



The Infinite Actuary

Course Syllabus – VEE Mathematical Statistics

Description of this Course

The emphasis of this course is to develop the fundamental statistical concepts of inference, parameter estimation, confidence intervals, and hypothesis testing using the tools of probability theory. The course has been designed to fulfill the joint VEE requirement for Mathematical Statistics established by the society of Actuaries (SOA) and Canadian Institute of Actuaries (CIA).

Prerequisite

This course is designed for students that have taken an introductory course in probability and statistics. An understanding of probability distributions, moments of distributions, conditional probability, independence, and basic combinatorics is required. The course also assumes a working knowledge of single-variable calculus.

Students that have passed Exam P/1 should have sufficient background to be successful.

Textbook

The video lessons included in the online seminar contain all material required to pass this course; however, some of the material covered is derived from *Statistics and Data Analysis: From Elementary to Intermediate 1st Edition* (Tamhane, Dunlop). Owning this textbook may be helpful for some students.

Course Structure

The course is divided into four sections. Each section includes several topics which are covered in a video lesson. At the end of each section, there is an assignment. The assignments are, untimed, multiple choice, and students may submit each assignment up to twice.

Throughout the course, students will have access to ask questions to the course instructor through the course forum, or by email.

At the end of the course there is a 120-minute, multiple-choice exam. This exam must be proctored, either remotely through our third party partner (ProctorU) for an additional fee, or in person by a

certified professional of the student's choosing. Details on the proctoring process will be distributed separately from this syllabus.

Grading

Each homework assignment is worth 10% of the final grade (40% total). If an assignment is submitted multiple times, the highest grade will be used.

The exam is worth 60% of the final grade.

To receive VEE credit from actuarial organizations, a grade of B- (80%) or higher is required.

Syllabus

- I. SECTION A – Sampling
 - a. A.1 – Probability Review
 - b. A.2 – Random Sampling
 - c. A.3 – Sampling Distributions
- II. SECTION B – Parameter Estimation
 - a. B.1 – Bias, Variance, and Mean Squared Error
 - b. B.2 – Efficiency
 - c. B.3 – Consistency and UMVUE
 - d. B.4 – Percentile Matching
 - e. B.5 – Method of Moments
 - f. B.6 – Maximum Likelihood Estimation
- III. SECTION C – Confidence Intervals
 - a. C.1 – Intervals on the Mean
 - b. C.2 – Difference between Means
 - c. C.2 – Inference on Variance
 - d. C.3 – Proportions
- IV. SECTION D – Hypothesis Testing
 - a. D.1 – Testing the Mean
 - b. D.2 – Testing Variance
 - c. D.3 – Other Chi Square Tests
 - d. D.4 - Likelihood Ratio Tests & Neyman-Pearson Lemma
 - e. D.5 – Information Criteria