<div align="center">

**Course Syllabus**
**MBSB 501 Systems Biosciences**
**Academic Year 2022**

</div>

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

**Instructors:**

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

**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 | Omics data management and 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 2022**
Monday, Wednesday and Friday, Time 9:00-12:00, Room A407

| Date | Lecture No. | Topic | Teaching & Learning Strategy | Assessment | Instructor |
|---|---|---|---|---|---|
| | 1 | Introduction to systems biosciences | Interactive lecture | Assignment | Narisorn |
| | 2 | Core components in systems biosciences | Interactive lecture | Assignment | Chutima |
| | | Self-study | | | |
| | 3 | High-throughput sequencing technologies | Interactive lecture | Assignment | Nuankanya |
| | 4 | Genomics | Interactive lecture and practicals | Assignment | Pimphen |
| | 5 | Research highlight in systems biosciences I | Presentation, group discussion | Performance assessment using rubrics, Q&A | All |
| | | Self-study | | | |
| | | Assignment/Exam (Lecture 1-4) | | | |
| | 6 | Transcriptomics | Interactive lecture | Assignment | Natee |
| | 7 | Proteomics | Interactive lecture | Written exam | Duangnapa |
| | | Self-study | | | |
| | 8 | Epigenomics | Interactive lecture | Assignment | Alisa |
| | 9 | Metabolomics | Interactive lecture | Written exam | Phatchariya |
| | 10 | Research highlight in systems biosciences II | Presentation, group discussion | Performance assessment using rubrics, Q&A | All |
| | | Self-study | | | |
| | | Assignment/Exam (Lecture 6-9) | | | |
| | 11 | Application software for systems biosciences | Interactive lecture and practicals | Assignment | Boonsit |
| | 12 | Omics data management and annotation | Interactive lecture and practicals | Assignment | Sissades |
| | 13 | Protein database and molecular visualization, structural bioinformatics | Interactive lecture | Assignment | Duangrudee |
| | | Self-study | | | |
| | 14 | Overview of drug discovery | Interactive lecture | Assignment | Sirirat |
| | 15 | Muti-omics approaches to systems biosciences | Problem-based learning, group discussion | Assignment | Trairak |
| | 16 | Research highlight in systems biosciences III | Presentation, group discussion | Performance assessment using rubrics, Q&A | All |
| | | Self-study | | | |
| | | 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%) | 1) Take-home assignments<br>2) Written exam | 1) Punctual assignment submission<br>2) Creativity<br>3) Sequencing of information<br>4) Content accuracy<br>5) Supporting evidences<br>6) Grammar and originality |
| Attendance/participation (10%) | 1) Direct observation<br>2) Group activities and discussion | 1) Attendance and punctuality<br>2) Participation<br>3) Distracting behaviors<br>4) General attitude towards learning |
| Presentation (30%) | 1) Presentations<br>2) Group discussion | 1) Organization<br>2) Content<br>3) Subject knowledge/ answering questions<br>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, 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:** October 10, 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%)**<br>- The structure of presentation includes an engaging introduction, detailed body/results and memorable conclusion.<br>- Relationship between ideas is clear.<br>- Audience can easily follow information presented. | ……….<br>……….<br>………. |
| **Content (20%)**<br>- Introduction: describe the importance of the topic/research questions/objectives, provide sufficient background information.<br>- Methods: clearly describe key techniques used in the study, explain rationale of each experiment.<br>- Results: clearly describe and criticize key results with adequate supporting data.<br>- Discussion and conclusions: discuss and summarize the main finding, significance and direction of further research. | ……….<br><br>……….<br><br>……….<br><br>………. |
| **Subject knowledge/Answering questions (25%)**<br>- Give clear, concise, and logical answers<br>- Demonstrate comprehensive knowledge about basic principles, ideas and concepts<br>- Demonstrate in-depth understanding of the topic | ……….<br><br>……….<br>………. |
| **Presentation Style (20%)**<br>- Slides are clear and easy to follow (fonts, charts, images and page number).<br>- Students present naturally and confidently, speak very well and clearly.<br>- Students use gestures comfortably; eye contact is appropriate for audience. | ……….<br>……….<br><br>………. |
| **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.<br><br>Too easy question. | Students have limited understanding of the subject.<br>Appropriate question. | Students have good understanding of the subject.<br>Good question. | Students have good understanding of the subject.<br>Excellent question and leads to discussion |  |
| Student Name | Students do not ask any question. | Students do not appear to understand subject.<br><br>Too easy question. | Students have limited understanding of the subject.<br>Appropriate question. | Students have good understanding of the subject.<br>Good question. | Students have good understanding of the subject.<br>Excellent question and leads to discussion |  |
| Student Name | Students do not ask any question. | Students do not appear to understand subject.<br><br>Too easy question. | Students have limited understanding of the subject.<br>Appropriate question. | Students have good understanding of the subject.<br>Good question. | Students have good understanding of the subject.<br>Excellent question and leads to discussion |  |
| Student Name | Students do not ask any question. | Students do not appear to understand subject.<br><br>Too easy question. | Students have limited understanding of the subject.<br>Appropriate question. | Students have good understanding of the subject.<br>Good question. | Students have good understanding of the subject.<br>Excellent question and leads to discussion |  |

**Signature:**

**Date:**