BIO-463

Genomics and bioinformatics

Rougemont Jacques

Cursus	Sem.	Type
Life Sciences Engineering	MA2, MA4	Opt.
Systems Engineering minor	E	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

This course covers various data analysis approaches associated with applications of DNA sequencing technologies, from genome sequencing to quantifying gene expression, transcription factor binding and chromosome conformation.

Content

- Genome sequencing and assembly
- Genome annotation, gene prediction
- Hidden Markov Models
- Comparative genomics
- Phylogenetic trees
- Models of molecular evolution
- Transcription
- Gene expression profiling
- Gene regulation
- Chromosome conformation

Learning Prerequisites

Recommended courses

Molecular biology, genetics, linear algebra, ordinary differential equations, basic statistics, computer programming

Important concepts to start the course

DNA and RNA, replication, transcription and translation.

Learning Outcomes

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

- Choose a method or algorithm to analyse different kinds of genomic data
- Design an analysis strategy to interpret complex, heterogenous genomic data
- Assess / Evaluate a publication based on genomic data

Transversal skills

- Access and evaluate appropriate sources of information.
- Summarize an article or a technical report.
- Communicate effectively with professionals from other disciplines.
- Use both general and domain specific IT resources and tools

Teaching methods

2 hours lecture (theoretical concepts) followed by 2 hours practical exercises (review the theory and practice with bioinformatics tools and data)
Lecture notes, slides and exercises provided on Moodle.

Expected student activities

Following the lectures, completing exercises, doing a project

Assessment methods

The evaluation is based on a written test at week 7 and a personal project between week 7 and week 14. Each counts for 50% of the grade.

Resources

Bibliography

- A primer of genome science / Greg Gibson, Spencer V. Muse
- Bioinformatics: sequence and genome analysis / David W. Mount
- Bioinformatics and functional genomics / Jonathan Pevsner
- Biological sequence analysis: probabilistic models of proteins and nucleic acids / Richard Durbin

Ressources en bibliothèque

- A primer of genome science / Gibson
- Bioinformatics / David W.Mount
- Biological sequence analysis
- Bioinformatics and functional genomics

Moodle Link

- http://moodle.epfl.ch/course/view.php?id=11181