

Course Syllabus
MBSB 504 TECHNIQUES IN SYSTEMS BIOSCIENCES
Academic Year 2021

Course ID and name: MBSB 504 Techniques in Systems Biosciences

Course coordinator: Dr. Kittiphong Paiboonsukwong

Email: Kittiphong.pai@mahidol.ac.th

Asst. Prof. Dr. Phatchariya Phannasil

Email: phatchariya.pha@mahidol.ac.th

Dr. Alita Kongchanagul

Email: alita.kon@mahidol.ac.th

Instructors:

- | | |
|--|----------------------------------|
| 1. Assoc. Prof. Dr. Panat Anuracpreeda | 7. Dr. Chutima Thepparit |
| 2. Asst. Prof. Dr. Alisa Tubsuwan | 8. Dr. Duangnapa Kovanich |
| 3. Asst. Prof. Dr. Duangrudee Tanramluk | 9. Dr. Kittiphong Paiboonsukwong |
| 4. Asst. Prof. Dr. Narisorn Kitiyanant | 10. Dr. Natee Jearawiriyapaisarn |
| 5. Asst. Prof. Dr. Phatchariya Phannasil | 11. Dr. Promsin Masrinoul |
| 6. Dr. Alita Kongchanagul | |

Credits: 2(0-6-2)

Curriculum: Doctor of Philosophy Program in Systems Biosciences (Required course for Plan 2.2)

Semester offering: Year 1/ Semester 1

Prerequisite: None

Course level: Intermediate

Course Description:

Research methodology; basic statistics for research; genomic DNA extraction; DNA amplification by PCR, DNA cloning, plasmid extraction; mammalian cell culture; transfection; RNA extraction, RT-PCR, and RT-qPCR; protein analysis; microscopic techniques; immunocytochemistry; flow cytometry; high throughput technology; immunoassay; bioinformatics; imaging technology; laboratory animal handling.

Course Learning Outcomes (CLOs)

Upon completion of this course, students are able to:

1. Describe principle and limitation of the techniques in molecular biology
2. Apply and analyses comprehensive knowledge in molecular biosciences or related disciplines to do scientific research
3. Develop their own research questions, systematically formulate hypotheses to answer the question and select the appropriate technique to do research to answer the questions
4. Respond to critical feedback, and seek to make scientific information understandable to scientists, peers, and the general public in both a written and oral format.

Constructive Alignment of Course Content to CLOs and Program ELOs

Activities	CLOs	PLOs
In-class activities (Experiments), Laboratory participation	1-3	1-6
Laboratory report/ Lab notebook	1-4	2-4, 7-8
Group Discussion	2-4	1-6
Group Presentation	1-4	1-4, 6-8
Question and Answer	3, 4	2-6, 8

Course Schedule 2021

Date: Monday-Friday,

Time 09:00-16:00

On-site Laboratory at Institute of Molecular Biosciences, Mahidol University

Date	Time	Topics/Details	Number of hours	Class activity/ Teaching media	Lecturer
Thu 19	09.00- 10.00	Course Orientation	1	Lecture	Kittiphong Paiboonsukwong
May 2022	10.00- 12.00	Biosafety and Chemical Safety	2	Lecture	Kittiphong Paiboonsukwong
	13.00- 16.00	Genome editing using CRISPR/Cas9 system	3	Experiments	Alisa Tubsubwan, Narisorn Kitiyanant, and Kittiphong Paiboonsukwong
Mon 23 May 2022	09.00- 12.00	DNA cloning I: Construction guide RNA	3	Experiments	Natee Jearawiriyapaisarn, Alita Kongchanagul and Phatchariya Phannasil
	13.00- 16.00	DNA cloning II: Bacterial transformation and plating	3	Experiments	Natee Jearawiriyapaisarn, Alita Kongchanagul and Phatchariya Phannasil
Tue 24 May 2022	09.00- 12.00	Mammalian cell culture	3	Experiments	Chutima Thepparit, Alita Kongchanagul and Alisa Tubsubwan
	13.00- 16.00	DNA cloning III: Bacterial colony picking	1	Experiments	Natee Jearawiriyapaisarn, Alita Kongchanagul and Chutima Thepparit
Wed 25 May 2022	09.00- 12.00	DNA cloning IV: Plasmid Extraction	3	Experiments	Natee Jearawiriyapaisarn, Alita Kongchanagul and Chutima Thepparit
	13.00- 16.00	Transfection	3	Experiments	Chutima Thepparit, Alita Kongchanagul and Alisa Tubsubwan

