SCBI 372 I SCBE 411 Molecular Biology Applications
วทชว ๓๗๒ I วททส ๔๑๑ การประยุกต์ใช้ในชีววิทยาระดับโมเลกุล
Department of Biology, Faculty of Science, Mahidol University

Second Semester, Academic Year 2021 - 2022
Class Time: SCBI 372 Thursday 1:30 - 4:30 pm (XXX)
SCBE 411 Friday 1:30 – 4.30 pm (XXX)   Phayathai

Course Coordinator

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Prerequisite

SCBI 270 or SCBE 207

Course Description

การประยุกต์นำชีววิทยาระดับโมเลกุลมาใช้ในการทดลอง วิธีการทดลองทางชีววิทยา หัวข้อทันสมัยในการ
ทดลองเพื่อตอบปัญหาทางวิทยาศาสตร์ได้อย่างถูกต้อง ตัวอย่างและวิเคราะห์ตัวอย่างการทดลองตามความ
สนใจของนักศึกษา
The methodology to biological research; current topics in biological research with focus on
the methodology aiming to answer specific questions; current scientific literature.

Course Goals

SCBI 372 I SCBE 411 Molecular Biology Applications provides students with the upper-level
concepts in molecular biology and the techniques that lead to advancements in understandings
and applications for environmental biology, agriculture, and medicine. The course format intends
to integrate class lecture and scientific paper discussions and presentations with individual and
collaborative writing assignments on contemporary and current molecular biology application
topics. This aims to equip students with analytical skills to critically evaluate results/claims/news
with scientifically-sound judgements. In addition, the course will touch upon the topics of
genetically modified organisms (GMOs), gene therapy, gene editing by CRISPR-Cas9 system, or
human gene editing, which are of global interest and raise many bioethical debates.

Class Schedule

Week	SCBI 372 Thu 13.30 (XXX)	SCBE 411 Fri 13.30 (XXX)	Topic	Assignment
1	Jan 12	Jan 13	Course Introduction, Model Organisms	HW1 out
2	Jan 19	Jan 20	Regulation of Gene Expression: Concepts and Current Trends **Dr. Sittinan Chanarat** *(Department of Biochemistry, Faculty of Science)*	
3	Jan 26	Jan 27	Regulation of Gene Expression: **Techniques & Applications** DNA barcoding, Human Genome Project, qRT-PCR, RNA-Seq, Microarray, RNA interference (RNAi)	HW2 out
4	Feb 2	Feb 3	Molecular Biology for Forensic Science **Dr. Achirapa Bandhaya** *(Forensic Science Unit, Faculty of Science)*	
5	Feb 9	Feb 10	Structure and Function of Genome and Nucleic Acid **Techniques & Applications:** Gel electrophoresis, restriction endonuclease, gene cloning, Southern blotting, *in situ* hybridization, karyotype, and fluorescent *in situ* hybridization (FISH), Polymerase Chain Reaction (PCR), and Sanger DNA sequencing	HW3 out
6	Feb 16	Feb 17	Regulation of Gene Expression: Epigenetic Regulation **Application:** Chromatin immunoprecipitation, ChIP-Seq, iPS Cell	

7	Feb 23	Feb 24	Functional Genomics and Systems Biology **Application:** Next-generation sequencing, RNA sequencing, single-cell sequencing *Dr. Varodom Charoensawan* *(Department of Biochemistry, Faculty of Science)*	
8	Mar 2	Mar 3	- Paper discussion Midterm Revision	
9	**Midterm Exam: Mar 7 – Mar 10**			
10	Mar 16	Mar 17	Genome Repair and Genome Editing **Techniques and Applications:** PCR-based mutagenesis, homologous recombination, knock-out mice, CRISPR-Cas9 technology	
11	Mar 23	Mar 24	- Paper discussion Gene Therapy **Techniques & Applications:** Western blotting, protein purification, co-immunoprecipitation, immunoassay, mass spectrometry, protein sequence alignment, and reporter gene	HW4 out
12	Mar 30	Mar 31	Structure, Domain, and Modification of Protein *Dr. Puey Ounjai (Department of Biology, Faculty of Science)* **Techniques & Applications:** Crystallography and Cryo-EM	HW5 out
13	~~Apr 6~~ Tue Apr 4	Apr 7	Synthetic Biology *Dr. Chayasith Uttamapinant* (School of Biomolecular Science and Engineering, VISTEC)	

14	Apr 13 No class	Apr 14 No class	Songkran Holiday Apr 13 – Apr 15	
15	Apr 20	Apr 21	Presentation and Final Revision	
16	~~Apr 27~~ Tue Apr 25	Apr 28	Precision Medicine *Dr. Somponnat Sampattavanich* *(Siriraj Laboratory for Systems Pharmacology, Faculty of Medicine Siriraj Hospital)*	
17-18			**Final Exam Week: May 1 – May 12**	

Guest Lecturers

Assoc. Prof. Dr. Sittinan Chanarat ดร.สิทธินันท์ ชนะรัตน์ (sittinan.cha@mahidol.edu)

>   Department of Biochemistry, Faculty of Science, Mahidol University

Asst. Prof. Dr. Achirapa Bandhaya ดร.อจิรภาส์ พันธัย (achirapa.ban@mahidol.ac.th)

>   Programme Director Forensic Science Graduate Programme, Forensic Science Unit,
>   Faculty of Science, Mahidol University

Assoc. Prof. Dr. Varodom Charoensawan รศ. ดร.วโรดม เจริญสวรรค์ (voradom.cha@mahidol.ac.th)

>   Department of Biochemistry, Faculty of Science and Integrative Computational
>   BioScience Center, Mahidol University

Asst. Prof. Dr. Puey Ounjai ผศ. ดร.ป๋วย อุ่นใจ (puey.oun@mahidol.edu)

>   Head, Center of Nanoimaging
>   Department of Biology, Faculty of Science, Mahidol University

Dr. Chayasith Uttamapinant ดร.ชยสิทธิ์ อุตมาภินันท์ (chayasith.u@vistec.ac.th)

>   School of Biomolecular Science and Engineering, Vidyasirimedhi Institute of Science
>   and Technology (VISTEC)

Asst. Prof. Dr. Somponnat Sampattavanich ผศ. ดร.สมพลนาท สัมปัตตะวนิช

>   (somponnat.sam@mahidol.ac.th)
>   Director, Siriraj Research Excellence Center for Cancer Genomics and Precision Oncology
>   Co-director, Siriraj Laboratory for Systems Pharmacology, Department of Pharmacology,
>   Faculty of Medicine Siriraj Hospital, Mahidol University

Class Format

Each 3-hr class will be generally divided into 2 sections: 2-hr of PowerPoint lecture and 1-hr of activity (class activity, paper discussion, or student presentation).

Class Readings

- Recommended Textbook: Watson JD, Baker TA, Bell S, Gan A, Levine M, and Losick R, **Molecular Biology of the Gene**. 7th ed. Pearson Education; 2014.
- Class materials are posted in **Google Classroom**

Evaluation

Assignments[a]	25 points	
Attendance[b]	10 points	
Midterm Exam	25 points	
Term Assignment	15 points	
Final Exam	25 points	
Total	**100 points**	

[a]Each assignment is worth 5 points.

[b]Attendance is mandatory. Each unexcused absence will result in **1-point** subtraction.

Office Hour

Appointment can be made by e-mail at pagkapol.pon@mahidol.edu for in-person or online Zoom meeting.