

Division of Life Science, The Hong Kong University of Science and Technology

LIFS 4630 Advanced Topics in Biotechnology

Spring semester, 2022-2023

Time and venue: Monday and Wednesday 10:30 - 11:50; Rm 1409, Lift 25-26 (60)

Instructor: Zhen LIU

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Course Description:

Life science is now at an unprecedented stage because of the development of new biotechnologies and the following ground-breaking discoveries in the past decades. This course is dedicated to sharing with you the latest breakthroughs, how they are discovered, the principles and applications, and pinpointing the opportunities your generations will embrace. Topics include state-of-the-art technologies such as genome editing techniques, super-resolution microscopies, DNA nanotechnology, omics, and the latest biotechnology approaches to investigate and tackle human diseases such as COVID-19, hereditary diseases, and cancers.

Course goals

This course will introduce the students to the multi-disciplinary nature and various applications of contemporary biotechnology. Students will learn the state-of-the-art biotechnologies developed in recent years and their applications in various contexts such as new approaches developed to prevent, diagnose, and treat various human diseases.

Learning outcomes

By the end of this course, the students are expected to be able to:

1. Understand the multi-disciplinary nature of biotechnology which involves the use of a wide spectrum of cutting-edge technologies.
2. Appreciate the wide scope of applications of biotechnology.
3. Obtain the knowledge of the most recent advances in biotechnology and their applications.
4. Recognize the ethical concerns brought by modern biotechnology.

Assessment

Attendance: 30%

Oral presentation: 30%

Final literature review: 40%

Course outline:

1. Week 1-2: Course introduction, the multidisciplinary nature of biotechnology, historical and modern biotechnology
2. Week 3-4: Biotechnology related to infectious diseases and COVID-19

3. Week 5- 6: Gene editing, CRISPR, and its applications
4. Week 7- 8: Super-resolution fluorescence microscopy
Week 8: Day 2 for group presentation and discussion
5. Week 9- 10: Bionanotechnology and nanobiotechnology
Week 10: Day 2 for group presentation and discussion
6. Week 11-12: The era of omics
Week 12: Day 2 for group presentation and discussion

References:

1. Nature Biotechnology
2. Nature Methods
3. Ulrich Kuck and Nicole Frankenberg-Dinkel, Biotechnology.
4. Michael Wink, An introduction to Molecular Biotechnology.
5. Firdos Alam Khan, Biotechnology Fundamentals.