

Engineering Statistics

SECTION I: Course Overview

Course Code: MATH340PRG

Subject Area(s): Mathematics

Prerequisites: See Below

Language of Instruction: English

Total Contact Hours: 45

Recommended Credits: 3

COURSE DESCRIPTION

This course is designed to cover topics from mathematical statistics that are of interest to students from engineering and/or the sciences. Topics include descriptive statistics, elementary probability, random variables and distributions, mean variance, parameter estimation, hypothesis testing, (time permitting) regression, and analysis of variance. Students will apply their calculus knowledge to learn the meanings of, and computational procedures relating to, basic statistical concepts used for making decisions in the sciences and engineering.

LEARNING OBJECTIVES

Upon successful completion of this course, you will be able to:

- Describe the meanings of various statistical measures, including the mean, median, mode, standard deviation, variance, and quartiles.
- Compute confidence intervals.
- Distinguish between accurate and misleading graphical representations of data.
- Apply the concept of a probability distribution to real-world problems involving various distributions, such as binomial, normal, hypergeometric, and Poisson distributions.
- Critically examine validity of statistical claims, common pitfalls in sampling, and misrepresentation of conclusions.

PREREQUISITES

Prior to enrollment, this course requires you to have completed Calculus III.

SECTION II: Instructor & Course Details

INSTRUCTOR DETAILS

Name:	TBD
Contact Information:	TBD
Term:	SUMMER

GRADING & ASSESSMENT

The instructor will assess your progress towards the above-listed learning objectives by using the forms of assessment below. Each of these assessments is weighted and will count towards your final grade. The following section (Assessment Overview) will provide further details for each.

Engagement	20%
Homework	20%
Group Project	20%
Midterm Examination	20%
Final Examination	20%

ASSESSMENT OVERVIEW

This section provides a brief description of each form of assessment listed above. Your course instructor will provide further details and instructions during class time.

Engagement (20%): Engagement in class is expected of all CEA CAPA students. Guidelines for engagement can be found on the list of academic policies.

Homework (20%): Homework is assigned on average once a week. Please write the homework question before showing, in complete steps, the solution and do not forget to consider any modifications to problem sets announced in class. The homework is due at the date scheduled independent of the schedule of lectures. Homework assignments will be added to Moodle.

Group Project (20%): Students will be assigned in small groups and will apply the statistical principles taught during the first four weeks of the course on a practical example. They will provide the theoretical basis, the statistical methods used and engage in a discussion with the other students during the final presentation. The students will provide a PowerPoint presentation with the summary of their project and a document supporting their conclusions with data. All data will be added to Moodle.

Midterm Exam (20%): The midterm exam is designed to establish and communicate to you the progress you are making towards meeting the course learning objectives listed above. It is comprised of questions and exercises that test your abilities in three important areas of competency: the amount of information you master; the accuracy of the information you present; and the significance you ascribe to the facts and ideas you have integrated across your study in this course.

Final Exam (20%): A comprehensive final examination during the last week of classes.

ACTIVE LEARNING

CEA CAPA courses are designed to include a variety of active learning component that will take you out of the classroom and allow you to explore your local, host city. This course includes:

- Technical Museum

REQUIRED READINGS

The reading assignments for this course are listed below. All required readings must be completed according to the due date assigned by the course instructor. You will not need to purchase these readings; the instructor will provide these selected readings to you in class (either in paper or electronic format) and/or through CEA CAPA's online Moodle classroom.

SELECTED READING(S): The selected readings for this course are listed below. You will not need to purchase these readings; the instructor will provide these selected readings to you in class (either in paper or electronic format).

Devore, Jay. *Probability and Statistics for Engineering and the Sciences* (9th Edition). Boston: Cengage Learning, 2016.

RECOMMENDED READINGS

The recommended reading(s) and/or text(s) for this course are below. These recommended readings are not mandatory, but they will assist you with research and understanding course content.

Montgomery, Douglas C., and Runger, George C. *Applied Statistics and Probability for Engineers* (7th Edition). Hoboken: Wiley, 2007.

KEY RESOURCES

In order to ensure your success abroad, CEA CAPA has provided the academic resources listed below.

