Course Syllabus

MBMG515 Protein Technologies and Applications

Academic year 2021

Course ID and Name: MBMG 515 Protein Technologies and Applications

Course Coordinator: Associate Professor Chartchai Krittanai

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Instructors:

1. Assoc. Prof. Chartchai Krittanai, Ph.D.
2. Assoc. Prof. Surapon Piboonpocanun, Ph.D.
3. Asst. Prof. Chalongrat Noree, Ph.D.
4. Asst. Prof. Duangrudee Tanramluk, Ph.D.
5. Dr. Duangnapa Kovanich, Ph.D.
6. Dr. Chonticha Saisawang, Ph.D.
7. Dr. Phattara-orn Havanapan, Ph.D.

Supporting Staffs:

1. Nuanwan Phungthanom
2. Naraporn Sirinonthanawech

Credits 2 (1-2-3)

Curriculum Master of Science Program in Molecular Genetics and Genetic Engineering (required course)

Doctor of Philosophy Program in Molecular Genetics and Genetic Engineering (required course for students from B.Sc.)

Semester offering: Second semester

Pre-requisites: None

Course Learning Outcomes (CLOs):

Upon completion of this course, students are able to:

1. Acquire new knowledge and innovation in protein technologies and applications
2. Integrate and apply comprehensive knowledge in protein technologies and applications to solve scientific research questions
3. Analyze and present lab data by using appropriate information and communication technologies
4. Demonstrate scientific integrity, responsibility, and safety practice
5. Demonstrate teamwork, interpersonal skills and responsibilities for the work assignments

Alignment of teaching and assessment methods to course learning outcome:

Course learning outcome	Teaching method	Assessment method
1. Acquire new knowledge and innovation in protein structure and function	(1) In-class/ on-line lecture (2) In-class/on-line discussion	(1) Written examination (2) In-class/on-line discussion (3) Quizzes (4) Assignment
2. Integrate and apply comprehensive knowledge in molecular biology of proteins to solve scientific research questions	(1) In-class/on-line discussion (2) Hands-on practice/VDO lab demonstration (3) Problem-based learning	(1) Direct observation (2) Lab performance/discussion (3) Problem-based learning presentation

3. Analyze and present lab data by using appropriate information and communication technologies	(1) Experimental data presentation and discussion	(1) Reports (2) Lab notebooks (3) Short presentation (4) In-class/on-line discussion
4. Demonstrate scientific integrity, responsibility, and safety practice	(1) Assignment (2) Lab safety guidelines	(1) Assessment of assigned work (2) Direct observation (3) Class attendance
5. Demonstrate teamwork, interpersonal skills and responsibilities for the work assignments	(1) Group/individual assignment	(1) Direct observation (2) Assessment of assigned work (3) Assessment of responsibility for assigned work.

Course description:

Proteomics; expression profiling by 2D Electrophoresis; mass spectrometry; bioinformatics tools for proteomic analysis; phage display; protein database and protein visualization; drug design; fluorescent protein technology

Course schedule:

Date: Monday-Friday

Time: 09.00-16.30

Room C405 (On-site lecture) and D401 (On-site lab), Institute of Molecular Biosciences or Webex/Zoom meetings for Online activities

Topics	Time	Format	Instructors	Room
29 November 2021				
PCR of mCherry DNA cassette	09.00 – 12.00	Lab	CN / NS	online
Primer design	13.00 – 15.00	Lecture / Computer	CN	
Yeast culture preparation	15.00 – 15.30	Lab	CN / NS	
30 November 2021				
Yeast competent cell preparation	09.00 – 12.00	Lab	CN / NS	online
Yeast transformation	13.00 – 16.00	Lab		
1 December 2021				
Replica plating	09.00 – 10.00	Lab	CN / NS	online
Screening transformants under fluorescent microscope	10:00 – 12:00	Lab		
Discussion	13.00 – 15.00	Discussion		
2 December 2021				
Proteomics	09.30 – 12.00	Lecture	CK	online
Protein Mass spectrometry	13.30 – 15.00	Lecture	DK	online
7 December 2021				
Drug design	09.30 – 11.30	Lecture / Computer	DT	online
Phage Display	13.00 – 15.00	Lecture	SP	online
8 December 2021				
Self-study	9.30- 15.00	Self-study	-	online
9 December 2021				
Written exam	09.00 – 11.00	Exam	CK	online

13 December 2021				
514-515 Problem-Based Learning	10.00 – 12.00	Presentation	Staff	online
20 January 2022				
Expression profiling by 2D electrophoresis: Protein Preparation	09.00 – 12.00	Lab	CK / PH / CS / NP	Onsite D401
Determination of protein concentration	13.00 – 15.00	Lab		
First dimension separation by isoelectric focusing (IEF)	15.00 - 16.00	Lab		
21 January 2022				
Sample equilibration and Second dimension separation by SDS-PAGE	09.00 – 12.00	Lab	CK / PH / CS / NP	Onsite D401
Gel staining/de-staining and image analysis	13.00 – 14.00	Lab		
Protein visualization and database	14.30 - 16.30	Lab	DT	Onsite Computer Lab

Teaching staffs:

CK Chartchai Krittanai DT Duangrudee Tanramluk

CN Chalongrat Noree PH Phattara-Orn Havanapan

CS Chonticha Saisawang SP Surapon Piboonpocanun

DK Duangnapa Kovanich

Supporting staffs:

NP Nuanwan Phungthanom NS Naraporn Sirinonthanawech

Assessment Criteria:

