

Course Syllabus
MBSB 501 Systems Biosciences
Academic Year 2021

Course ID and name: MBSB 501 Systems Biosciences
Course coordinator: Dr. Natee Jearawiriyapaisarn
Email: natee.jea@mahidol.ac.th

Instructors:

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|--|------------------------------------|
| 1. Assoc. Prof. Dr.Panat Anuracpreeda | 10. Dr.Kittiphong Paiboonsukwong |
| 2. Asst. Prof. Dr.Alisha Tubsuwan | 11. Dr.Natee Jearawiriyapaisarn |
| 3. Asst. Prof. Dr.Boonsit Yimwadsana | 12. Dr.Nuankanya Sathirapongsasuti |
| 4. Asst. Prof. Dr.Duangrudee Tanramluk | 13. Dr.Phatchariya Phannasil |
| 5. Asst. Prof. Dr.Narisorn Kitiyanant | 14. Dr.Pisut Pongchaikul |
| 6. Asst. Prof. Dr.Pimphen Charoen | 15. Dr.Promsin Masrinoul |
| 7. Dr.Alita Kongchanagul | 16. Dr.Sirirat Kumarn |
| 8. Dr.Chutima Thepparit | 17. Dr.Trairak Pisitkun |
| 9. Dr.Duangnapa Kovanich | |

Credits: 3 (3-0-6)

Curriculum: Doctor of Philosophy Program in Systems Biosciences (Required course)

Semester offering: First 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 protein database and molecular visualization, structural bioinformatics, and drug discovery
5. Critically evaluate and present recent 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 systems biosciences	1	1-2
2	Core components in systems biosciences	1	1-2
3	High-throughput sequencing technologies	2	1-2
4	Genomics	2	1-3
5	Research highlight in systems biosciences I	5	1-4, 6-8
6	Transcriptomics	2	1-3
7	Proteomics	2	1-3
8	Epigenomics	2	1-3
9	Metabolomics	2	1-3
10	Research highlight in systems biosciences II	5	1-4, 6-8
11	Application software for systems biosciences	3	1, 2, 7
12	Genomic annotation	3	1, 2, 7
13	Protein database and molecular visualization, structural bioinformatics	4	1, 2, 7
14	Overview of drug discovery	4	1-3, 7
15	Muti-omics approaches to systems biosciences	1, 2, 5	1-8
16	Research highlight in systems biosciences III	5	1-4, 6-8

Course Schedule (January 5 – March 2, 2022)

Monday, Wednesday and Friday, Time 9:00-12:00, Online class with Webex.

Date	Lecture No.	Topic	Teaching & Learning Strategy	Assessment	Instructor
Jan 5	1	Introduction to systems biosciences	Interactive lecture	Assignment	Narisorn
Jan 7	2	Core components in systems biosciences	Interactive lecture	Assignment	Chutima
Jan 10		Self-study			
Jan 12	3	High-throughput sequencing technologies	Interactive lecture	Assignment	Nuankanya
Jan 14	4	Genomics	Interactive lecture and practicals	Assignment	Pimphen
Jan 17	5	Research highlight in systems biosciences I	Presentation, group discussion	Performance assessment, Q&A	All
Jan 19		Self-study			
Jan 21		Assignment/Exam (Lecture 1-4)			
Jan 24	6	Transcriptomics	Interactive lecture	Assignment	Natee
Jan 26	7	Proteomics	Interactive lecture	Written exam	Duangnapa
Jan 28		Self-study			
Jan 31	8	Epigenomics	Interactive lecture	Assignment	Alisa
Feb 2	9	Metabolomics	Interactive lecture	Assignment	Phatchariya
Feb 4	10	Research highlight in systems biosciences II	Presentation, group discussion	Performance assessment, Q&A	All
Feb 7		Self-study			
Feb 9		Assignment/Exam (Lecture 6-9)			
Feb 11	11	Application software for systems biosciences	Interactive lecture and practicals	Assignment	Boonsit
Feb 14	12	Genomic annotation	Interactive lecture and practicals	Assignment	Pisut
Feb 17	13	Protein database and molecular visualization, structural bioinformatics	Interactive lecture	Assignment	Duangrudee
Feb 18		Self-study			
Feb 21	14	Overview of drug discovery	Interactive lecture	Oral exam	Sirirat
Feb 23	15	Muti-omics approaches to systems biosciences	Problem-based learning, group discussion	Performance assessment, Q&A	Trairak
Feb 25	16	Research highlight in systems biosciences III	Presentation, group discussion	Performance assessment, Q&A	All
Feb 28		Self-study			
Mar 2		Assignment/Exam (Lecture 11-15)			

Assignments

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

Assessment Criteria

Assessment Criteria	Assessment Method	Scoring Rubric
Assignment/Exam (60%)	<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
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 (30%)	<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
$\geq 80\%$	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, a final grade will be adjusted based on frequency distribution of student's scores from the whole course.

Appeal Procedure

Should the students have any appeal regarding the assessments or grade, inquiry 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. 1314

Date revised: November 24, 2021

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, show much effort in going beyond the scope of the book.	Frequently participates in class, often asks thought provoking questions. 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.	Frequent 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 extremely desirable to learn, and enhance the learning of others in the class.	Seems interested in learning, makes an above average effort to gain the most out of learning experience.	A willing participant in the classroom, and exhibits willingness to learn concepts and course material.	Shows little evidence of wanting to be in the class to learn. The motive for the individual is somewhat questionable.	Shows a complete lack of desire for learning. Contributes nothing to his or her own or others learning.	

Comment to student: _____

Signature: _____

Date: _____

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.					

Guideline for Oral Presentation

MBSB 501-Research Highlight in Systems Biosciences

Objective: To demonstrate the cumulative learning of “Omic” technologies and their applications in systems biosciences and biomedical research. (CLOs 1, 2, 3, 4, 6, 7)

Format: - Each student will be responsible for presenting an assigned research article.

- 20-minute individual oral presentation with 15 minutes of question and answer time.

- Questions will be asked by audiences.

- 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 your ability according to a rubric score. Students must receive an overall score of more than 50% to pass the presentation, if not students will be asked to re-present with 80% of 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%) <ul style="list-style-type: none"> - 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%) <ul style="list-style-type: none"> - 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%) <ul style="list-style-type: none"> - 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%) <ul style="list-style-type: none"> - 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; eye contact is appropriate for audience. 	
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: