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

LIFS 4800 Epigenetics and Chromosome Biology

Spring semester, 2016-2017
Credits: 3
Class duration: 3 hours per week

Instructor: Toyotaka Ishibashi (course coordinator) and guest lecturer.

Meeting Time and Venue: Mondays 16:30-17:50 and Fridays 12:00-13:20, Room 2302, Academic Building

Course goals

This course will cover recent advances in the fields of epigenetics and chromosome biology. The students will acquire basic knowledge in chromosome biology and epigenetics. The students will also practice how to critically review scientific publications. They will grow their team-working capability and refine their scientific communication and presentation skills.

Intended Learning Outcomes

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

1. Describe the basic concepts of chromosome structure and epigenetics.
2. Relate these concepts to relevant biological phenomena such as transcription and diseases.
3. Analyze related scientific articles published in international journals and assess their relevance.
4. Work as a team to gather relevant information and discuss related topics.
5. Communicate effectively to present the findings, both orally and in writing.

Course description

Epigenetics is defined as heritable changes in gene expression that is not coded in the DNA sequence. Epigenetic changes affect many cellular and developmental processes such as transcription and cell differentiation. Moreover, epigenetic changes are highly relevant for human health topics such as aging and X chromosome-linked diseases. This course will cover the principles and recent discoveries of chromosome biology and epigenetics. Several topics related to epigenetics including aging and human diseases will be discussed.

Teaching approach

The primary method of the course will be interactive lectures. In addition of the lectures, the students will be organized in small teams (about 2-3 students per team) to work together, analyze scientific papers and present them to the class.

They are expected to lead the discussions within the audience. The results will be summarized in a written report and in a group oral presentation, in which peer participation and assessment will be expected.

Assessment scheme

1. Attendance 10%
2. Mid-term examination 30%
3. Oral presentation 20%
4. Final examination 40%

Student learning resources

The course material will be drawn from the book "Epigenetics" by C. David Allis, Thomas Jenuwein, and Danny Reinberg (Cold Spring Harbor Laboratory Press) and from scientific research literature.

Course outline

-Introduction (Feb. 3rd)
-Chromosome organization and function (Feb. 6th)
-Histone post-translational modifications (Feb. 10th, 13th)
-Histone variants and epigenetics (Feb. 17th)
-DNA methylation, Methyl-CpG regulation and demethylation (Feb. 20th, 27th)
-Histone modification enzymes (Mar. 3rd)
-The epigenetics of non-coding RNA (Mar. 6th)
-Transcription silencing by Polycomb Group Proteins (Mar. 10th, 13th)
-Mid-term review (Mar. 17th), Mid-term exam (Mar. 20th), Mid-term discussion (Mar. 24th)
-Chromatin structure modifications and their mechanism of action (Mar. 27th)
-Transcription and epigenetics (Mar. 31th)
-Epigenetic regulation of chromosome inheritance (Apr. 3rd)
-Epigenetics of X chromosome inactivation and dosage compensation (Apr. 10th)
-Epigenetics determinants of cancer (Apr. 21st, 24th)
-The role of epigenetics in immune diseases (Apr. 28th)
-Epigenetics: diet and aging (May 5th)
-Final exam review (May 8th)