

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

**LIFS 6800 : Frontiers in Nucleic Acid Research**

**Spring semester, 2022-2023**

Credits: 4

**Time:** Thursday 12:00 – 03:50 PM

**Venue:** Room 2463 (Lift 25/26)

**Instructors:** Dr. Tom CHEUNG (Room 5522, E-mail: tcheung@ust.hk) (Course Coordinator)  
Dr. Toyotaka ISHIBASHI (Room 5509, E-mail: toyotaka@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 branches of Life, with a particular focus on nucleic 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 nucleic 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 <sup>a</sup>	1, 2, 4	20
Written analysis of scientific papers <sup>b</sup>	1, 2, 3	50
1-page written proposal on the study of nucleic acid research <sup>d</sup>	1, 2, 5	30

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) one 1-page written proposal from a list of topics chosen by the instructors.

There will be no mid-term or final examination. Class attendance is compulsory.

## 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	Feb 9	Introduction and Molecular mechanism of transcription regulation	Ishibashi	
2	Feb 16	Detecting positioning techniques for RNA polymerase in the genome	Ishibashi	
3	Feb 23	Epigenetics: DNA methylation	Ishibashi	
4	Mar 2	Epigenetics: Histone PTMs	Ishibashi	
5	Mar 9	Epigenetics: Histone variants and chromatin structure	Ishibashi	
6	Mar 16	Scientific writing workshop/ Preliminary proposal review	Cheung, Ishibashi	Specific Aim page
7	Mar 23	Technologies for non-coding RNA discovery	Cheung	
8	Mar 30	microRNA	Cheung	1 <sup>st</sup> written review
9	Apr 13	Long non-coding RNA	Cheung	
10	Apr 20	Dosage compensation and development	Ishibashi	
11	Apr 27	Detection methods for Chromatin 3D structure in cells	Ishibashi	2nd written review
12	May 4	Final proposal review	Ishibashi /Cheung	1-page proposal