COURSE	Name	: Random Process and Statistical Signal Processing
	Code	: EE185131
	Credit(s)	: 3
	Semester	: I

Description of Course

Various signals and phenomena in communication systems and networks can be modeled as a random process, which can then be used to analyze the performance of a system or to design a particular technique. In this course, students will study probabilities, random variables, random vectors, random processes, and calculation methods. In addition, the main statistical signal processing techniques for telecommunications will be studied, namely: parameter estimation and detection and several application examples, such as channel estimation, equalization, and adaptive filters.

Learning Outcomes

Knowledge

(P01) Mastering the concepts and principles of science in a comprehensive manner, and to develop procedures and strategies needed for the analysis and design of systems related to the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics as a preparation for further education or professional career.

Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

General Skill

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

Course Learning Outcomes

Knowledge

Mastering the concepts of probability and random processes, as well as the calculation methods to be applied to various problems in the telecommunications field.

Specific Skill

Able to model various kinds of random signals, transform them in systems and phenomena that exist in communication systems and networks, and be able to calculate probabilities and other statistical quantities.

General Skill

Able to use software and tools to implement statistical signal processing on various problems in telecommunications, for example Matlab.

Attitude

Demonstrating the attitude of being responsible for the work in his area of expertise independently.

Main Subjects

1. Probability theory
2. Random variables
3. Functions of random variables
4. Random vector, random sequence and matrix computation
5. Moments of random variables
6. Random processes
7. Systems, noises and power spectral density
8. Parameter estimation
9. Hypothesis test and detection
10. Statistical signal analysis applications

Reference(s)

[1] Henry Starks & Hohn W. Woods, “Probability, Statistics and Random Processes for Engineers,” 4th ed., Pearson, 2012.
[2] John J. Shynk, “Probability, Random Variables, and Random Processes: Theory and Signal Processing Applications,” Jong Wiley & Sons, 2013.
[3] Umberto Spagnolini, “Statistical Signal Processing in Engineering,” John Wiley & Sons, 2018.

Prerequisite(s)

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