

Course Syllabus
MBSB 501 Systems Biosciences
Academic Year 2024

Course ID and name: MBSB 501 Systems Biosciences
Course coordinator: Asst. Prof. Dr.Natee Jearawiriyapaisarn
Email: natee.jea@mahidol.edu

Instructors:

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|---|-----------------------------------|
| 1. Assoc. Prof.Soraya Chaturongakul | 9. Asst. Prof. Dr.Pimphen Charoen |
| 2. Asst. Prof. Dr.Alisa Tubsuwan | 10. Asst. Prof.Pisut Pongchaikul |
| 3. Asst. Prof. Dr.Alita Kongchanagul | 11. Asst. Prof. Dr.Sirirat Kumarn |
| 4. Asst. Prof. Dr.Duangrudee Tanramluk | 12. Dr.Chutima Thepparit |
| 5. Asst. Prof. Dr.Narisorn Kitiyanant | 13. Dr.Duangnapa Kovanich |
| 6. Asst. Prof. Dr.Natee Jearawiriyapaisarn | 14. Dr.Kittiphong Paiboonsukwong |
| 7. Asst. Prof. Dr.Nuankanya Sathirapongsasuti | 15. Dr.Promsin Masrinoul |
| 8. Asst. Prof. Dr.Phatchariya Phannasil | 16. Dr.Waradon Sungnak |

Credits: 3 (3-0-6)
Curriculum: Doctor of Philosophy Program in Systems Biosciences (Required course)
Semester offering: Second semester
Prerequisite: None
Course level: Intermediate

Course Description:

Introduction to systems biosciences and differences from molecular and cellular biology; core components in systems biosciences; high-throughput sequencing technologies; genomics; transcriptomics; proteomics; epigenomics; metabolomics; application software for systems biosciences; omics data management and annotation; protein database and molecular visualization; structural bioinformatics; overview of drug discovery; multi-omics approaches to systems biosciences

Course Learning Outcomes (CLOs)

Upon completion of this course, students are able to:

1. Identify the importance of multi-omics technologies in molecular, cellular, and system biosciences research
2. Demonstrate core principles and comprehensive knowledge of omics technologies used to study whole genomes, transcriptomes, proteomes, epigenomes, and metabolomes
3. Examine basic analytical methods and access database resources generated in omics studies
4. Identify implications of structural bioinformatics and drug discovery
5. Critically evaluate and present recently published literature in the field of omics and system biosciences

Constructive Alignment of Course Content to CLOs and Program ELOs

Lecture No.	Topic	CLOs	Program ELOs
1	Introduction to molecular, cellular, and systems biosciences	1	1-2
2	Essentials in systems biosciences	1	1-2
3	High-throughput sequencing technologies and their applications	2	1-2
4	Genomic annotation and functional assignment	3	1, 2, 7
5	Genome-wide association study and its applications	2	1-3
6	Transcriptomics and its applications	2	1-3
7	Proteomics and its applications	2	1-3
8	Recent advances in systems biosciences	5	1-4, 6-8
9	Epigenomics and its applications	2	1-3
10	Metabolomics and its applications	2	1-3
11	Application software for systems biosciences	3	1, 2, 7
12	Overview of drug discovery	4	1-3, 7
13	Computational approaches for drug discovery	4	1, 2, 7
14	Single-cell and spatial omics/multi-omics	1, 2, 5	1-8
15	Current trends in systems biosciences	5	1-4, 6-8

Course Schedule (January 20 – March 14, 2024)
Monday, Wednesday, and Friday, Time 9:00-12:00, Online (Webex).

Date	Topic No.	Topic	Teaching & Learning Methods	Assessment	Instructor
Jan 20	1	Introduction to molecular, cellular, and systems biosciences	Interactive lecture	-	Narisorn
Jan 23	2	Essentials in systems biosciences	Interactive lecture	Assignment	Chutima
Jan 24	3	High-throughput sequencing technologies and their applications	Interactive lecture	Assignment	Nuankanya
Jan 27		Self-study			
Jan 29	4	Genomic annotation and functional assignment	Interactive lecture and practicals	Assignment	Pisut
Jan 31		Self-study			
Feb 3	5	Genome-wide association study and its applications	Interactive lecture and practicals	Class discussion	Pimphen
Feb 5	6	Transcriptomics and its applications	Interactive lecture	Assignment	Natee
Feb 7	7	Proteomics and its applications	Interactive lecture	Written exam	Duangnapa
Feb 10		Self-study			
Feb 14		Assignment/Exam (Lecture 2 - 7)			
Feb 17	8	Recent advances in systems biosciences (Student Presentation)	Presentation & group discussion	Performance assessment, Q&A	All
Feb 19	9	Epigenomics and its applications	Interactive lecture	Assignment	Alisa
Feb 21	10	Metabolomics and its applications	Interactive lecture	Class discussion	Phatchariya
Feb 24		Self-study			
Feb 26	11	Application software for systems biosciences	Interactive lecture and practicals	Assignment	Waradon
Feb 28	12	Overview of drug discovery	Knowledge session, group activities	Assignment with optional drop-in sessions	Sirirat
Mar 3		Self-study			
Mar 5	13	Computational approaches for drug discovery	Interactive lecture	Assignment	Duangrudee
Mar 7	14	Single-cell and spatial omics/multi-omics	Problem-based learning, group discussion	Class discussion	Waradon
Mar 10		Self-study			
Mar 12		Assignment (Lectures 9-14)			
Mar 14	15	Current trends in systems biosciences (Student Presentation)	Presentation & group discussion	Performance assessment, Q&A	All

Assignments

1. Reading, practical, or problem-solving assignments from instructors
2. Paper discussions

Assessment Criteria

Assessment Criteria	Assessment Method	Scoring Rubric
Assignment/ Exam (52.5%)	<ol style="list-style-type: none">1) Take-home assignments2) Written exam	<ol style="list-style-type: none">1) Punctual assignment submission2) Creativity3) Sequencing of information4) Content accuracy5) Supporting evidences6) Grammar and originality
Class discussion (17.5%)	<ol style="list-style-type: none">1) Class discussion2) Level of engagement	<ol style="list-style-type: none">1) Contribution2) Engagement3) Accuracy and relevance4) Summary of main points5) Cooperative attitude
Attendance/ Participation (10%)	<ol style="list-style-type: none">1) Direct observation2) Group activities and discussion	<ol style="list-style-type: none">1) Attendance and punctuality2) Participation3) Distracting behaviors4) General attitude towards learning
Presentation (20%)	<ol style="list-style-type: none">1) Presentations2) Group discussion	<ol style="list-style-type: none">1) Organization2) Content3) Subject knowledge/ answering questions4) Presentation style

Students must receive a score of 60% or more to pass the course. Student's achievement will be graded using symbols: A, B+, B, C+, C and F based on the following criteria;

Percentage	Grade	Description
≥ 80%	A	Excellent
75-79.99%	B ⁺	Good
70-74.99%	B	Fairly good
65-69.99%	C ⁺	Fair
60-64.99%	C	Poor
< 60%	F	Fail

However, the final grade will be adjusted based on the frequency distribution of the students' scores from the whole course.

Appeal Procedure

Should the students have any appeal regarding the assessments or grades, inquiries can be made to the instructors and/or the course coordinator immediately either by direct contact, telephone, or email.

Course Reading Materials

A series of textbooks, online resources, and appropriate journal articles will be introduced throughout the course by the instructors. These materials may be found on the google classroom.

General Inquiry

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Date revised: November 30, 2024