BIO-373

Génétique et génomique

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Cursus	Sem.	Type
Ingénierie des sciences du vivant	BA5	Opt.

Langue d'enseignement	français
Crédits	4
Session	Hiver
Semestre	Automne
Examen	Ecrit
Charge	120h
Semaines	14
Heures	**4 hebdo**
Cours	2 hebdo
Exercices	1 hebdo
Projet	1 hebdo
Nombre de places	

Remarque

Please note that the Genomics Part of this Course is taught in English

Résumé

La partie théorique de ce cours couvre la génétique classique et la génomique contemporaine. Comme le langage de programmation R est devenu un outil important pour la recherche en génomique, le cours comprend également une introduction à R, suivie d'applications pratiques en analyses génomiques.

Contenu

- Normal and abnormal chromosomes; major chromosomal diseases.
- Different modes of transmission: Mendelian, non-Mendelian, risk factors.
- Importance and limitations of genetic analyses.
- Different types of genetic variants and effect on the individual and the population.
- Examples of the most frequent hereditary diseases, genotype-phenotype correlation.
- What does it mean to be genetically different? What are genomic variants and how can they impact phenotypes?
- Ethical guidelines on genetic research and gene therapy.
- Composition and organization of the genome
- Regulatory networks: what are their components, their architecture and how do they work?
- How is the genome structured in the nucleus of the cell; what is the impact of structural features on the function of the genome?
- Overview of high-throughput sequencing technologies
- How are regulatory networks fine-tuned, and what are the current methodological challenges?
- What is a minimal genome? How can the genome be modified for biotechnological applications?
- What is the future of genomics in the context of personalized medical applications?

Mots-clés

Genome, chromosome, genetic and phenotypic variation, sequencing, regulatory networks differentially expressed genes, personalized medicine

Compétences requises

Cours prérequis obligatoires

Cours prérequis indicatifs

Biologie cellulaire et moléculaire

Acquis de formation

A la fin de ce cours l'étudiant doit être capable de:

- Elaborer the social implications of current genetics
- Evaluer the differences between mutations, risk factors and genetic variations
- Examiner population and quantitative genetics, evolutionary and conservation genetics
- Discuter the ethical implications of genetic testing and gene therapy
- Elaborer the architecture of a genome and its function with a specific focus on creating a knowledge base of how the genome interacts with its proteome
- Analyser the structural and functional properties of gene regulatory networks and how these networks coordinate differential gene expression
- Expliquer how solving the human genome sequence is paving the way for personalised medicine
- Exécuter Basic genomic analyses using R (alignment, differential expression etc.)

Méthode d'enseignement

Ex cathedra, exercices and group project

Travail attendu

Exercises + group project in R

Méthode d'évaluation

Written exam + report on a project in R

Encadrement

Office hours	Non
Assistants	Oui
Forum électronique	Oui

Ressources

Service de cours virtuels (VDI)

Non

Bibliographie

Concepts of Genetics / Klug - 10th edition, ISBN 978-0-321-72412-0
Genomes / Brown - 3rd Edition ISBN 0 8153 4138 5

Ressources en bibliothèque

- Génétique / Klug
- Genomes / Brown