Probability and Stochastic Processes

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1. Course Description

This course provides an introduction to stochastic processes. The items are as follows: Basics of probability, random variable, characteristic values of the random variables, probability generating function, characteristic function, basics of stochastic processes, Poisson process, renewal process, and Markov chain. Problem solving exercises in wide areas such as social sciences, economics in addition to sciences and engineering are studied.

The classes consist of lectures and exercises. Students will give presentations on homework assignments in the classes.

This subject is related to the clause 3 of the diploma policy of the Department of Information and Electronic Engineering.

2. Course Objectives

The objectives of this course for the students are to understand the basic concept of stochastic processes in probability theory and how to handle the random variables and probability distributions dependent on time and the characteristic values of the random variables.

3. Grading Policy

The term-end examination (80%) and presentations on homework assignments in the classes (20%) will be evaluated.

The acceptance line is accuracy rate of 60% in the above term-end examination and presentations on homework assignments.

4. Textbook and Reference

Textbook
  M.Fushimi "Probability and Stochastic Processes" Asakurashoten (2004) in Japanese. (ISBN 978-4-254-29553-5)
Reference
  Kolmogorov A.N., Zhurbenko I.G. and Prokhorov A.V. ; translated by T.Maruyama and Y.Baba "Introduction to Probability Theory" Morikita Publishing (2003) in Japanese (ISBN 4-627-09511-2)

5. Requirements(Assignments)

Students are required to review the lectures and to do the homework assignments.

6. Note

It is recommended for students to access the homework assignments on the LMS.

It is prohibited for students to refer the textbook and notebook in term-end examination and makeup examination.

7. Schedule

[1]	Basics of probability : Probability space, Characteristics of probability, Conditional probability, Stochastic independence
[2]	Random variable : Random variable and distribution function, Probability function and probability density function
[3]	Random variable : Joint distribution function, Practices
[4]	Characteristic values of the random variables : Mean, Variance, Chebyshev's inequality, Weak law of large numbers
[5]	Generating function and characteristic function : Probability generating function, Characteristic function, Moment generating function
[6]	Generating function and characteristic function : Central limit theorem, Practices
[7]	Concept of stochastic processes : Stochastic processes, Bernoulli trial, Counting Process
[8]	Poisson process : Poisson process, Non-homogeneous Poisson process
[9]	Renewal process : Renewal equation, Excess life distribution
[10]	Renewal process : Operation rate of equipment, Practices
[11]	Markov chain : Markov chain, Transition Probability, Random walk
[12]	Markov chain : Recursiveness, Mean first passage time
[13]	Markov chain : Long-run distribution and stationary distribution, Brand Selection
[14]	Markov chain : Practices
[15]	Review, Term-end examination