EPFL

MATH-438	**Statistical genetics**
	Goldstein Darlene

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

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

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, R, GWAS

Learning Prerequisites

Required courses

None, but 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 appropriate 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

Transversal skills

- Use a work methodology appropriate to the task.
- Write a scientific or technical report.
- Write a literature review which assesses the state of the art.
- 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.

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)
No

Bibliography
To be provided during the course.
Pre-recorded lectures (videos) will also be provided.

Moodle Link

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