

MATH-383

**Risk and environmental sustainability**

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<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
Mathematics	BA6	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

This course gives an introduction to the assessment of risk with a particular focus on modelling of rare events, which can have huge environmental impacts.

**Content**

Motivation: environmental risks and catastrophes.

Elements of risk analysis and of statistical modelling.

Probability models for rare events: Poisson process and its properties; extremal distributions and extremal paradigm.

Statistical application of rare event models in environmental settings: analysis of block maxima, threshold exceedances, Poisson models. Risk assessment via return levels, etc. Complications such as clustering and non-stationarity.

Practical examples.

Deterministic and probabilistic forecast evaluation. Scoring rules and their propriety.

**Keywords**

Environmental risk. Extremal paradigm. Poisson process. Block maxima. Threshold exceedances. Risk assessment. Forecasting.

**Learning Prerequisites****Required courses**

Basic courses in probability and statistics (e.g., MATH-230, MATH-240)

**Learning Outcomes**

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

- Choose an appropriate approach to data analysis.
- Estimate risk using statistical methods.
- Formulate models for risk analysis.
- Discuss possible issues with their analyses and propose remedies.
- Expound the main approaches and models used for analysis of rare events.

**Transversal skills**

- Write a scientific or technical report.
- Demonstrate the capacity for critical thinking

- Demonstrate a capacity for creativity.
- Use a work methodology appropriate to the task.

### **Teaching methods**

Ex cathedra lectures, exercises in class and at home, mini-project.

### **Expected student activities**

Attending lectures and exercise classes, working with other students.

### **Assessment methods**

Final written exam, mini-project (continual assessment, 30% of final mark).

### **Resources**

#### **Moodle Link**

- <https://go.epfl.ch/MATH-383>