### Summary

Modelling of rare events, such as stock market crashes, storms and catastrophic structural failures, is important. This course will describe the special models and methods that are relevant to such modelling, including the mathematical bases, statistical tools and applications.

### Content

- **Mathematical bases**: behaviour of maxima and threshold exceedances in large samples, both for independent and dependent data. Poisson process modelling.


- **Applications**: Environmental, financial, and engineering applications. Use of R for extremal modelling.

### Learning Prerequisites

**Important concepts to start the course**

Probability and statistics at the level of second-year bachelor (mathematics), plus further knowledge of statistics and stochastic processes.

### Learning Outcomes

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

- Recognize situations where statistical analysis of extrema is appropriate
- Manipulate mathematical objects related to the study of extrema
- Analyze empirical data on extremes using appropriate statistical methods
- Construct appropriate statistical models for extremal data
- Interpret such models in terms of underlying phenomena
- Infer properties of real systems in terms of probability models for extremes

### Teaching methods
Lectures, theoretical and computational exercises in class and at home.

Assessment methods
Mini-project, final exam.
Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communiquée aux étudiants concernés.

Resources

Bibliography

Ressources en bibliothèque
• An Introduction to the Statistical Modelling of Extreme Values / Coles
• Statistics of Extremes / Beirlant

Moodle Link
• https://go.epfl.ch/MATH-447