

# ECE 6001 (Proposed): Probability and Random Variables

## Course Description

Probability, random variables, and random vectors for analysis and research in electrical engineering. Distribution functions, characteristic functions, functions of random variables and vectors, Markov chains.

**Prior Course Number:** ECE 804 and 805

**Transcript Abbreviation:** Prob & Rand Varb

**Grading Plan:** Letter Grade

**Course Deliveries:** Classroom

**Course Levels:** Graduate

**Student Ranks:** Masters, Doctoral

**Course Offerings:** Autumn

**Flex Scheduled Course:** Never

**Course Frequency:** Every Year

**Course Length:** 14 Week

**Credits:** 3.0

**Repeatable:** No

**Time Distribution:** 3.0 hr Lec

**Expected out-of-class hours per week:** 6.0

**Graded Component:** Lecture

**Credit by Examination:** No

**Admission Condition:** No

**Off Campus:** Never

**Campus Locations:** Columbus

**Prerequisites and Co-requisites:**

**Exclusions:** Not open to students with credit for 804 or 805.

**Cross-Listings:**

**Course Rationale:** Existing course.

**The course is required for this unit's degrees, majors, and/or minors:** No

**The course is a GEC:** No

**The course is an elective (for this or other units) or is a service course for other units:** Yes

**Subject/CIP Code:** 14.1001

**Subsidy Level:** Doctoral Course

## Course Goals

Learn the mathematical foundations and tools of probability theory
Learn probability spaces, univariate and multivariate distribution and density functions, expectation and conditional expectation, characteristic functions, functions of random variables and vectors, and Markov chains
Learn the basics of estimation theory, including least-square estimation and Bayesian decision theory, and Markov chains

## Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Preliminaries, Axioms, Probability Spaces	2.0							
Bayes' Rule and all its component concepts	3.0							
Random Variables, Distributions, and Densities	4.0							

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Conditional and Joint Distributions and Densities	4.0							
Functions of Random Variables	5.0							
Expectations	4.0							
Random Vectors, Covariance Matrices	5.0							
Least Square Estimation	2.0							
Bayesian Decision Theory	2.0							
Bernoulli Process	1.0							
Poisson Process	3.0							
Markov Chains	4.0							
Weak Law of Large Numbers	1.0							
Central Limit Theorem	1.0							

## Grades

Aspect	Percent
Homework Assignments	15%
Midterm Exam	35%
Final Exam	50%

## Representative Textbooks and Other Course Materials

Title	Author
<i>Introduction to Probability, 2nd Edition, ISBN: 978-1-886529-23-6</i>	Dimitri P. Bertsekas and John N. Tsitsiklis

## ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
*	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
	c	An ability to design a system, component, or process to meet desired needs.
	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
	g	An ability to communicate effectively.
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
	i	A recognition of the need for, and an ability to engage in life-long learning.
	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

## Additional Notes or Comments

updated exclusions and topics to match university format  
 updated textbook edition; 4/4/13; CED

Prepared by: Carol Duhigg