- **UNH Online Library:** As a CEA CAPA student, you will be given access to the online library of the University of New Haven (UNH). You may access the UNH online library [here](#). You must comply with [UNH Policies](#) regarding library usage.
- **CEA CAPA Classroom – Moodle**

COURSE CALENDAR
Engineering Statistics

SESSION	TOPICS	ACTIVITY	READINGS & ASSIGNMENTS
1	<p style="text-align: center;">Course Introduction: Review Syllabus, Classroom Policies</p> <p style="text-align: center;">Ch. 1 – Overview & Descriptive Statistics</p>	<p style="text-align: center;">Lecture and In-class problem solving on: Introduction – The role of Statistics in Engineering</p> <ul style="list-style-type: none"> • Trainer and Course Introduction • History of Statistics • Descriptive and Inferential Statistics • Data, Population, and Samples • Sampling Methods • Discrete and Continuous Variables • Pictorial and Tabular Methods in Descriptive Statistics • Applications 	Read Chapter 1
2	Ch. 1 – Descriptive Statistics	<p style="text-align: center;">Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • Creating Histograms • Measures of Central tendency: Mean, Median, Mode • Measures of Variation: Range, interquartile Range, Variation, Standard Deviation, and Boxplots • Normal Distribution • Applications 	Read Chapter 1 HW1 Assigned
3	Ch. 2 – Probability	<p style="text-align: center;">HW1 Due</p> <p style="text-align: center;">Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • Sample Space and Events • Mutually Exclusive Events • Independent and Dependent Events • Relative Frequency of Occurrence • Axioms, Rules, and Properties of Probability • Counting Techniques • Conditional Probability • Tree Diagrams 	Read Chapter 2.1 HW1 Due

		<ul style="list-style-type: none"> • Revising probabilities and Bayes Theorem • Application 	
4	Ch. 3 – Discrete Random Variables & Probability Distribution	<p>Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • Defining Random Variables • Probability Distributions for Discrete Random Variables • Expected Values • The Binomial Probability Distribution • The Poisson Probability Distribution • Applications and Exercises 	Read Chapter 3 HW2 Assigned
5	Ch. 4 – Continuous Random Variables & Probability Distributions	<p>Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • Probability and Density Functions • Cumulative Distribution Functions & Expected Values • The Normal Distribution • Practical Use of the Normal Distribution • Applications and Review Midterm Exam 	Read Chapter 4 HW 2 Due
6	Midterm Exam Review		Prepare for midterm exam
7	MIDTERM EXAM		
8	Ch. 4 – Continuous Random Variables & Probability Distributions	<p>Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • The Exponential, Uniform, and Gamma Distributions • Other Continuous Distributions: Weibull, Lognormal, Beta, and Triangular Distributions • Probability Plots • Applications 	Read Chapter 4
9	Ch.5 – Joint Probability Distributions & Random Samples	<p>Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • Jointly Distributed Random Variables • Expected Values, Covariance, and Correlation • Statistics and their Distributions • The Distribution of the Sample Mean 	Read Chapter 5 HW3 Assigned

		<ul style="list-style-type: none"> • The Distribution of a Linear Combination • Applications 	
10	Ch.6 – Point Estimation	<p>Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • General Concepts of Point Estimation • Methods of Point Estimation • Exercises 	Read Chapter 6 HW3 Due
11	Ch.7 – Statistical Intervals Based on Single Sample	<p>Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • Basic Properties of Confidence Intervals • Large Sample Confidence Intervals for a Population Mean and Proportion • Application on a Normal Population • Exercises 	Read Chapter 7
12	Ch.8 – Tests of Based on a Single Sample	<p>Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • Hypothesis and Test Procedures • Tests about Population Means • p-values • Exercises 	Read Chapter 8
13	Ch. 16 – Quality Control Methods	<p>Lecture and In-class problem solving on:</p> <ul style="list-style-type: none"> • Introducing Quality and Quality Control • Sampling Methods in Quality Control • Control Charts and Statistical Process Control • Acceptance sampling • Exercises 	Read Chapter 16 HW4 Assigned
14	FIELD STUDY		
15	Project Presentation And Review Exercises	<p>Group Project Presentation:</p> <ul style="list-style-type: none"> • PowerPoint presentation • Submission of Data evaluation • Review Exercises for Final Exam 	HW4 Due

SECTION III: CEA CAPA Academic Policies

To see all CEA CAPA academic policies outlined, please follow the following links. Students are expected to review and understand all CEA CAPA student policies, including the academic policies outlined online. CEA CAPA reserves the right to change, update, revise, or amend existing policies and/or procedures at any time.

Class & Instructor Policies can be found [here](#)

General Academic Policies can be found [here](#)