Date	Time	Topics/Details	Number of hours	Class activity/ Teaching media	Lecturer
Thu 26	09.00- 12.00	Flow cytometry	3	Experiments	Narisorn Kitiyanant
May 2022	13.00- 16.00	Genomic DNA Extraction	3	Experiments	Kittiphong Paiboonsukwong, Narisorn Kitiyanant and Natee Jearawiriyapaisarn
Fri 27 May 2022	09.00- 12.00	PCR	3	Experiments	Kittiphong Paiboonsukwong, Narisorn Kitiyanant and Natee Jearawiriyapaisarn
	13.00- 16.30	T7EI Assay	3	Experiments	Kittiphong Paiboonsukwong, Narisorn Kitiyanant and Natee Jearawiriyapaisarn
Mon 30 Jun 2022	09.00- 12.00	Protein Extraction	3	Experiments	Alita Kongchanagul, Promsin Masrinoul and Duangnapa Kovanich
	13.00- 16.00	Immunoprecipitation	3	Experiments	Alita Kongchanagul, Promsin Masrinoul and Duangnapa Kovanich
Tue 31 May 2022	09.00- 12.00	Western Blot I	3	Experiments	Promsin Masrinoul, Narisorn Kitiyanant and Alita Kongchanagul
	13.00- 16.00	Western Blot II	3	Experiments	Promsin Masrinoul, Narisorn Kitiyanant and Alita Kongchanagul
Wed 01 Jun 2022	09.00- 12.00	Western Blot III	3	Experiments	Promsin Masrinoul, Narisorn Kitiyanant and Alita Kongchanagul
	13.00- 16.00	Western Blot IV	3	Experiments	Promsin Masrinoul, Narisorn Kitiyanant

Date	Time	Topics/Details	Number of hours	Class activity/ Teaching media	Lecturer
					and Alita Kongchanagul
Thu 02 Jun 2022	09.00- 12.00	Mass spectrometry I	3	Demonstration	Duangnapa Kovanich
	13.00- 16.00	Mass spectrometry II	3	Demonstration	Duangnapa Kovanich
Mon 06 Jun 2022	09.00- 12.00	RNA Extraction	3	Experiments	Phatchariya Phannasil, Alita Kongchanagul and Natee Jearawiriyapaisarn
	13.00- 16.00	cDNA synthesis	3	Experiments	Phatchariya Phannasil, Alita Kongchanagul and Natee Jearawiriyapaisarn
Tue 07 Jun 2022	09.00- 12.00	qRT-PCR	3	Experiments	Phatchariya Phannasil, Alita Kongchanagul and Natee Jearawiriyapaisarn
	13.00- 16.00	Immunocytochemistry I	3	Experiments	Alisa Tubsuwan, Alita Kongchanagul and Chutima Thepparit
Wed 08 Jun 2022	09.00- 12.00	Immunocytochemistry II	3	Experiments	Alisa Tubsuwan, Alita Kongchanagul and Chutima Thepparit
	13.00- 16.00	Confocal microscopy	3	Experiments	Narisorn Kitiyanant
Thu 09 Jun 2022	09.00- 12.00	Advance Imaging technology	3	Demonstration	Narisorn Kitiyanant
Fri 10 Jun 2022	09.00- 12.00	High throughput technology	3	Demonstration	Natee Jearawiriyapaisarn
Mon 13 Jun 2022	09.00- 12.00	Advance technology I	3	Experiments	Panat Anuracpreeda
	13.00- 16.00	Advance technology II	3	Experiments	Panat Anuracpreeda

Date	Time	Topics/Details	Number of hours	Class activity/ Teaching media	Lecturer
Tue 14 Jun 2022	13.30- 16.30	Bioinformatics	3	Demonstration/Hand on Practice	Duangrudee Tanramluk, Natee Jearawiriyapaisarn and Phatchariya Phannasil
Wed 15 Jun 2022	09.00- 12.00	Student presentation	3	Presentation	All staffs

Assessment Criteria

Assessment Criteria	Assessment Method	Scoring Rubric
Laboratory report/ Lab notebook 30%	(1) Lab notebooks	(1) Writing style (2) Report sending (3) Presentation of data (4) Data analysis and Conclusion (5) Lab notebook
In-class activities, Laboratory participation 40%	(1) Direct observation (2) In-class discussion	(1) Ability to follow procedure or to design a procedure for experiment (2) Use of equipment (3) Working area and safety (4) Class participation
Group presentation 30%	(1) Presentation	(1) Structure (2) Scientific content and understanding (3) Group presentation (4) Question handling (5) Group presentation

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, 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.

General Inquiry

Miss. Siriporn Monkasemsiri e-mail: siriporn.mon@mahidol.edu; Tel. 02-441-9003-7 ext. 1316

