BIO-463 **Genomics and bioinformatics**

Rougemont Jacques

Cursus	Sem.	Type
Bioengineering	MA1, MA3	Opt.
Sciences du vivant	MA1, MA3	Opt.
Systems Engineering minor	H	Opt.

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

Summary

This course reviews the different techniques of DNA sequence analysis and the associated bioinformatics tools in the context of applications to current research in molecular biology.

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:

- Interpret large-scale genomic data
- Manipulate high-dimensional, noisy and heterogeneous genomic data
- Describe classical algorithms for DNA sequence analysis and gene expression classification
- Develop a quantitative understanding of transcriptional regulation

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.

Assessment methods

2 written tests covering mostly the lecture part: at 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

- Bioinformatics and functional genomics / Pevsner
- Biological sequence analysis: probabilistic models of proteins and nucleic acids / Durbin
- A primer of genome science / Gibson
- Bioinformatics: sequence and genome analysis / Mount

Moodle Link

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