Probability/Statistics

**ECTS** : 4

**Volume horaire** : 36

**Description du contenu de l'enseignement :**

Following up on the first year module, this unit is designed to remind the students of probability concepts and common distributions, as well as introduce theory and techniques of inferential statistics.

This course aims to provide students with a range of basic estimation and statistical tools that they might need to apply in further fields of their academical studies (finance, economics, marketing, etc.). It also aims to empower them with a knowledge based critical look on the numbers they will encounter in their studies or readings, both in their academic and everyday life. Finally, for those interested, it provides a strong foundation to further quantitative courses, for example in the financial field.

**Compétence à acquérir :**

By the end of this module, students will have demonstrated: **Knowledge** 1. Advanced knowledge of the mathematical definitions of the underlying concepts (sample space, probability measure, discrete/continuous distribution, joint/marginal distributions, random variable, PDF, CDF, Moments) 2. Advanced knowledge of the in-scope common distributions. (Uniform, Bernoulli, Binomial, Poisson, Exponential, Normal) 3. Knowledge of the sampling theory and its main theorems. 4. Knowledge of the various estimation methods 5. Familiarity with hypothesis testing **Skills** 6. Ability to derive moments of a random variable given its distribution. 7. Ability to identify the right distribution suited to real-life situations. 8. Ability to derive PDF and/or CDF from one another. 9. Accurate reading of statistics tables 10. Ability to apply the pointwise estimation methods, using the appropriate theorems 11. Ability to compare estimators. 12. Ability to derive a confidence interval for an unknown parameter. **Values and Attitudes** 13. Rigor in reasoning 14. Ability to articulate more sophisticated demonstrations

**Mode de contrôle des connaissances :**

The summative assessment is made of 2 mid-terms and a final exam:

- Test 1 (week 6 - 1.5h): Probabilities and sampling theory
- Test 2 (week 11 - 1.5h): Inferential statistics and Estimation

The Final exam (2h) will take place during exam week and will cover the whole course.

**Bibliographie, lectures recommandées :**

**Core Sources**

Handout designed by Laëtitia Comminges. Past papers and lectures slides will be available.

**Supplementary and Secondary Sources**

Probability and Statistics (4th edition) – Schaum's Outlines

Naked Statistics – Charles Wheelan

Statistics for Business and Economics, Anderson, Sweeney, Williams (11 ed).