Course Syllabus

MBNS 751 Research Methods in Cellular and Molecular Neuroscience

Academic Year 2/2023

Course ID and Name: MBNS 751 Research Methods in Cellular and Molecular Neuroscience

Course Coordinator: Assoc. Prof. Sujira Mukda

Tel: 02-441-9003-7 ext. 1206 / 1437

E-mail: sujira.muk@mahidol.edu

Instructors:

1. Assoc. Prof. Dr. Sujira Mukda
2. Asst. Prof. Dr. Narisorn Kitiyanant
3. Asst. Prof. Dr. Alisa Tubsuwan
4. Asst Prof. Dr. Natee Jearawiriyapaisarn
5. Asst Prof. Dr. Phatchariya Phannasil
6. Dr. Nopphon Petchyam

Supporting Staff:

1. Ms. Somsong Phengsukdaeng
2. Ms. Sasithorn Prommet
3. Ms. Kornkanok Promthep
4. Ms. Chonnicha Subkod

Credits: 2 (1-2-3)

Curriculum: Doctor of Philosophy Program in Neuroscience (elective course)

Semester offering: Second semester

Pre-requisites: None

Course learning outcomes (CLOs):

Upon completion of this course, students are able to:

1. Select and apply appropriate research methods and techniques for investigating cellular and molecular aspects of the nervous system. (Aligned with PLO2(P), PLO3(P), PLO5(P))
2. Critically evaluate scientific literature within the field of cellular and molecular neuroscience, assessing experimental methodologies and data interpretation. (Aligned with PLO1(P), PLO2(P), PLO3(P), PLO5(P))
3. Conduct experiments using advanced laboratory equipment and techniques relevant to cellular and molecular neuroscience (Aligned with PLO1(P), PLO2(P), PLO3(P), PLO4(P), PLO5(P))

Alignment of teaching and assessment methods to course learning outcome:

Course learning outcome	Teaching method	Assessment method
1. Select and apply appropriate research methods and techniques for investigating cellular and molecular aspects of the nervous system.	1. Lecture 2. In-class discussion 3. Assignments/ Exercises	1. Written examination 2. Assessment of assigned work/ exercises 3. Oral presentation
2. Critically evaluate scientific literature within the field of cellular and molecular neuroscience, assessing experimental methodologies and data interpretation.	1. Lecture 2. In-class discussion 3. Assignments/ Exercises	1. Written examination 2. Assessment of assigned work/ exercises 3. Oral presentation
3. Conduct experiments using advanced laboratory equipment and techniques relevant to cellular and molecular neuroscience	1. In-class discussion 2. Hands-on practice	1. Assessment of assigned work/ exercises 2. Laboratory performance 3. In-class discussion

Course description:

The in-depth knowledge of the research design and methods used in the cellular and molecular neuroscience research; the experimental design, data analyses and interpretations; presentations of the research results; techniques to analyze the anatomical and chemical changes of the cells, proteins, or genes in the nervous system

ความรู้เชิงลึกของการออกแบบการวิจัยและวิธีการที่ใช้ในการวิจัยทางประสาทวิทยาศาสตร์ระดับเซลล์และโมเลกุล การออกแบบการทดลอง การวิเคราะห์ข้อมูล และแปลผล การนำเสนอผลงานวิจัย เทคนิคในการวิเคราะห์การเปลี่ยนแปลงทางกายวิภาคและเคมีของเซลล์โปรตีนหรือยีนในระบบประสาท

Course schedule:

Date: Monday-Friday

Time: 09:00-16:00

Venue: Lecture: Room A407 Institute of Molecular Biosciences [(1)], MaSHARES Co-working Space@MB [(2)]

Lab: (To be announced)

Schedule

MBNS 751 Research Methods in Cellular and Molecular Neuroscience

Lecture: 23 April 2024 – 13 May 2024

Course Coordinator: Assoc. Prof. Sujira Mukda

Tel: 02-441-9003-7 ext. 1206, 1437

E-mail: sujira.muk@mahidol.edu

	Date	Time	Topic	Lecturer
0	23 April 2024	09.00-09.30	**L0:** Course orientation	Sujira[(1)]
		09.30-11.30	**L1:** Next-generation sequencing technologies and their applications in neuroscience	Natee[(1)]
		13.00-15.00	**L2:** Transcriptomics in neuroscience research	Natee[(1)]
	24 April 2024	09.30-11.30	*Lab:* Next-generation sequencing	Natee
		13.00-15.00	**L3:** Discussion: Current research in cellular and molecular neuroscience	Sujira[(1)]
	25 April 2024	09.30-11.30	**L4:** Metabolomics in neuroscience research	Phatchariya[(1)]
		13.00-15.00	*Lab:* Metabolomics	Phatchariya
	26 April 2024	09.30-11.30	**L5:** Genetic modification, Genome editing, and CRISPR	Alisa[(1)]
		13.00-15.00	*Lab:* Genome editing	Alisa
	29 April 2024	09.00-12.00	**Mid-Course Exam**	Somsong/Sujira[(1)]
	30 April 2024	09.30-11.30	**L6:** Flow cytometry in neuroscience research	Narisorn[(1)]
		13.00-15.00	**L7:** Enzyme kinetics and their applications	Nopphon/Sujira[(1)]
	1 May 2024	09.00-12.00	*Lab:* Protein Purification I	Nopphon/ Chonnicha/ Narisorn/ Sujira
		13.00-16.00	*Lab:* Protein Purification II	Nopphon/ Chonnicha/ Narisorn/ Sujira
	2 May 2024	09.00-12.00	*Lab:* Protein Purification III	Nopphon/ Chonnicha/ Narisorn/ Sujira

