Course Syllabus

MBNS 751 Research Methods in Cellular and Molecular Neuroscience

Academic Year 2/2024

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

Course Coordinator: Assoc. Prof. Sujira Mukda

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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. Asst Prof. Dr. Jiraporn Panmanee
7. Dr. Nopphon Petchyam

Supporting Staff:

1. Ms. Somsong Phengsukdaeng
2. Ms. Sasithorn Prommet

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. Demonstrate knowledge of ethical standards and regulations in neuroscience research. (Aligned with CLO1(P))

2. Apply advanced knowledge of cellular and molecular neuroscience to design experiments that reflect current trends in the field. (Aligned with CLO2(P))

3. Critically evaluate scientific literature within the field of cellular and molecular neuroscience, assessing experimental methodologies and data interpretation. (Aligned with CLO3(P))

4. Work effectively as part of a team, demonstrating leadership and collaborative skills in group projects. (Aligned with CLO4(P))

5. Evaluate and interpret experimental results using appropriate statistical methods and communicate findings clearly. (Aligned with CLO5(P))

Alignment of teaching and assessment methods to course learning outcome:

Course learning outcome	Teaching method	Assessment method
1. Demonstrate knowledge of ethical standards and regulations in neuroscience research.	1. Lecture 2. In-class discussion 3. Assignments/ Exercises	1. Assessments/ exercises 2. In-class discussion
2. Apply advanced knowledge of cellular and molecular neuroscience to design experiments that reflect current trends in the field.	1. Lecture 2. In-class discussion 3. Assignments/ Exercises 4. Hands-on practice	1. In-class discussion 2. Assessments/ exercises 3. Oral presentation 4. Laboratory performance
3. 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. Hands-on practice	1. Assessment / exercises 2. Laboratory performance 3. In-class discussion 4. Oral presentation
4. Work effectively as part of a team, demonstrating leadership and collaborative skills in group projects	1. In-class discussion 2. Assignments/ Exercises 3. Hands-on practice	1. Assessment / exercises 2. Laboratory performance 3. In-class discussion
5. Evaluate and interpret experimental results using appropriate statistical methods and communicate findings clearly.	1. In-class discussion 2. Assignments/ Exercises 3. Hands-on practice	1. In-class discussion 2. Assessments/ exercises 3. Oral presentation 4. Laboratory performance

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: (To be announced) Institute of Molecular Biosciences.

Lab: (To be announced)

Schedule

MBNS 751 Research Methods in Cellular and Molecular Neuroscience

Lecture: 28 April 2025 – 13 May 2025 & xx May 2025

Course Coordinator: Assoc. Prof. Sujira Mukda

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	Date	Time	Topic	Lecturer
	28 April 2025	09.00-09.30	**L0:** Course orientation	Sujira[1]
1		09.30-11.30	**L1:** Flow cytometry in neuroscience research	Narisorn[1]
2		13.00-15.00	**L2:** Enzyme kinetics and their applications	Nopphon [1]
3	29 April 2025	09.00-11.00	**L3:** Viral vectors and their applications	Narisorn[1]
4		13.00-15.00	**L4:** Downstream processing and virion analytics	Narisorn
5	30 April 2025	09.00-12.00	*Lab:* Viral vector I	Narisorn/ Jiraporn
6		13.00-16.00	*Lab:* Viral vector II	Narisorn/ Jiraporn
7	1 May 2025	09.00-12.00	*Lab:* Viral vector III	Narisorn/ Jiraporn
8		13.00-16.00	*Lab:* Viral vector IV	Narisorn/ Jiraporn
9	2 May 2025	09.00-12.00	*Lab:* Viral vector V	Narisorn/ Jiraporn
10	6 May 2025	09.30-11.30	**L5:** Genetic modification, Genome editing, and CRISPR	Alisa[1]
11		13.00-15.00	*Lab:* Genome editing	Alisa
12	7 May 2025	09.30-11.30	**L6:** Next-generation sequencing technologies and their applications in neuroscience	Natee[1]
13		13.00-15.00	**L7:** Transcriptomics in neuroscience research	Natee[1]
14	8 May 2025	09.00-12.00	*Lab:* Next-generation sequencing	Natee
15		13.00-15.00	**L8:** Discussion: Current research in cellular and molecular neuroscience	Sujira[1]
16	13 May 2025	09.30-11.30	**L9:** Metabolomics in neuroscience research	Phatchariya[1]
17		13.00-15.00	*Lab:* Metabolomics	Phatchariya
	xx May 2025	09.00-16.00	**Student Presentation** (join with MBNS 752 Research Methodology in Cognitive Neuroscience, MBNS 658 Animal Experimentation in Neuroscience & MBNS 659 Microtechniques in Neuroscience Research courses)	Teaching Staff[2]

Assessment Criteria:

Assessment Criteria	Assessment Method	Scoring Rubric
Assignments / Quiz (50%)	1. Report 2. Quiz	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.

Lab Performance Evaluation Rubric

Criteria	Exemplary (score = 4)	Proficient (score = 3)	Basic (score = 2)	Inadequate (score = 1)
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 discussed and evaluated.	Students has some degree of knowledge of topics being studied, but could be improved in certain points.	Student has very little or no knowledge about topics being studied and not 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	Speaker's voice is steady and confident. Spoken language is fluent and mostly	Speaker's voice is moderately confident but could be developed. Spoken language is	Speaker's voice is unsteady and lacks confident. Use of spoken language needs to be improved, and many	Speaker fails to deliver proper presentation orally. Unable to deliver presentation via spoken

Problem-based learning Presentation Rubric					
Criteria	**Excellent** **(score = 5)**	**Very good** **(score = 4)**	**Adequate** **(score = 3)**	**Limited** **(score = 2)**	**Poor** **(score = 1)**
	grammatically corrected.	grammatically corrected.	mediocre and has some grammatical errors.	errors can be recognized.	English language.
Non-verbal communication	Speaker appears to be comfortable and confident. Effective uses of eye contacts and gestures are presented to support the presentation.	Speaker appears to be fairly confident. Eye contacts and gestures are generally used.	Speaker appears to be generally at ease. Moderate use of eye contact and gesture but not very effective.	Speaker appears uneasy, insecure or panicked. Eye contact and gesture are rarely used.	Speaker is obviously uncomfortable for presentation. 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: 6 January 2025