

**TMM 010- Introductory Statistics**  
**3 - 4 Semester Hours/5-6 Quarter Hours**  
**Prerequisite:** Intermediate Algebra.

Non-Calculus Based Statistics Learning Outcomes (for a general education course or a prerequisite course to be followed by a specialized statistics course in a social science discipline.) This description is intended to apply to a range of introductory courses, from highly conceptual (e.g. *Statistics: Concepts and Controversies*) to more traditional presentations. It is assumed that technology is used (calculators or computer packages) to minimize involved computations.

Outcomes marked with an asterisk are essential and must be taught.

This is a course of study that introduces statistical thinking and statistical methods to those students considering pursuing a business degree. The American Statistical Association has developed a set of six recommendations for the teaching of introductory statistics – these recommendations are known as the “Guidelines for Assessment and Instruction in Statistics Education.” The recommendations are as follows:

1. Emphasize statistical literacy and develop statistical thinking;
2. Use real data;
3. Stress conceptual understanding rather than mere knowledge of procedures;
4. Foster active learning in the classroom;
5. Use technology for developing conceptual understanding and analyzing data;
6. Use assessments to improve and evaluate student learning;

The prerequisite for Introductory Statistics is a course in Intermediate Algebra (covering topics such as operations and equations with rational expressions, equations of a line, introduction to functions, introduction to systems of linear equations in two or three variables, absolute-value equations and inequalities, rational exponents, operations and equations with radicals, introduction to complex numbers, quadratic equations and various application problems on these topics).

To qualify for TMM 010 (Introductory Statistics), a course must cover as a minimum the essential learning outcomes, noted by an asterisk \*. A course in Introductory Statistics may also commonly include some of the listed nonessential learning outcomes. These optional topics should be included only if there is adequate course time to do so beyond giving primary course attention to the essential learning outcomes. At least 70% of the classroom instructional time has to be spent on the essential learning outcomes. The optional learning outcomes are learning experiences that enhance, reinforce, enrich or are further applications of the essential learning outcomes. If review of prerequisite course content is necessary, only a minimal amount of time should be devoted to such review.

***Real data and hands-on projects should be incorporated throughout the course.***

The successful non-calculus based statistics student should be able to:

- 1. Select and produce appropriate graphical, tabular, and numerical summaries of the distributions of variables in a data set. Summarize such information into verbal descriptions.\***
- 2. Summarize relationships in bivariate data using graphical, tabular, and numerical methods including scatter plots, two-way tables, correlation coefficients, and least squares regression lines. Investigate and describe the relationships or associations between two variables using caution in interpreting correlation and association.\***
- 3. Use the normal distribution to interpret  $z$ -scores and compute probabilities. •**
- 4. Understand the principles of observational and experimental studies including sampling methods, randomization, replication and control. Understand how the type of data collection can affect the types of conclusions that can be drawn.\***
- 5. Construct a model for a random phenomenon using outcomes, events, and the assignment of probabilities. Use the addition rule for disjoint events and the multiplication rule for independent events. Compute conditional probabilities in the context of two-way tables.\***
- 6. Introduce the concept of a sampling distribution. Discuss the distribution of the sample mean and sample proportion under repeated sampling (Central Limit Theorem). Students should be expected to simulate or generate sampling distributions to observe, empirically, the Central Limit Theorem.\***
- 7. Estimate a population mean or proportion using a point estimate and confidence intervals, and interpret the confidence level and margin of error. Understand the dependence of margin of error on sample size and confidence level.\***
- 8. Determine the appropriate sample size for a specific margin of error and confidence level.**
- 9. Given a research question involving a single population, formulate null and alternative hypotheses. Describe the logic and framework of the inference of hypothesis testing. Make a decision using a  $p$ -value and draw an appropriate conclusion. Interpret statistical significance.\***
- 10. Carry out a hypothesis test for a mean or proportion. Interpret statistical and practical significance in this setting.\***
- 11. Perform interval estimation and hypotheses testing for two-sample problems (e.g., difference of two means or proportions and chi-square test of independence).**