	Date	Time	Topic	Lecturer
		13.00-16.00	*Lab:* Protein Purification IV	Nopphon/ Chonnicha/ Narisorn/ Sujira
	3 May 2024	09.00-12.00	*Lab:* Protein Purification V	Nopphon/ Chonnicha/ Narisorn/ Sujira
		13.00-15.00	**L8:** Viral vectors and their applications	Narisorn[(1)]
	8 May 2024	09.00-12.00	**Final Exam**	Somsong/Sujira[(1)]
	13 May 2024	09.00-16.00	**Student Presentation** (join with MBNS 752 Research Methodology in Cognitive Neuroscience & MBNS 658 Animal Experimentation in Neuroscience courses)	Teaching Staff[(2)]

Assessment Criteria:

Assessment Criteria	Assessment Method	Scoring Rubric
Written examination/ Assignments / Quiz (50%)	1. Written examination 2. Report	1. Comprehension
Laboratory performance (20%)	1. Direct observation 2. Practical examination 3. 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. Group work
Problem-based learning presentation (20%)	1. Presentation 2. In-class discussion	1. Ability to apply knowledge to solve research problems 2. Ability to answer questions
Class attendant (10%)	1. Number of classes signed in 1. Direct observation	1. Class participation

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
85-100	A	Excellent
80-84	B+	Very good
70-79	B	Good
60-69	C+	Fairly good
50-59	C	Fair
45-49	D+	Poor
40-44	D	Very poor
< 40	F	Fall

Lab Performance Evaluation Rubric				
Criteria	**Exemplary (score = 4)**	**Proficient (score = 3)**	**Basic (score = 2)**	**Inadequate (score = 1)**
Active participation	Student enthusiastically involves in participation and discussion with friends and teachers, and shows evident leadership skills.	Student actively involves in participation in class with friends and teachers.	Student is present in class and shows moderate interest during study.	Student shows no interest in participation or fails to present in class.
Group communication		Student communicates well with other students and teachers, both verbally and non-verbally.	Student moderately communicates or discusses with other students, or when being asked.	Student fails to communicate with others and tends to leave discussion.
Theory knowledge		Student shows profound background knowledge on topics being	Students has some degree of knowledge of topics being studied, but could be	Student has very little or no knowledge about topics being studied and not

Lab Performance Evaluation Rubric				
Criteria	**Exemplary (score = 4)**	**Proficient (score = 3)**	**Basic (score = 2)**	**Inadequate (score = 1)**
		discussed and evaluated.	improved in certain points.	prepared for this session.

Problem-based learning Presentation Rubric					
Criteria	**Excellent (score = 5)**	**Very good (score = 4)**	**Adequate (score = 3)**	**Limited (score = 2)**	**Poor (score = 1)**
Information quality and organization of topic presented (including answering the questions)	Main points are explicitly presented with impressive detail and organization. Information is directly linked to the topic of presentation.	Main points are presented with good amount of detail. Information is well-organized and linked to the topic given.	Main points are somewhat clear but could add some more detail. Information is organized and linked to the topic given.	Main points are not clear and lack detail. Information is loosely organized and some are off-topic.	Main points are missed and have no detail. Information is disorganized and off-topic.
Verbal communication and English language proficiency	Speaker's voice is very steady, clear and confident. Spoken language is very fluent and grammatically corrected.	Speaker's voice is steady and confident. Spoken language is fluent and mostly grammatically corrected.	Speaker's voice is moderately confident but could be developed. Spoken language is mediocre and has some grammatical errors.	Speaker's voice is unsteady and lacks confident. Use of spoken language needs to be improved, and many errors can be recognized.	Speaker fails to deliver proper presentation orally. Unable to deliver presentation via spoken English language.
Non-verbal communication	Speaker appears to be comfortable and confident. Effective uses	Speaker appears to be fairly confident. Eye contacts and	Speaker appears to be generally at ease. Moderate use	Speaker appears uneasy, insecure or panicked. Eye	Speaker is obviously uncomfortable for presentation.

Problem-based learning Presentation Rubric					
Criteria	**Excellent (score = 5)**	**Very good (score = 4)**	**Adequate (score = 3)**	**Limited (score = 2)**	**Poor (score = 1)**
	of eye contacts and gestures are presented to support the presentation.	gestures are generally used.	of eye contact and gesture but not very effective.	contact and gesture are rarely used.	No eye contact or gesture is presented.
Visual tools	Visual aids are very creative, easy to read and greatly enhance presentation.	Visual aids are typically clear and easy to follow.	Visual aids are good in terms of quality, but some points can be improved.	Limited visual aids are used or difficult to help audiences follow the topic.	No visual aids are used, and presentation is not interested by audiences.

Date revised: 5 March 2024