

MATH-383

Risk and environmental sustainability

Mhalla Linda

Cursus	Sem.	Type
Mathematics	BA5	Opt.
Minor in statistics	H	Opt.
Statistics	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
Hours	4 weekly
Courses	2 weekly
Exercises	2 weekly
Number of positions	

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 statistical modelling.

Elements of risk analysis.

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>