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:

1. Assoc. Prof.Soraya Chaturongakul
2. Asst. Prof. Dr.Alisa Tubsuwan
3. Asst. Prof. Dr.Alita Kongchanagul
4. Asst. Prof. Dr.Duangrudee Tanramluk
5. Asst. Prof. Dr.Narisorn Kitiyanant
6. Asst. Prof. Dr.Natee Jearawiriyapaisarn
7. Asst. Prof. Dr.Nuankanya Sathirapongsasuti
8. Asst. Prof. Dr.Phatchariya Phannasil
9. Asst. Prof. Dr.Pimphen Charoen
10. Asst. Prof.Pisut Pongchaikul
11. Asst. Prof. Dr.Sirirat Kumarn
12. Dr.Chutima Thepparit
13. Dr.Duangnapa Kovanich
14. Dr.Kittiphong Paiboonsukwong
15. Dr.Promsin Masrinoul
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, 2025)
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%)	1) Take-home assignments 2) Written exam	1) Punctual assignment submission 2) Creativity 3) Sequencing of information 4) Content accuracy 5) Supporting evidences 6) Grammar and originality
Class discussion (17.5%)	1) Class discussion 2) Level of engagement	1) Contribution 2) Engagement 3) Accuracy and relevance 4) Summary of main points 5) Cooperative attitude
Attendance/ Participation (10%)	1) Direct observation 2) Group activities and discussion	1) Attendance and punctuality 2) Participation 3) Distracting behaviors 4) General attitude towards learning
Presentation (20%)	1) Presentations 2) Group discussion	1) Organization 2) Content 3) Subject knowledge/ answering questions 4) 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
$\geq 80\%$	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

Ms. Siriporn Monkasemsiri   siriporn.mon@mahidol.edu; Tel. 02-441-9003-7 ext. 1316

Date revised: November 30, 2024

Rubric Score for Assignments

Rubric Criteria	Excellent (5)	Above Average (4)	Average (3)	Needs Improvement (2)	Needs Significant Improvements (1)
1. Punctual assignment submission					
2. Creativity: provide creative ideas on the scientific basis					
3. Sequencing of information: information is organized in a clear, logical way. It is easy to anticipate.					
4. Content accuracy: all content throughout the report is accurate. There are no factual errors.					
5. Supporting evidences: provide enough and reasonable support evidences and citing properly					
6. Grammar and originality: report is free of distracting spelling, punctuation, and grammatical errors. There is no plagiarism.					

MBSB 501 Rubric Score for Class discussion

Rubric Criteria	Excellent (5)	Above Average (4)	Average (3)	Needs Improvement (2)	Needs Significant Improvement (1)
1. Contibutes to class activities					
2. Engages others in class discussions					
3. Accuracy and relevance of statements made					
4. Identifies and summarizes main points					
5. Positive, cooperative attitude during class					

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Guideline for Oral Presentation

MBSB 501: Recent advances in systems biosciences, and

Current trends in systems biosciences

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Objective: To demonstrate the cumulative learning of "Omic" technologies and their applications in systems biosciences and biomedical research. (CLO 5)

Format: - Each student will present an assigned research article.

- Oral presentation should last 20 minutes, followed by a 15-minute question and answer session.

- Questions will be asked by both students and instructors.

- The oral presentation should include background, statement of research questions, aims of the research, key methods and results with discussions, and conclusions or take-home messages.

Criteria: Students will be assessed on the quality and extent of their abilities according to a rubric score. Students must receive an overall score of more than 50% to pass the presentation. If a student does not meet this requirement, they will be asked to re-present with 80% of the full score.

MBSB 501 Student Presentation Rubric Scores

Student Name:……………………………………………………………………….

1	2	3	4	5
Unsatisfactory Needs significant improvement	Needs improvement	Average	Above average	Excellent

Rubric Criteria	Score
Organization (20%) - The structure of presentation includes an engaging introduction, detailed body/results and memorable conclusion. - Relationship between ideas is clear. - Audience can easily follow information presented.	………. ………. ……….
Content (20%) - Introduction: describe the importance of the topic/research questions/objectives, provide sufficient background information. - Methods: clearly describe key techniques used in the study, explain rationale of each experiment. - Results: clearly describe and criticize key results with adequate supporting data. - Discussion and conclusions: discuss and summarize the main finding, significance and direction of further research.	………. ………. ………. ……….
Subject knowledge/Answering questions (25%) - Give clear, concise, and logical answers - Demonstrate comprehensive knowledge about basic principles, ideas and concepts - Demonstrate in-depth understanding of the topic	………. ………. ……….
Presentation Style (20%) - Slides are clear and easy to follow (fonts, charts, images and page number). - Students present naturally and confidently, speak very well and clearly. - Students use gestures comfortably.	………. ………. ……….
Comments:	

Signature...

Date…………………………………………

MBSB 501 Q&A session and Time management (to be filled by course coordinator)

Presenter Name:

	1	2	3	4	5	Score
Time management (5%)	Student gave a presentation of the topic within 20 ± 10 mins.	Student gave a presentation of the topic within 20 ± 8 mins.	Student gave a presentation of the topic within 20 ± 6 mins.	Student gave a presentation of the topic within 20± 4 mins.	Student gave a presentation of the topic within 20 ± 2 mins.	
Questions (10%)	1	2	3	4	5	**Score**
Student Name	Students do not ask any question.	Students do not appear to understand subject. Too easy question.	Students have limited understanding of the subject. Appropriate question.	Students have good understanding of the subject. Good question.	Students have good understanding of the subject. Excellent question and leads to discussion	
Student Name	Students do not ask any question.	Students do not appear to understand subject. Too easy question.	Students have limited understanding of the subject. Appropriate question.	Students have good understanding of the subject. Good question.	Students have good understanding of the subject. Excellent question and leads to discussion	
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Signature:

Date:

MBSB501 Attendance & Participation

Student Name
Instructor Name

Rubric Criteria	4	3	2	1	0	Score
Attendance and punctuality	Punctually	5 minutes late	10 minutes late	15 minutes late	>20 minutes late or absence	
Participation	Frequently participates in class, often asks thought provoking questions. Appears enthused about class activities.	Frequently participates in class. Appears enthused about class activities.	Moderately participates in class. Has the answer when called on. Appears interested in class activities.	Seldom participates in class.	Never participates in class. Appears apathetic towards class activities.	
Distracting behaviors	Never engages in verbal/nonverbal behavior that is distracting to others or instructor.	Seldom engages in activities other than those required for learning.	Infrequently distracts others from learning, or the instructor from teaching the class.	Shows some verbal or nonverbal behaviors that distract others or the instructor.	Frequently shows disrespect for others' learning, or frequently distracts the instructor.	
General attitude towards learning	Exhibits an interest in learning, and enhances the learning of others in the class.	Exhibits an interest in learning, makes an above average effort to gain the learning experience.	Seems interested in learning.	Shows little evidence of wanting to be in the class to learn.	Shows a complete lack of desire for learning. Contributes nothing to his or her own or others learning.	

Comment to student:

Signature:

Date: