# U3600-246: Elementary Statistics

**Course Format:** Online

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**Course credits: 4**

**Prerequisites:** Completion of an introductory-level Algebra course or U3600-110 College Algebra with a C or better or the equivalent.

**Course Description:**
The primary aim of the course is to help students develop a basic understanding and use of statistical concepts and methods to facilitate study and research in other disciplines.

Major topics that we will cover include:
1. Producing (collecting) data
2. Exploring data analysis (EDA) which includes organizing, summarizing, and visualizing data and studying relationships among variables.
3. Studying various probability models
4. Understanding sampling distributions and
5. Making statistically correct interpretations using estimation and inferences

Specific topics we will cover include data collection, descriptive statistics, both graphical and numerical; measures of central tendency; measures of variability; grouped data; discrete and continuous distributions such as binomial distribution, the normal distribution; sampling distributions and central limit theorem; the t-distribution; the fundamentals of statistical interference ----confidence intervals and hypothesis testing; the chi-square tests and simple regression and correlation.
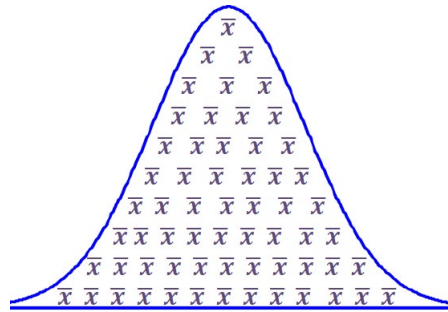

Fig: Visual representation of Central Limit Theorem

Students who have successfully learned these materials will be prepared to interpret data from their field of study.

**Required Course Materials**
- [Introductory Statistics, by Illowsky, Barbara and Susan Dean.](#) This is an open educational resource (OER) linked within the course on Canvas and in WebAssign
- WebAssign Access subscription - 3 Month Subscription. Please see the HW section below for details.
  - If you have any questions about WebAssign, please reach out to [Cengage Technical Support .](#)or your [Independent Learning Success Coaches.](#)

**Optional/Recommended Course Materials**

The following texts are optional materials. They are recommended if you are looking for supplemental material. Any edition of the following texts will work for this course.

- Diez, D., Barr, C., Cetinkaya-Rundel, M. (2015). OpenIntro Statistics (3rd edition). OpenIntro. The text is available as a free open educational resource (OER).  ISBN-10: 1943450056. ISBN-13: 978-1943450053
- Sullivan, M. (2018) Fundamentals of Statistics, 5th Edition.  ISBN 978-0-13-413353-9
- Diez, D., Barr, C., Cetinkaya-Rundel, M. (2019). OpenIntro Statistics (4th edition). OpenIntro. The text is available as a free open educational resource (OER).

**Hardware Requirements**

You will need a webcam, speakers, and a microphone. You will complete your exams through an online proctor, requiring all three components. You will also need a scanner (there are free apps, such as Cam Scanner)—at the end of proctored exams you will be scanning your handwritten work to a single and uploading that as a pdf file.

**Course Learning Objectives**

After completing this course, the student will be able to:

- Develop and interpret descriptive statistical methods.
- Use basic concepts of probability to calculate and explain the probability of outcomes associated with random experiments.
- Explain and calculate probabilities from binomial and normal distributions.
- Explain the reasoning behind sampling distribution including the central limit theorem.
- Use and apply point estimation, inferential statistics including one-same (both small and large) confidence intervals, and hypothesis testing for population mean and population proportion.
- Use and apply inferential techniques for two-sample hypothesis testing of the population means and proportions.
- Use and interpret one-way ANOVA for performing hypothesis testing related to three or more population means.
- Use the Chi-square tests test to see if:
  - A sample of data came from a population with a specific distribution: the Goodness-of-Fit test.
  - There is any association/dependency between two categorical variables: the test of Independence.
  - Three or more population proportions are different: the test of homogeneity of proportions.
- Find a correlation between two variables and perform linear regression analysis and interpret the results. Test for the association between two quantitative/numeric variables.

**Course Overview**

| Lesson # | Lesson Topic | EVALUATED ACTIVITIES |
|---|---|---|
| **Part I: Introduction to Data** | | |
| 1 | Module 1: Sampling and Data | <ul><li>Lesson Homework</li><li>Lesson Quiz</li></ul> |
| 2 | Module 2: Descriptive Statistics | <ul><li>Lesson Homework</li><li>Lesson Quiz</li></ul> |
| | **Project 1 (Module 1 and 2)**<br><br>**Exam I  (Module 1 and 2)** | <ul><li>**Project I (Chapters 1 and 2)**</li><li>**Exam I  (Chapters 1 and 2)**</li></ul> |

