USEEJ1 - Mathematics of Random Signal

Mis à jour le 08-04-2020

Code : USEEJ1

Unité spécifique de type cours

6 crédits

Responsabilité nationale :
EPN03 - Electroniques, électrotechnique, automatique et mesure (EEAM) / Dariush GHORBANZADEH

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Présentation

Prérequis

Bachelor Mathematics level

Objectifs pédagogiques

The primary objective of this course is to provide mathematical background and sufficient experience so that the student can understand sentences in the language of probability theory, as well as solve probabilistic problems in Telecommunications Engineering programs and applied science. Broad range of topics, such as random vectors, random sequences, convergence of random sequences, random processes and correlation are introduced.

Compétences

Upon completion of the subject, students will be able to understand:

1. The concepts surrounding probability and random processes such as the sample space, conditional probability, total probability, Bayes theorem, and independence.
2. One Random Variable and One Function of One Random Variable.
3. One function of two random variables, two functions of two random variables, moments, covariance and correlation, joint characteristic functions, conditional distributions and moments and minimum mean-square-error (MSE) estimation.
4. Sequences of Random Variables. Distributions and densities, independence, M functions of M random variables, covariance and correlation matrices and joint characteristic functions.
5. Limit Theorems. The Law of Large Numbers. The Central Limit Theorem
6. Random process. Stationarity : strict sense and wide sense. Ergodicity. Poisson Processes. Markov Processes.
7. Students will be able to understand the applications and practical issues such as the numerical simulation of random phenomena using python.

Programme

Contenu

1. Foundations of Probability Theory

2. Random Variables

3. Distribution and Density Functions

4. Functions and Sequences of Random Variables

5. Expectation. Conditional Expected

6. Characteristic Functions and Moment Generating Functions

7. Ordered Statistics

8. Multivariate normal distribution

9. Elements of Random Processes

10. Limit Theorems

11. Simulation (using numerical Python)

Modalités de validation

- Projet(s)
- Examen final

Description des modalités de validation

Validation will be done through final exam and projects

Bibliographie

Titre	Auteur(s)
Probabilités. Exercices corrigés. ISBN : 9782710807476.	Ghorbanzadeh.D
Éléments de Mathématiques du Signal. Exercices résolus. 3° édition. EAN13 : 9782100519361	Ghorbanzadeh.D. , Marry.P. , Point.N., Vial.D
Probability and Random Processes 2nd Edition. ISBN: 978-0-471-99828-0.	Venkatarama Krishnan, Kavitha Chandra
Probability and Random Processes, Second Edition: With Applications to Signal Processing and Communications 2nd Edition. ISBN-13: 978-0123869814 .	Scott Miller , Donald Childers