

Philadelphia University

Probability Theory

Faculty: Science

Department: Basic Sciences

Module Name: Probability Theory

Module Number: 250232

Level: 2

Credit Hours: 3 credit hours

Prerequisite /Co-Requisite: 210231

Lecturer: Associate Professor Dr. Jaffar Almousawi

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Module Coordinator: Dr. Jaffar Almousawi

Aims (Module Purpose)

This course provides a practical introduction to probability theory. The materials covered in this course represent the corner stone of much of what will be needed in statistical inference in the future. All concepts introduced in the course are illustrated with examples that demonstrate principles.

Teaching Methods

Duration: 16 weeks in second semester, 32 hours in total.

Lectures: 45 hours in total, 3 per week (including two 1-hour midterm exams).

Learning Objectives

Upon completion of the course, the student will be able to:

- 1. use counting principles.*
- 2. use probability as a tool for addressing random variation and statistical relationships.*
- 3. define discrete random variable and use the probability mass function to find probabilities of discrete random variables.*
- 4. define continuous random variable and use the probability density function to find probabilities of continuous random variables.*
- 5. compute the mean and variance of discrete and continuous random variables.*
- 6. Calculate the mean and variance using the probability generating function.*
- 7. move from one-dimensional to two-dimensional random variables.*

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Module Outlines

Week	Day	Subject
(1)		The rule of sums, the rule of products, factorials, permutations, circular permutations, combinations, probabilities and counting
(2)		Probability, some general definitions, Venn diagrams, intersections and unions, mutually exclusive events, collectively exhaustive events, partitioning, complement
(3)		Some useful rules, what is probability? Postulates of probability, consequences, conditional probability, multiplication rule, independence, Bayes' rule
(4)		Discrete random variables and probability mass functions, definition of a random variable, types of random variables, probability mass function, Bernoulli random variable, the cumulative distribution function, Mean and variance
(5)		The binomial random variable, the hypergeometric random variable, the geometric random variable
(6)		The negative binomial random variable, the Poisson random variable,
(7)		Continuous random variables and probability density functions, the uniform random variable
(8)		The exponential random variable, the cumulative distribution function
(9)		The normal distribution, the 68-95-99 rule
(10)		The gamma random variable The chi-square random variable, the Chebychevs'-inequality
(11)		The moment generating function
(12)- (13)		The bivariate distributions, jointly distributed random variables, marginal distributions, the conditional distributions
(14)		Independent random variables
(15)		Covariance and correlation

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Modes of Assessment

Mode of Assessment	Weight	Date
First Test	25%	
Second Test	25%	
Final : (Comprehensive; Written)	50%	

- Make-up exams will be offered only for valid reasons with consent of the dean.
- Make-up exams may be different from regular exams in content and format.

Attendance Policy

Lecture attendance is expected. The course notes and textbook are not comprehensive. Additional materials will be covered in lecture. Students are responsible for all materials covered in lectures.

Expected Workload

On average, you should expect to spend at least (9) hours per week on this module.

Textbook(s) and Supporting Materials

Textbook:

Title: Introduction to Probability Theory and Statistical Inference

Author: Harold J. Larson

Publisher: John Wiley & Sons

ISBN: 0-471-05909-9

Reference:

Title: Introduction to Probability

Author: Harold J. Larson

Publisher: Addison-Wesley

ISBN: 0-201-51286-6

Website of Interest:

http://www.dartmouth.edu/~chance/teaching_aids/books_articles/probability_book/pdf.html