Date revised: March 19, 2023

Lab Report/ Lab notebook Evaluation Rubric				
Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs to Improve (1)
1. Writing Style (5%)	Report was neat and well organized with minimum spelling error.	Report was neat and appropriately organized with a few spelling errors.	Report was somewhat neat and organized with some spelling errors.	Report was disorganized with many spelling errors.
2. Report Sending (3%)	Report was sent on time.	Report was sent one day late.	Report was sent two days late.	Report was sent more than two days late.
3. Presentation Of Data (7%)	Experimental data was clearly presented with tables, diagrams, pictures or graphs that effectively present the experimental data. Showed clear detail of results and graphical data were labeled accurately.	Experimental data was presented in an appropriate format with only a few minor errors or omissions. Showed clear detail of results and graphical data were labeled accurately.	Experimental data was presented in an appropriate format but some significant errors were noticed. Some tables, graphical data could be better organized. Some units, labels, and titles were	Experimental data was poorly presented. Graphs or tables were poorly constructed with several errors. Data was missing or incorrect. Some units, labels, and titles were not included.
4. Data Analysis and Conclusion (5%)	Reasonable scientific explanations for the results were discussed and logically analyzed. Conclusion was well written with a complete answer to the question or hypothesis. Provided description of what was learned, possible sources of error, good suggestions for improving the	Scientific explanations for the results were given. Conclusion was appropriately written with a possible answer to the question or hypothesis. Provided description of what was learned, possible sources of error, suggestions for improving the experiment and	Scientific explanations for the results were given but not complete or accurate. Conclusion was written with inaccurate answer to the question or hypothesis. Description of what was learned, possible sources of error, suggestions for improving the experiment and application were missing.	Scientific explanations for the results were given but not complete or accurate. Conclusion was poorly written with inaccurate answer to the question or hypothesis. Description of what was learned, possible sources of error, suggestions for improving the experiment and application were missing.
5. Lab notebook (10%)	Lab notebook was complete including procedure for each experiment, calculation, results and conclusion.	Lab notebook was sufficiently complete with only minor omissions.	Lab notebook had partial information with major omissions.	Lab notebook was incomplete and difficult to understand.
Total (30 %)	Total points earned =			

In-class activities and Laboratory participation Evaluation Rubric				
Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs to Improve (1)
1. Ability to Follow Procedure or to Design a Procedure for Experiment (20 %)	Actively followed the instructions in the procedure with no assistance. Showed ability to perform additional experiments or tests beyond what was required in the procedure.	Followed the instructions in the procedure with little or no assistance. If the procedure was not provided, the student was able to determine an appropriate experiment to satisfy the lab objectives.	Had difficulty with some of the instructions in the procedure and needed clarification from the instructor or lab partner. If the procedure was not provided, the student needed some guidance about experiments to perform to satisfy the lab objectives.	Had difficulty reading the procedure and following the directions. Several mistakes were made during the experiment. If the procedure was not provided, student was incapable of designing a set of experiments to satisfy the given lab objectives.
2. Use of Equipment (10 %)	Showed proper techniques for handling tools and lab equipment without error.	Showed proper techniques for handling tools and lab equipment with a few minor errors.	Showed adequate care for handling tools and lab equipment with some minor errors.	Showed improper techniques for handling with some major errors.
3. Working Area and Safety (5 %)	Lab was carried out with full attention to relevant safety procedures & directions. No incident occurred. Outstanding job cleaning up working area, tools and equipment. Lab tools were organized and stored with care.	Lab was generally carried out with attention to relevant safety procedures & directions. No incident occurred. Good job on cleaning up working area, tools and equipment. Lab tools were properly stored.	Lab was carried out with some attention to relevant safety procedures & directions. A few incidents occurred. Had to be reminded to clean up area and equipment. Sometimes showed disorganized storage of lab tools.	Safety procedures were ignored. Did not follow directions. Several incidents occurred. Did not clean up area and equipment after working. Showed disorganized storage of lab tools.

In-class activities and Laboratory participation Evaluation Rubric				
Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs to Improve (1)
4. Class participation (5 %)	Used time well in class and focused attention on the lecture and experiments. Actively participated in the group and in classroom discussion.	Used time pretty well. Stayed focused on the lecture and experiments most of the time. Usually provided useful ideas when participating in the group and in classroom discussion.	Focused on the class but did not appear very interested. Sometimes provided useful ideas when participating in the group and in classroom discussion.	Participation was minimal. Rarely provided useful ideas when participating in the group and in classroom discussion.
Total (40 %)	Total points earned =			

Group presentation Rubric				
Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs to Improve (1)
1. Structure (4%)	Logical structure: The audience is able to follow with ease	With some structure: The audience is able to follow	Acceptable structure: The audience is able to follow but with difficulty	Poor structure: The audience struggles to follow
2. Scientific content and understanding (15%)	Student demonstrates comprehensive and correct knowledge and principles	Student demonstrates some comprehensive and correct knowledge and principles	Incomplete in terms of comprehensiveness and/or correctness	Student needs to improve
3. Presentation skills include eye contact, use of a laser pointer, body language (2%)	Engaging Student speaks with confidence, fluency and excellent presentation skills	Able to engage at points Student speaks clearly and with good presentation skills	Student attempts to speak in accordance with basic presentation skills	Student needs to improve

Group presentation Rubric				
Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs to Improve (1)
4. Question handling (5%)	Able to answer or respond to all questions (90-100%)	Able to answer or respond to most questions (70-90%)	Able to answer or respond to only some questions (50-70%)	Inadequate (<50%)
5. Group presentation (2%)	The presentation was well organized, and easy to follow. All of the group members contributed equally to the presentation.	The presentation had good organization. Everyone gave some presentation but someone gave more contributions than others.	The presentation could be better organized. Certain people did not do as much work as others.	The presentation lacked organization. A few people or only one person worked on the presentation.
6. Time management (2%)	15±2 min	15±4 min	15±6 min	15±8 min
Total (30%)	Total points earned =			