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## CSE 312 Foundations of Computing II

### **Credits**

4.0 (3 hrs lecture, 1 hr section)

### **Lead Instructor**

Martin Tompa

### **Textbook**

*Introduction to Probability*, Bertsekas & Tsitsiklis

### **Course Description**

Examines fundamentals of enumeration and discrete probability; applications of randomness. Examines fundamentals of enumeration and discrete probability; applications of randomness to computing; polynomial-time versus NP; and NP-completeness. Prerequisite: CSE 311.. Prerequisite: CSE 311.

### **Prerequisites**

CSE 311; CSE 332, which may be taken concurrently.

### **CE Major Status**

Required

## Course Objectives

Course goals include an appreciation and introductory understanding of (1) methods of counting and basic combinatorics, (2) the language of probability for expressing and analyzing randomness and uncertainty (3) properties of randomness and their application in designing and analyzing computational systems, (4) some basic methods of statistics and their use in a computer science & engineering context

## ABET Outcomes

(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics(H)

(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (M)

(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies (H)

## Course Topics

- permutations, combinations
- pigeonhole principle
- inclusion-exclusion
- probability axioms
- conditional probability
- law of total probability
- Bayes' Rule
- independence
- random variables
- expectation and variance
- joint distributions
- binomial distribution, geometric distribution, Poisson distribution,

- continuous random variables
- uniform distribution, exponential distribution, normal distribution
- central limit theorem
- randomized algorithms
- Markov and Chebyshev inequalities
- Chernoff bounds
- law of large numbers
- maximum likelihood estimate