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

LIFS 6800: Frontiers in nucleic acid research

Spring semester, 2016-2017
Credits: 4
Time: Monday 10:00 – 11:50 LT-H
Thursday 10:00 – 11:50 Room 2463

Instructors: Dr. Tom CHEUNG (Room 5522, E-mail: tcheung@ust.hk) (course coordinator)
Dr. Danny LEUNG (Room 5452, E-mail: dcyleung@ust.hk)

Course goals

Student will gain knowledge on the physiological functions of nucleic acid research and acquire analytical skills on the use of advanced molecular techniques for nucleic acid research.

Learning outcomes

By the end of this course, you will be able to:
1. Explain how biological processes can be regulated by nucleic acids and related networks.
2. Critically assess the scientific literature in writing.
3. Critically review and present scientific literature in oral presentations.
4. Propose experiments concerning the use or characterization of nucleic acid research in biological studies.

Course description

Nucleic acids, which include DNAs and RNAs, are large biomolecules that are essential for all forms of life. It functions to encode, transmit and express genetic information. This course will cover molecular-scale understanding of fundamental processes across all braches of Life, with a particular focus on nuclei acid research. Literature regarding to various fundamental processes such as cell fate determination, epigenetics, anti-viral defense and non-coding RNA regulation will be discussed. In addition, methodologies and technologies for the study of nuclei acid will also be discussed in details.

Teaching approach

Course material will be delivered in lectures. One-on-one feedback will be given on written assignments and oral presentations by instructors. Students are expected to actively participate in class discussion and contribute to peer assessment.

Assessment scheme

Assessment Task	Learning Outcomes (LO)	Weighting (%)
Oral presentation of scientific papers [a]	1, 2, 4	20
Written analysis of scientific papers [b]	1, 2, 3	40
Experimental design using technologies focus on nucleic acid research [c]	5	20
1-page written proposal on the study of nucleic acid research [d]	1, 2, 5	20

Each student will give: (a) one 30-minute oral presentation on an assigned paper during the course; (b) two 1-page written reviews on assigned papers; (c) written details of experimental design on the use of CRISPR for genome editing; (d) one 1-page written proposal from a list of topics chosen by the instructors.
There will be no mid-term or final examination.

Assessment rubrics

Written reviews of scientific papers

	Needs improvement	Good	Excellent
Summarizes background information of the paper	Does not consult the primary literature cited in the introduction section of the paper.	Reviews the primary literature cited in the introduction section of the paper.	Reviews the cited primary literature and assesses whether the hypotheses of the paper are justified.
Describes and evaluates the methods used in the paper	Lack of understanding of the methods and their potential shortcomings.	Understands the methods and their potential shortcomings.	Understands the methods and identifies alternative approaches that can complement or improve the paper.
Assesses the validity of the results	Incorrect interpretation of data.	Correct interpretation of data.	Correct interpretation of data. Identifies pitfalls and limitations of data.

Assessment rubrics for other assignments will be available at the beginning of the course.

Student learning resources

Course material will be mostly based on recent scientific literature in the field. Links for downloading course material will be available.

Course schedule

Each week, there will be 2 hours of lecture and 2 hours of student oral presentation/discussion.

Week	Date	Topic	Instructor	Assignments due
1	Feb6,9	Non-coding DNA and Genome organization	Leung	
2	Feb13,16	DNA methylation and epigenetics	Leung	
3	Feb20,23	Technologies for studying epigenomics	Leung	
4	Feb27,Mar2	piRNA and transposon silencing	Leung	
5	Mar6,9	Transcriptional regulation in cell biology	Leung	
6	Mar13,16	Ribozyme	Cheung	1st written review
7	Mar20,23	microRNA	Cheung	
8	Mar27,30	Bioinformatics workshop/ Preliminary proposal review	Leung/Cheung	2nd written review
8	Apr3,6	RNAi	Cheung	
9	Apr10,20	CRISPR	Cheung	
10	Apr24,27	Long non-coding RNA	Cheung	Expt. design
11	May4	Technologies for non-coding RNA discovery	Cheung	
12	May8	Final proposal review	Leung/Cheung	1-page proposal