



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Biologia Cellulare e Molecolare PhD Program

Genome editing technologies using CRISPR-Cas systems

Learning outcomes and Course contents

CRISPR-Cas systems are revolutionizing the field of genetic engineering. By the end of the course, the PhD student will understand how CRISPR-Cas systems were discovered, how this technology can be applied, and the latest “CRISPR-Cas based” tools that can be used for genome editing in vitro and in vivo. The PhD student will also learn how to design genome editing experiments, gaining the skills to design sgRNAs, select the most appropriate gene editor, and choose the best model for testing.

Program:

- History of genetic editing
- Discovery of the CRISPR-Cas system
- Genome editing with CRISPR-Cas9: DNA repair pathways, double-/single-cut editing
- CRISPR-Cas based genome editing technologies: CRISPRi, CRISPRa, base editing, transposases, and prime editing
- Delivery strategies for genome editing components
- Mitochondrial genome editing
- Challenges for precision and safety in genome editing

Teaching methods

The theoretical lessons will be taught by the instructor with continuous references to recent publications related to the topic being discussed. The practical part, which involves designing sgRNAs and planning a genome editing experiment, will be carried out on the students' personal computers.

Assessment methods

Multiple-choice test and brief discussion of a paper related to the course.

How to attend

The course is aimed in particular at first year PhD students.

Students interested in attending the course are kindly requested to register by sending an email with the subject “PhD genome editing course” to francesco.chemello2@unibo.it, indicating whether they wish to attend in person or online, by no later than 01 February 2025, to allow for the organization of the classroom (in-person + virtual) based on the number of interested participants.