Course Syllabus

MBMG516 Cell Technologies and Applications

Academic year 2018

Course ID and Name: MBMG516 Cell Technologies and Applications

Course coordinator: Assoc. Prof. M.L. Saovaros Svasti, Ph.D.
Tel: 02-441-9003-7 ext. 1357
E-mail: saovaros.sva@mahidol.ac.th, stssv@yahoo.com

Instructors:

1. Prof. Duncan R. Smith, Ph.D.
2. Assoc. Prof. Chalermporn Ongvarrasopone, Ph.D.
3. Assoc. Prof. M.L. Saovaros Svasti, Ph.D.
4. Asst.Prof. Kusol Pootanakit, Ph.D.,
5. Nitwara Wikan, Ph.D.
6. Atichat Kuadkitkan, Ph.D.
7. Arpaporn Sutipatanasomboon, Ph.D.
8. Thavaree Thilavech, Ph.D.
9. Phatchariya Phannasil, Ph.D.

Credits: 3 (1-6-5)

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 call technologies and applications
2. Integrate and apply comprehensive knowledge in call technologies 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 call technologies and applications	(1) Lecture (2) Class discussion	(1) Written examination (2) In-class discussion
2. Integrate and apply comprehensive knowledge in call technologies to solve scientific research questions	(1) Class discussion (2) Hands-on practice (3) Problem-based learning	(1) Direct observation (2) Lab performance (3) Poster 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 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:

Biosafety; basic mammalian cell culture; mammalian cell expression system; RNA interference; real-time PCR; immunofluorescence assay; fluorescence microscopy; flow cytometry; RNA extraction; cell cycle; cellular homeostasis; cytotoxicity and cell proliferation; computational prediction of miRNAs and their targets and cell applications

Course schedule:

Date: Monday-Friday

Time: 09.00-16.00

Rooms C405 and D401, Institute of Molecular Biosciences

Date	Time	Topics/Details	Class Activity/ Teaching Media	Lecturer
26 Nov 2018	09:00-10:00	Orientation and over view of the class	Lecture	Saovaros
	10:00-11:00	Biosafety	Lecture (1)	Duncan
	11:00-12:00	Basic mammalian cell culture	Lecture (2)	Nitwara
	13:00-16:00	Mammalian cell expression system I: mammalian cell culture	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
27 Nov 2018	09:00-12:00	Mammalian cell expression system II: transfection	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
	13:00-14:00	Mammalian cell expression system	Lecture (3)	Nitwara
	14:00-15:00	RNA interference	Lecture (4)	Chalermporn
	15:00-16:00	Real-time PCR	Lecture (5)	Kusol
28 Nov 2018	09:00-10:00	Immunofluorescence assay (IFA)	Lecture (6)	Nitwara/ Duncan
	10:00-11:00	Fluorescence microscopy	Lecture (7)	Duncan/ Nitwara
	11:00-12:00	Flow cytometry	Lecture (8)	Saovaros
	13:00-14:00	Mammalian cell expression system III: Light microscope	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
	14:00-16:00	PBL1	Lab	
29 Nov 2018	09:00-16:00	Mammalian cell expression system III: Fluorescence microscope, flow cytometry, Immunofluorescence assay	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya

Date	Time	Topics/Details	Class Activity/ Teaching Media	Lecturer
30 Nov 2018	09:00-16:00	Mammalian cell expression system IV: Immunofluorescence assay (Continued) and confocal microscopy	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/ Naraporn Phatchariya
3 Dec 2018	09:00-10:00	RNA extraction	Lecture (9)	Chalermporn
	10.00-12.00	Cell cycle analysis	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
	13:00-16:00	Flow cytometry and analysis	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
4 Dec 2018	09:00-12:00	Wrap up		Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
	13:00-16:00	Examination (Lecture 1, 2, 3, 6, 7, 8)		
6 Dec 2018	09:00-16:00	RNA extraction RNA quantitation cDNA synthesis RNA gel electrophoresis	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
7 Dec 2018	09:00-16:00	Real-time PCR and semi-quantitative PCR	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
11 Dec 2018	09:00-10:00	Cell cycle	Lecture (10)	Duncan
	10:00-11:00	Cellular homeostasis	Lecture (11)	Duncan
	11:00-12:00	Cytotoxicity and cell proliferation	Lecture (12)	Duncan
	13:00-15:00	Real-time PCR analysis and wrap up	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya

