EPFL

MATH-438	**Statistical genetics**

Cursus	Sem.	Type
Ing.-math	MA2, MA4	Opt.
Mathématicien	MA2	Opt.
Statistics	MA2	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	During the semester
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Remark

pas donné en 2022-23

Summary

This course will cover the major topics in statistical genetics.

Content

Topics will include (as time permits):
- Population genetics, Hardy-Weinberg Equilibrium
- Mendelian genetics
- Genetic epidemiology
- Gene mapping
- Pedigree analysis
- Segregation analysis
- Hidden Markov Model (HMM)
- Likelihoods on pedigrees - Elston-Steward and Lander-Green algorithms
- Lod scores and linkage analysis
- Linkage disequilibrium and association analysis
- Genome-wide association studies (GWAS)

Keywords

genetics, genetic epidemiology, pedigree analysis, gene mapping, pedigree analysis, HMM, linkage disequilibrium, GWAS

Learning Prerequisites

Required courses

A previous statistics course would be useful.

Recommended courses

A previous statistics course would be useful.

Important concepts to start the course

A good understanding of likelihood would be useful, although we can cover this in the course if necessary.

Learning Outcomes

By the end of the course, the student must be able to:
- Choose of analysis for a genetic problem
- Construct an appropriate genetic model
- Design a genetic study
- Compute necessary values for a genetic study
- Implement correct analysis methods
- Report results
- Choose appropriate analysis for a genetic problem

Transversal skills

- Use a work methodology appropriate to the task.
- Set objectives and design an action plan to reach those objectives.

Teaching methods

Lectures plus handwritten as well as computer exercises.

Expected student activities

Class and exercises attendance and participation as well as report writing. Some group work will also be assigned. Students are expected to participate in their learning by attending lectures and practical exercise sessions, posing questions, proposing topics of interest, peer reviewing of preliminary reports, and interacting with teaching staff regarding their understanding of course material.

Assessment methods

Assignments based on group exercises and an individual report on a genetic study.
Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés.

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)
No

Bibliography
To be provided during the course.

Moodle Link
- https://go.epfl.ch/MATH-438