of Tests and the Neyman-Pearson Lemma
10.11 Likelihood Ratio tests
10.12 Summary

NOTES: All topics in this chapter are assessable, except Sections 10.10 and 10.11.

Chapter 11 Linear Models and Estimation by Least Squares

11.1 Introduction
11.2 Linear Statistical Models
11.3 The Method of Least Squares

11.4 Properties of the Least-Squares Estimators: Simple Linear Regression
11.5 Inferences Concerning the Parameters β_i
11.6 Inferences Concerning Linear Functions of the Model Parameters: Simple Linear Regression
11.7 Predicting a Particular Value of *Y* by Using Simple Linear Regression
11.8 Correlation
11.9 Some Practical Examples
11.10 Fitting the Linear Model by Using Matrices
11.11 Linear Functions of the Model Parameters: Multiple Linear Regression
11.12 Inferences Concerning Linear Functions of the Model Parameters: Multiple Linear Regression
11.13 Predicting a Particular Value of *Y* by Using Multiple Regression
11.14 A Test for $H_0 : \beta_{g+1} = \beta_{g+2} = \cdots = \beta_k = 0$
11.15 Summary and Concluding Remarks

NOTES: None of this Chapter is assessable for STAT2001 students.
Only Sections 11.1 to 11.9 and 11.15 are assessable for STAT6039 students.