UCLouvain

lbrmc2101

2024

Genetic engineering

5.00 credits	37.5 h + 15.0 h	Q1

Teacher(s)	Chaumont François (coordinator) ;Hachez Charles ;
Language :	French > English-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	General biochemistry and general genetics
Main themes	The theoretical part will detail the major steps of genetic engineering: preparation and screening of libraries, gene cloning, gene characterization and modification, gene expression in heterologous hosts. Concrete problems of genetic engineering in the microbial, animal and plant fields will be discussed. Recent examples of genetic engineering achievements from the recent literature will be discussed.
Learning outcomes	**At the end of this learning unit, the student is able to :** a. Contribution de l'activité au référentiel AA (AA du programme) Cohérence des AA cours en regard de ceux du programme 1.2, 1.3 2.2 3.4, 3.9 6.1, 6.2 b. Formulation spécifique pour cette activité des AA du programme 1 By the end of this course, the student should be able: - To explain the main genetic engineering methodologies - To choose, according to the problem posed, among different strategies used to clone a gene, modify it and transfer it into other organisms - To propose experimental approaches aimed at solving practical problems of genetic engineering in the microbial, animal and plant fields - To understand and set out examples of genetic engineering in the microbial, animal and plant fields as described in English scientific journals
Evaluation methods	The assessment is based, on the one hand, an open-book written examination on the solution of exercises simulating concrete genetic engineering problems and also covering the material covered during the practical work (60%, 12 points out of 20 of the final mark) and, on the other hand, the preparation and presentation in groups of a genetic engineering theme in front of the class (flipped classroom; 40%, 8 points out of 20 of the final mark). **Existence of an absorbing mark**: a minimum mark of 8/20 in the written exam (i.e. 4.8 points out of 20 of the final mark) is required for the mark related to the flipped classroom part to be taken into account in the calculation of the final mark. The flipped classroom part is subject to continuous evaluation of student work, accounting for 40% of the final course evaluation. Therefore, no further evaluations are organized during the exam sessions for this part. **The mark obtained for this part is deemed to be attached to each of the sessions of the academic year.** Students are also required to self-assess on flipped classroom work and this self-assessment can be used to adapt the grades. If generative AIs are used, the student must systematically indicate all parts where AIs have been used, e.g. in a footnote or in Power Point slides, specifying whether the AI was used to search for information, to write the text or to correct it. Furthermore, sources of information must be systematically cited in accordance with bibliographic referencing standards. Students remain responsible for the content of their work, regardless of the sources used.
Teaching methods	Part of the course is organized as a flipped classroom. Students are divided into working groups during a class session (see the course schedule communicated during the first class) and are required to work on the themes assigned to them in order to prepare a presentation to the rest of the audience. After a presentation by the course lecturers on certain theoretical aspects of genetic engineering (key enzymes, vectors, cloning strategies and associated molecular biology techniques - DNA and RNA sequencing - directed mutagenesis - gene expression in host organisms, etc.), students will be asked to take an interest in a model organism used in genetic engineering, and answer a thematic question. Practical work sessions will illustrate, in a very concrete way, the basics of genetic engineering. Classroom exercises are also organized. They simulate specific genetic engineering problems and are solved individually by the students before being solved collectively.

Content	Theoretical part: Methods of genomic and cDNA screening - Global analysis of the genome and its expression (genomics, transcriptomics, proteomics, metabolomics) - directed mutagenesis - gene expression in heterologous hosts: Escherichia coli, other bacteria, yeast, transgenic cell lines and transgenic organisms (animals and plants) - protein engineering - genic therapy. Solving problems: concrete problems of genetic engineering will be exposed and solved by the students.
Inline resources	Moodle
Bibliography	Le syllabus et les notes de cours et de travaux pratiques rédigées par l'équipe d'enseignants et dont l'usage est jugé obligatoire sont disponibles sur Moodle. Le cours ne fait appel à aucun autre support particulier qui serait payant et jugé obligatoire. Les ouvrages payants qui seraient éventuellement recommandés le sont à titre facultatif et sont tous consultables à la Bibliothèque des Sciences et Technologies.
Other infos	This course can be given in English. Participation in the first course is mandatory for the organization of the flipped classroom. Attendance at all practical sessions is essential. In the event of unjustified absence, or absence for which justification has not been accepted, a penalty will be applied to the final grade. The penalty is proportional to the number of absences. Penalties are definitively imposed and may lead to a final mark of 0/20 for LBRMC2101.
Faculty or entity in charge	AGRO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biochemistry and Molecular and Cell Biology	BBMC2M	5		
Master [120] in Biomedical Engineering	GBIO2M	5		
Master [60] in Biology	BIOL2M1	5		
Master [120] in Chemistry and Bioindustries	BIRC2M	5		