| | Part II: Probability and Foundations for Inference | |
|---|---|---|
| 3 | Module 3: Probability Topics | • Lesson Homework<br>• Lesson Quiz |
| 4 | Module 4: Discrete Random Variables | • Lesson Homework<br>• Lesson Quiz |
| 5 | Module 5: Continuous Random Variables | • Lesson Homework<br>• Lesson Quiz<br>• Project 1 |
| 6 | Module 6: The Normal Distribution | • Lesson Homework<br>• Lesson Quiz |
| 7 | Module 7: The Central Limit Theorem | • Lesson Homework<br>• Lesson Quiz |
| | **Exam II (Modules 3 to 7)** | • **Exam II (Chapters 3 to 7)** |
| | Part III: Statistical Inference: Confidence Interval and Hypothesis Testing | |
| 8 | Module 8: Confidence Intervals | • Lesson Homework<br>• Lesson Quiz |
| 9 | Module 9: Hypothesis Testing with One Sample | • Lesson Homework<br>• Lesson Quiz |
| | **Project 2 (Module 9)** | • **Project 2** |
| 10 | Module 10: Hypothesis Testing with Two Samples | • Lesson Homework<br>• Lesson Quiz |
| 11 | Module 11: Chi-Square Distribution | • Lesson Homework<br>• Lesson Quiz |
| 12 | Module 13: F Distribution and One-Way ANOVA (**Note:** Module 13 comes before module 12) | • Lesson Homework<br>• Lesson Quiz |
| | **Exam III (Modules 8, 9, 10, 11 and 13)** | • **Exam II (Chapters 8, 9, 10, 11, and 13)** |
| 13 | Module 12: Linear Regression and Correlation | • Lesson Homework<br>• Lesson Quiz |
| | **Project 3 (Module 13)** | • **Project 3** |
| | **CUMULATIVE Final Exam (Exam IV) (Modules 1 to 13)** | • **Final Exam II (Chapters 1 to 3)** |

**Evaluation Methods**

Your final grade will be based on your performance on the following:

(1) Homework (22%)
(2) Quizzes (15%)
(3) Projects (15%)
(4) Three Midterm Exams each worth 10% (30%),
(5) Final Exam (18%)
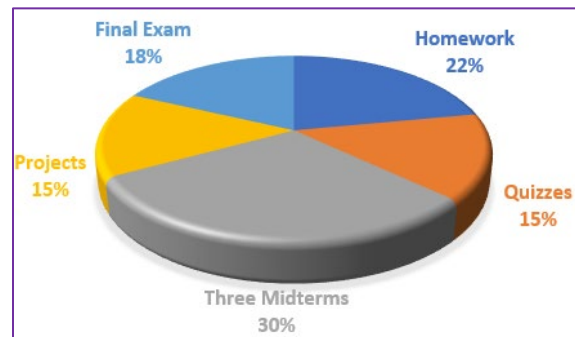
*Homework (22%) and Quizzes (15%)*

The homework assignments and quizzes for this course will be completed using an online homework platform called WebAssign. Please follow the link below to purchase and/or set up your WebAssign account access from Cengage. **NOTE:** You may be able to access a free 14-day trial version of WebAssign. **When logged in to Canvas**, click on Go to Cengage WebAssign (You will be taken to a separate Canvas page and prompted to load WebAssign in a new window). Here is a short video demonstrating WebAssign basics showing you how to use WebAssign, including how to access eTextbook, submit assignments, view grades etc. Get Started With WebAssign. There will be 13 homework assignments and 13 Quizzes, one for each chapter/module, assigned online through WebAssign during the semester. For the homework, you have 7 (seven attempts) for each part of every problem, and for the quizzes, the number of attempts is limited to five. The instructor **will not** be collecting any written work used to obtain the solutions to the homework assignments and partial credit will not be applied to online homework. Your grades for the homework and quizzes will be recorded in the Canvas grade book once you submit them in WebAssign.

*Projects (15%)*

There will be three written project assignments (equally weighted) that you will submit to the course page Dropbox. These assignments must be typed using the word template assigned to the project tasks document. All work must be shown for all your project conclusions and the solutions to the tasks should be well-organized so that any reader can follow the process and logic you used. Your efforts to organize your project report will be greatly appreciated.

*Midterm Exams (30%)*

The three midterm exams will account for 30% of your course exam score (10% for each exam).

*Final Exam (18%)*

Final exam worth 18% of the total semester grade.

**Exam Method: Online with Proctoring**

This course requires all students to complete exams online with a proctoring service. Students receive one attempt on each exam. You will complete all exams within Canvas, using the online proctoring system Proctorio. In compliance with the Proctorio, no cell phones are allowed to be present during the taking of the exam. You will be allowed to use:

- A note sheet not measured more than 8.5 X 11" (both sides of a regular printer paper). You can write notes and formulas on it, but no solved examples are allowed on the note card.
- GeoGebra and SALT online calculator (link would be provided)
- a physical calculator (a TI 84 calculator is highly recommended).

In addition to the above, you would be allowed to bring three pages of blank 8½" x 11" paper to show your solutions. Remember to write your name at the top of each page and write your solutions clearly. Though you don't need to do the problems in the order presented, you must clearly indicate to which problem your written work belongs. The number of the problem should be written large and circled at the start of the written work. After you have finished and submitted the Exam, you will have to scan your sheets and upload the file on Canvas. Please make suitable arrangements for this. If you've written on the back of any sheets, be sure you scan those as well. You will have a maximum of 120 minutes to complete the exam. Read each question carefully before responding. If you don't know how to start a problem or get stuck, skip it, and return to it later.

**Grading Scale**

The following grading scale is used to evaluate all course requirements and determine your final grade:

| A = 93–100 | B = 83–87.9 | C = 70–77.9 | D = 60–69.9 |
|---|---|---|---|
| AB = 88–92.9 | BC = 78–82.9 | | F = Below 60 |

*Pass/Fail Option*

Students who enroll in an Independent Learning (IL) course under the pass/fail option will receive a final grade of S in place of a final grade equivalent to an A, AB, B, BC, or C and a final grade of U in place of a final grade equivalent to a D or F.