

MATH-232

Probability and statistics

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Cursus	Sem.	Type
Communication systems	BA4	Obl.
Computer science	BA4	Obl.
HES - IN	E	Obl.
HES -SC	E	Obl.

Language of teaching	English
Credits	6
Session	Summer
Semester	Spring
Exam	Written
Workload	180h
Weeks	14
Hours	6 weekly
Courses	4 weekly
Exercises	2 weekly
Number of positions	

Summary

A basic course in probability and statistics

Content

Revision of basic set theory and combinatorics.

Elementary probability: random experiment; probability space; conditional probability; independence.

Random variables: basic notions; density and mass functions; examples including Bernoulli, binomial, geometric, Poisson, uniform, normal; mean, variance, correlation and covariance; moment-generating function; joint distributions, conditional and marginal distributions; transformations.

Many random variables: notions of convergence; laws of large numbers; central limit theorem; delta method; applications.

Descriptive statistics: basic graphs and statistics; notions of robustness.

Statistical inference: different types of estimator and their properties and comparison; confidence intervals; hypothesis testing; likelihood inference and statistical modelling; Bayesian inference and prediction; examples.

Learning Prerequisites**Required courses**

Analyse I, II
Algèbre linéaire

Learning Outcomes

By the end of the course, the student must be able to:

- Construct confidence intervals for inference under uncertainty
- Contrast probability models and data
- Derive probabilities and other properties of random samples
- Compute probabilities based on simple combinations of logical statements
- Infer characteristics of probability models from empirical data
- Compute measures of location, scale and association for simple datasets
- Formulate probability models appropriate for simple problems
- Interpret data through simple graphics

Teaching methods

Ex cathedra lectures, exercises and problems

Assessment methods

Quizzes, mid-term test, final exam

Supervision

Office hours	No
Assistants	Yes
Forum	Yes

Resources**Bibliography**

Ross, S. (2012) A first course in probability (9th edition). Pearson.
Aussi disponible en traduction française (PPUR): 'Initiation aux probabilités'.
A polycopié of the course notes, with the problems etc., will also be available.

Moodle Link

- <http://moodle.epfl.ch/course/view.php?id=14411>

Prerequisite for

Electrométrie, Théorie du signal, Télécommunications, Information et codage, Fiabilités, ...