Date	Time	Topics/Details	Class Activity/ Teaching Media	Lecturer
12 Dec 2018	09:00-12:00	Examination (Lecture 4, 5, 9)		Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
	13:00-16:00	Cellular homeostasis I: Cytotoxicity	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
13 Dec 2018	09:00-12:00	Cellular homeostasis II: Cytotoxicity	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
	13:00-16:00	PBL 2 (progress)	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
14 Dec 2018	09:00-12:00	Cellular homeostasis III: MTT assay	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
	13:00-16:00	MTT analysis and wrap up	Lab	Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
17 Dec 2018	09:00-12:00	Self-study		
	13:00-15:00	Examination (lab)		Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya
18 Dec 2018	09:00-12:00	Computational prediction of miRNAs and their targets	Lecture (13) / Computer Lab	Chalermporn
	13:00-15:00	Cell Applications	Lecture (14)	Saovaros
19 Dec 2018	09:00-12:00	Students' presentations	Presentation	All staff
	13:00-16:00	Discussion review	Discussion review	

Date	Time	Topics/Details	Class Activity/ Teaching Media	Lecturer
20 Dec 2018	09:00-12:00	Self-study		
	13:00-16:00	Examination (lecture 10, 11, 12, 13, 14)		Saovaros/ Nitwara/ Atichat/ Arpaporn Thavaree/Phatchariya

Assessment Criteria:

Assessment Criteria	Assessment Method	Scoring Rubric
Laboratory performance 30%	(1) Direct observation (2) Practical examination (3) In-class 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 sending (3) Presentation of data (4) Data analysis and conclusion (5) Lab notebook
Quizzes and exercises 30%	(1) Written examination	(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 10%	(1) Direct observation (2) Short presentation	(1) Class participation (2) Group work (3) Assigned work sending (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

Percentage	Grade	Description
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)**	**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 (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	Lab was carried out with full attention to	Lab was generally carried out with attention to	Lab was carried out with some attention to relevant safety	Safety procedures were ignored. Did not follow directions.

Lab Performance Evaluation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
(5 %)	relevant safety procedures & directions. No incident occurred. Outstanding job cleaning up working area, tools and equipment. Lab tools were organized and stored with care.	relevant safety procedures & directions. No incident occurred. Good job on cleaning up working area, tools and equipment. Lab tools were properly stored.	procedures & directions. A few incidents occurred. Had to be reminded to clean up area and equipment. Sometimes showed disorganized storage of lab tools.	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)**	**Needs 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 some spelling errors.	Report was disorganized with many spelling errors.
2. Report Sending (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	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,	Experimental data was poorly presented. Graphs or tables were poorly constructed with several errors. Data was missing or incorrect. Some units, labels, and

Lab Report/ Lab notebook Evaluation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
	graphical data were labeled accurately.		and titles were missing.	titles were not included.
4. Data Analysis and Conclusion (2%)	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 experiment and application.	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 application.	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 (3%)	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 (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.
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.	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	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	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

Problem-based learning Presentation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
	Length of presentation was within the assigned time limits.	presentation. Length of presentation was one minute over the assigned time limits.	presentation was more than one minute over the assigned time limits.	few minutes over the 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 complete the assigned work.	Shared equal work as others. Gave ideas and completed the assigned work in the group.	Did almost as much work as others. Sometime gave ideas and asked for help from others.	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)**
3.Assigned work sending (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 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.
Total (20 %)	**Total points earned =**			

Date revised: 20 November 2018