科目ナンバリング	U-LAS14 20036 LE68						
授業科目名<英訳>	Basic Genetic Engineering-E2 Basic Genetic Engineering-E2			担当者所属職名・氏名	生命科学研究科 准教授 Adam Tsuda GUY		
群	自然科学科目群		分野(分類)	生物学(各論)		使用言語	英語
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2026・後期	曜時限	水2	配当学年	主として1・2回生	対象学生	理系向

[授業の概要・目的]

The objective of this course is to gain a familiarity with the methods, resources, and molecular tools used in genetic engineering. Using an active learning approach, we will cover basic cloning strategies, expression systems and applications that are widely used in labs today. The course is intended for 1st and 2nd year students to provide an introduction to genetic engineering, which will serve as a foundation for more advanced studies.
Students taking part in the iGEM competition and international students are most welcome to take this course.

[到達目標]

Students will acquire familiarity with DNA cloning, PCR, CRISPR-Cas9, epitope tags, gene knockouts, gene silencing, and other important techniques. Although this is not a "wet" lab, we will learn by actually designing genetic engineering projects. Depending on enrollment numbers, we will work in small groups or individually to plan a genetic engineering project, step by step.

[授業計画と内容]

Lecture topics are highly flexible, and will address the specific requirements of specific projects chosen by students. I will combine short mini-lectures with in-class work so that students can actively learn how to use some of the design tools and strategies for genetic engineering. The latter half of the course is mostly devoted to small group discussions and one-on-one work with the instructor.

1. Introductory Lecture. What can genetic engineering do for us? Some discussion of Bioethics. Student survey.
2. Lecture on Central Dogma of Molecular Biology
3. Basics of Genetic Engineering: Plasmids, Vectors, Restriction Enzymes, Transformation
4. Transformation vs Transfection; PCR theory.
5. More on restriction enzymes; Gel Electrophoresis. Reverse transcription-PCR. (one-on-one discussion about student projects)
6. Introduction to CRISPR-Cas9; more Bioethics; Genetically Modified Organisms as food. Sources of DNA for your project.
7. ApE walkthrough. CRISPR-Cas9 walkthrough using CHOPCHOP.
8. Any of the following topics, depending on students' projects: Epitope, fluorescent and affinity tags. Germline knockout advice. Transgenic method for plants: Ti plasmids.
9. Demo presentation by instructor. Quiz/test for students.
10. Lecture topic tailored to specific projects (one-on-one discussion)
11. Lecture topic tailored to specific projects (one-on-one discussion)
12. Lecture topic tailored to specific projects (one-on-one discussion)
13. Lecture topic tailored to specific projects (one-on-one discussion)
14. Oral presentation practice and preparation.
≪ Final Exam (group or individual oral presentations)≫
15. Feedback Class

Basic Genetic Engineering-E2(2)へ続く↓↓↓

Basic Genetic Engineering-E2(2)

[履修要件]

The course is designed for 1st and 2nd year students, from all science backgrounds. Genetic engineering is conceptually not difficult, but the vocabulary is technical. Students must bring a laptop or device with WiFi connection so that they can work in class.

[成績評価の方法・観点]

Final grades will be based on a quiz (10%), a final exam in the form of a short oral presentation (30%), and attendance and participation (60%).

[教科書]

使用しない

Printed handouts for each class are provided to students, and I will teach you how to use many online resources and freeware to work with DNA sequences, vectors, cloning, and designing gRNA for CRISPR-Cas9.

[参考書等]

（参考書）

授業中に紹介する

[授業外学修（予習・復習）等]

As we get into individual or team projects, some outside reading or planning will be necessary, 1-2 hours per week. Depending on individual student background knowledge, I may recommend some online reading/ educational videos to aid their learning, or provide printouts of research artices and reviews tailored to each student's project.

In this course, much of the students' preparation work for class will be looking technical terms up or searching online databases.

Students will need to spend some additional time preparing for their oral presentation on final exam day.

[その他（オフィスアワー等）]

In principle, anytime. Please contact the instructor by e-mail if you have any questions. For consultations about course-related matters outside class hours, please make an appointment directly or by e-mail.

[主要授業科目（学部・学科名）]