

### Network

#### Probabilities and statistics

#### IDENTIFICATION

CODE : TC-3-S2-EC-PBS  
ECTS : 1.0

#### HOURS

Lectures : 4.0 h  
Seminars : 8.0 h  
Laboratory : 0.0 h  
Project : 0.0 h  
Teacher-student  
contact : 12.0 h  
Personal work : 20.0 h  
Total : 32.0 h

#### ASSESSMENT METHOD

- 50 mn : Moodle MCQ midterm  
- 2h00 : Final exam

#### TEACHING AIDS

#### TEACHING LANGUAGE

French

#### CONTACT

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#### AIMS

This EC is part of the teaching unit Theoretical tools [TC-3-S1-OTE] and contributes to the following skills:

A2 Exploit a model of a real or virtual system

Capacity: Modeling a random experiment: universe, event, random variables, random signal  
Capacity: Exploit the statistical modeling of a problem to solve it by calculating a probability, a expectancy, the dsp of a random signal, etc.

Knowledge: Universe, experience, event. Notion of probability [frequency, axiomatic]. Prob. elementary and conditional, independence, Bayes theorem

Knowledge: Main laws of probability of discrete and continuous random variables. Expectancy, variance, function of a random variable.

Knowledge: Bienayme-Chebysheff's Theorem, Bernouilli's Theorem, Central Limit Theorem

Knowledge: Couples of random variables: joint law, marginal laws, conditional. Covariance, cof of correlation. Function of a couple of random variables

Knowledge: Stochastic process, stationarity and ergodism, dsp of a random signal [Wiener Khintchine theorem], filtering of a random signal.

Knowledge: Random Variable, Probability Law, Normal Law, Central Limit Theorem, Model

A6 Communicate an analysis or a scientific approach with scenarios adapted to their specialty

Capacity: Modeling a random experiment: universe, event, random variables, random signal

Knowledge: Main laws of probability of discrete and continuous random variables. Expectancy, variance, function of a random variable.

Knowledge: Bienayme-Chebysheff's Theorem, Bernouilli's Theorem, Central Limit Theorem

Knowledge: Couples of random variables: joint law, marginal laws, conditional. Covariance, cof of correlation. Function of a couple of random variables

Knowledge: Erlang's Law, Rayleigh Channel, Detection

Knowledge: Main laws of probability of discrete and continuous random variables. Expectancy, variance, function of a random variable.

Knowledge: Matlab, histogram, rayleigh caal

In addition, it requires the following skills:

A3 Implement an experimental approach

#### CONTENT

- 1) Permutations, combinations
- 2) Probability Concepts
- 3) Random variables, probability laws
- 4) Central limits theorem
- 5) Couple of random variables
- 6) Stochastic processes

#### BIBLIOGRAPHY

1. Probabilité pour scientifiques et ingénieurs, Patrick Bogaert, De Boeck supérieur, 2005
2. Modélisation probabiliste pour l'ingénieur, André Smolarz, Ellipses, 2009
3. Théorie et traitement des signaux, Frédéric de Coulon, Presses Polytechniques et Universitaires Romandes, 2013
4. Introduction aux probabilités, Jean-Pierre Delmas, Ellipses, 2000.

#### PRE-REQUISITE

Good basis of Mathematics

#### INSA LYON

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