COURSE DETAIL

MOLECULAR BASIS OF GENOME EDITING
Country Italy
Host Institution University of Bologna
Program(s) University of Bologna
UCEAP Course Level Upper Division
UCEAP Subject Area(s) Biological Sciences
UCEAP Course Number 145
UCEAP Course Suffix
UCEAP Official Title MOLECULAR BASIS OF GENOME EDITING
UCEAP Transcript Title MOL BAS GENOME EDIT
UCEAP Quarter Units 6.00
UCEAP Semester Units 4.00

Course Description

At the end of the course, the student possesses in-depth knowledge of the molecular mechanisms underlying genome editing methodologies in eukaryotic and prokaryotic cells and the main applications in biotechnology. In particular, the student is able to: 1) analyze and discuss topics concerning the basic mechanisms and applications of these methodologies; 2) understand and critically analyze the biomolecular literature.

This course covers: basic concepts concerning nucleic acids in the cell; chemical structure of nucleic acids; physical structures of DNA and RNA molecules; genetic code, genes and genomes; physical structure of genetic material: bacterial chromosomes (chromatin), eukaryotic chromatin, higher order chromatin structures; DNA recombination; the biological role of homologous recombination; molecular mechanisms of homologous recombination in bacterial cells and in eukaryotic cells; non-homologous recombination; site-specific recombination; mechanisms of DNA repair; types of DNA lesions; pathways and mechanisms of DNA repair: DNA photolyase, Nucleotide Excision Repair, Base Excision Repair, Mismatch Repair; repair mechanisms of DNA double-strand breaks: Nonhomologous end-joining and homologous recombination repair; conventional approaches used for genome-editing: homologous recombination, chemical methods and approaches based on homing endonucleases; genome-editing approaches based on modern methodologies using sequence-specific all-protein nucleases: mega-nucleases, zinc-finger nucleases (ZFNs) and Transcription Activator-Like Effector Nucleases (TALENs); and genome-editing approaches based on methodologies using RNA-guided nucleases: Clustered regularly interspaced short palindromic repeats (CRISPR-CAS systems).

The course includes an individual laboratory activity where the CRISPR-Cas9 system is used to specifically target and cleave a gene sequence of interest. The aim is to evaluate how introduced mutations affect target recognition and cleavage efficiency by the endonuclease.

Language(s) of Instruction
English

Host Institution Course Number
B6302

Host Institution Course Title
MOLECULAR BASIS OF GENOME EDITING

Host Institution Course Details
https://www.unibo.it/en/study/course-units-transferable-skills-moocs/course-uni...

Host Institution Campus
BOLOGNA

Host Institution Faculty

Host Institution Degree
L in BIOLOGY OF HUMAN AND ENVIRONMENTAL HEALTH

Host Institution Department
Biological, Geological, and Environmental Sciences

Course Last Reviewed
2025-2026

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