



COURSE DESCRIPTION

This course is an introduction to conducting statistical analysis in engineering applications. Students will explore statistical techniques used to analyze data and make informed decisions. The course is composed of a systematic introduction of the fundamental topics of engineering statistics, including:

- Data Characterization and Probability Theory
- Theoretical Basis for Statistical Inference
- Modeling and Algorithms
- Valuation Mechanism

EXPECTED LEARNING OUTCOMES

Graduate students will develop deeper understanding of theoretical foundations of statistical inference. By taking this course, both undergraduate and graduate students will possess the capability to:

- characterize and model data.
- understand the theoretical basis for statistical inference.
- apply methods and algorithms of statistical inference on engineering problems.

For graduate Students, additional learning outcomes include:

- approaches to evaluating the inference methods and algorithms.
- development of inference methods for given engineering problems.

COURSE FORMAT

- In-Person | **15-week** semester
- Tailored to your **professional needs**
- **3-credit** hour | You may apply it towards SIE MS and PhD programs
- **Prerequisites:** Advanced Standing



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ENROLLMENT
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COURSE SCHEDULE

WEEK 1

- ▶ Course Introduction and Fundamental Data Characterization
- ▶ Set Theory, Probability Concept and Counting Techniques

WEEK 2

- ▶ Conditional Probability & Independence, Concept of Random Variable
- ▶ Univariate & Multivariate Distribution Model

WEEK 3

- ▶ Marginal & Conditional Distribution Model
- ▶ Expectation & variance

WEEK 4

- ▶ Covariance & Conditional Expectation, Transformation
- ▶ Special Distributions- Discrete

WEEK 5

- ▶ Special Distributions- Continuous
- ▶ Exponential Family, Moment & Moment Generation Function (MGF)

WEEK 6

- ▶ Function of Random Vector, Fundamental Concepts of Statistics
- ▶ Samples from Normal distribution

WEEK 7

- ▶ Derived Distributions
- ▶ Review for Exam 1

WEEK 8

- ▶ Order Statistics & Sufficiency Principle
- ▶ Likelihood Principle & Point Estimation

WEEK 9

- ▶ Practice Exam 1 Review
- ▶ Exam 1

WEEK 10

- ▶ Method of Moment, Maximum Likelihood Estimation
- ▶ Bayes Estimation

WEEK 11

- ▶ Evaluating Point Estimators
- ▶ UMVUE

WEEK 12

- ▶ Hypothesis Testing, LRT
- ▶ Evaluating Hypothesis Test

WEEK 13

- ▶ Size & Level of a Test, P-Value
- ▶ Tests for Applications

WEEK 14

- ▶ Interval Estimation
- ▶ Applications of Interval Estimation

WEEK 15

- ▶ Exam 2 Review

WEEK 16

- ▶ Exam 2



Real-World
Application



Flexible/Interactive
Learning



Bridge Theory &
Practice



Innovative
Curriculum



Distinguished
Faculty

FROM EFFICIENCY TO INNOVATION—LEAD THE FUTURE OF INDUSTRIAL ENGINEERING.