Assessment Criteria	Assessment Method	Scoring Rubric
Laboratory performance **30%**	(1) Direct observation (2) Practical examination/Quizzes (3) In-class/on-line discussion (4) Short presentation	(1) Ability to follow procedure or to design a procedure for experiment (2) Use of equipment (3) Working area and safety
Laboratory report/ Lab notebook **10%**	(1) Reports (2) Lab notebooks	(1) Writing style (2) Report submission time (3) Presentation of data (4) Data analysis and conclusion (5) Lab notebook
Quizzes and exercises **20%**	(1) Quizzes (2) Written examination (3) Assignment	(1) Comprehension
Problem-based learning presentation **20%**	(1) Presentation	(1) Ability to apply knowledge to solve research problems (2) Ability to answer questions
Class participation, Group presentation, Group assignment **20%**	(1) Direct observation (2) Short presentation	(1) Class participation (2) Group work (3) Assigned work submission time (4) Group presentation

Student's achievement will be graded using symbols: A, B+, B, C+, C, D+, D and F based on the criteria as follows:

Percentage	Grade	Description
80–100	A	Excellent
75–79	B^+	Very Good
70–74	B	Good
65–69	C^+	Fairly Good
60–64	C	Fair
55–59	D^+	Poor
50–54	D	Very Poor
0–49	F	Fail

Lab Performance Evaluation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Need 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	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.

			satisfy the lab objectives.	
2. Use of Equipment (5 %)	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 %)	Experiment was carried out with full attention to relevant safety procedures & directions. No incident occurred. Outstanding job on cleaning up working area, tools and equipment. Lab tools were organized and stored with care.	Experiment 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.	Experiment 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.
Total (30 %)	**Total points earned =**			

Lab Report/ Lab notebook Evaluation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Need to Improve (1)**
1. Writing Style (2%)	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	Report was disorganized with many spelling errors.

Lab Report/ Lab notebook Evaluation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Need to Improve (1)**
			some spelling errors.	
2. Report Submission time (1%)	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 (2%)	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 labelled 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 labelled 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 missing.	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 (2%)	Reasonable scientific explanation for the results were discussed and logically analyzed. Conclusion was well written with a complete answer to the question or hypothesis. Provided	Scientific explanation for the results were given. Conclusion was appropriately written with a possible answer to the question or hypothesis. Provided description of what was learned,	Scientific explanation for the results were given but neither complete nor accurate. Conclusion was written with inaccurate answer to the question or hypothesis. Description of what	Scientific explanation for the results were given but neither complete nor accurate. Conclusion was poorly written with inaccurate answer to the question or hypothesis. Description of what was learned, possible

Lab Report/ Lab notebook Evaluation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Need to Improve (1)**
	description of what was learned, possible sources of error, good suggestions for improving the experiment and application.	possible sources of error, suggestions for improving the experiment and application.	was learned, possible sources of error, suggestions for improving the experiment and application were missing.	sources of error, suggestions for improving the experiment and application were missing.
5. Lab notebook (3%)	Lab notebook was completed including procedures 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 (10 %)	**Total points earned =**			

Problem-based learning Presentation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
1.Organization (2%)	Information was presented in a logical sequence. Flow of experiments was in order and well planned.	Information was presented in a logical sequence. Most of experiments were in order.	Information was loosely organized. Some experiments were not in order or linked.	Information lacked connection and not clear. Most experiments were not in order or linked.

Problem-based learning Presentation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
2.Scientific content (8%)	Main ideas were presented with depth and details. All key elements were included. Experimental design answered all questions. Poster contained accurate information.	Main ideas were presented with appropriate depth and details. Most key elements were included. Experimental design answered almost all questions. Poster contained a few mistakes.	Main ideas were presented but not complete or with superficial details. Some key elements were missing. Experimental design answered some questions. Poster contained some mistakes.	Main ideas were not presented and lacked of details. Most key elements were missing. Experimental design could not directly answer questions. Poster contained many mistakes.
3. Presentation (5%)	Presenter maintained good eye contact with the audience and appropriately used body motion. Delivery was clear and smooth with good language skills. Visuals were attractive and effectively enhanced the presentation. Length of presentation was within the assigned time limits.	Presenter generally maintained good eye contact with the audience and used body motion to support the presentation. Delivery was clear and smooth with good language skills. Visuals were appropriately used to enhance the presentation. Length of presentation was one minute over	Presenter did not always maintain good eye contact with the audience and used body motion to support the presentation. Delivery had some broken sentences. Visuals were not well used to enhance the presentation. Length of presentation was more than one minute over the	Presenter did not maintain good eye contact with the audience and lacked body motion. Delivery had many broken sentences and was not clear. Visuals were not used to enhance the presentation. Length of presentation was a few minutes over the assigned time limits.

Problem-based learning Presentation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
		the assigned time limits.	assigned time limits.	
4.Response to questions (5%)	Presenter answered questions confidently and completely.	Presenter answered most questions but needed some clarification.	Presenter answered some questions but always needed some clarification.	Presenter could not understand or answer most questions.
Total (20 %)	**Total points earned =**			

Class participation, Group presentation, Group assignment Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
1. 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.
2. Group work (5%)	Shared a lot of work with others. Gave ideas and helped others to	Shared equal work as others. Gave ideas and completed the	Did almost as much work as others. Sometime gave ideas and	Did less work than others. Did not give ideas or ask for help from others.

Class participation, Group presentation, Group assignment Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
	complete the assigned work.	assigned work in the group.	asked for help from others.	
3.Assigned work submission time (5%)	Completed assigned work on time.	Completed assigned work one day late.	Needed some reminding; work was late but no more than two days.	Needed much reminding; work was late more than two days.
4.Group presentation (5%)	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 contribution 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.
Total (20 %)	**Total points earned =**			

Revised Date: 2 November 2021