

**Course Syllabus**  
**MBNS 604 Research Methodology and Techniques in Neuroscience**  
**Academic Year 2023**

**Course ID and Name:** MBNS604 Research Methodology and Techniques in Neuroscience

**Course Coordinator:** Assoc. Prof. Sujira Mukda

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**Instructors:**

1. Prof. Duncan Richard Smith
2. Prof. Dr. Banthit Chetsawang
3. Assoc. Prof. Naiphinich Kotchabhakdi
4. Assoc. Prof. Nuanchan Chutabhakdikul
5. Assoc. Prof. Vorasith Siripornpanich
6. Assoc. Prof. Sujira Mukda
7. Asst. Prof. Sukonthar Ngampramuan
8. Asst. Prof. Kittikun Viwatpinyo
9. Dr. Jiraporn Panmanee
10. Dr. Narisra Komalawardhana
11. Dr. Lalitta Suriya-Arunroj
12. Dr. Siraprapa Boobphahom

**Supporting Staff:**

1. Ms. Somsong Phengsukdaeng
2. Ms. Sasithorn Prommet
3. Ms. Kanda Putthaphongphuek
4. Ms. Kornkanok Promthep
5. Mr. Umnaj Chanama
6. Ms. Chanikarn Boonchuay

**Credits:** 3 (2-2-5)

**Curriculum:** Master of Science Program in Neuroscience (required course)

Doctor of Philosophy Program in Neuroscience (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. Demonstrate learning and working integrity (including honesty, discipline, punctuality, and obedience) (Aligned with PLO1(P))
2. Acquire new knowledge in research techniques in Neuroscience (Aligned with PLO2(P))

3. Integrate and apply comprehensive knowledge in research techniques in Neuroscience to solve scientific research questions (Aligned with PLO3(P))
4. Demonstrate teamwork, interpersonal skills and responsibilities for the work Assignments (Aligned with PLO4(P))
5. Analyze and present lab data by using appropriate information and communication technologies (Aligned with PLO5(P))

**Alignment of teaching and assessment methods to course learning outcome:**

Course learning outcome	Teaching method	Assessment method
1. Demonstrate learning and working integrity (including honesty, discipline, punctuality, and obedience), and safety practice	1. Pre-session overview 2. Hands-on practice	1. Class Attendance (complete and punctual?) 2. Examination (cheating?) 3. Assignments (plagiarism?) 4. MU Labpass certificate
2. Acquire new knowledge in research techniques in Neuroscience	1. Lecture 2. In-class discussion 3. Assignments/ Exercises	1. Written examination 2. Assessment of assigned work/ exercises
3. Integrate and apply comprehensive knowledge in research techniques in Neuroscience to solve scientific research questions	1. In-class discussion 2. Assignments/ Exercises	1. Written examination 2. Assessment of assigned work/ exercises 3. Oral presentation 4. In-class discussion
4. 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
5. Analyze and present lab data by using appropriate information and communication technologies	1. Experimental data presentation and discussion	1. Reports 2. Oral presentation 3. In-class discussion

**Course description:**

The principles and methods used in the research process in neuroscience; fundamental skills required to assess the data generation and collecting; research ethics; research strategy and design; research practice; writing up research proposals; data analyses and interpretation; and presentations of the research results

**Course schedule:**

**Date:** Monday-Friday

**Time:** 09.00-16.00

**Venue:** Lecture: On-site (To be announced)<sup>(1)</sup>

Lab: Rooms B402<sup>(2)</sup>, D401-02<sup>(3)</sup>, and MB Animal Center<sup>(4)</sup> Institute of Molecular Biosciences

## Schedule

### MBNS 604 Research Methodology and Techniques in Neuroscience

Lecture: 18 September 2023 – 20 October 2023

Course Coordinator: Assoc. Prof. Sujira Mukda

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	Date	Time	Topic	Lecturer
0	18 Sep 2023	09.00-09.30	<b>L0:</b> Course orientation	Sujira <sup>(1)</sup>
		09.30-11.30	<b>L0:</b> Orientation to IMB Central Instrument Facility	Sujira Umnaj <sup>(1)</sup>
1		13.00-15.00	<b>L1:</b> Neuroimaging techniques	Naiphinich/ Vorasith <sup>(1)</sup>
2	19 Sep 2023	09.00-11.00	<b>L2:</b> How to design the ERP paradigm and ERP recording	Vorasith <sup>(1)</sup>
		13.00-16.00	<i>Lab:</i> ERP Recording	Vorasith <sup>(2)</sup>
3	20 Sep 2023	09.00-11.00	<b>L3:</b> Nucleic acid isolations & amplification	Jiraporn <sup>(1)</sup>
		13.00-16.00	<i>Lab:</i> RNA isolation & RT-PCR I	Jiraporn/Sujira/ Siraprapa <sup>(3)</sup>
	21 Sep 2023	09.00-12.00	<i>Lab:</i> RNA isolation & RT-PCR II	Jiraporn/Sujira/ Siraprapa <sup>(3)</sup>
		13.00-16.00	<i>Lab:</i> How to design primers for PCR	Jiraporn/Sujira/ Siraprapa <sup>(3)</sup>
4	22 Sep 2023	09.00-11.00	<b>L4:</b> Electrophysiology: extracellular recording	Lalitta <sup>(1)</sup>
		13.00-16.00	<i>Lab:</i> Electrophysiology	Lalitta <sup>(1)</sup>
5	25 Sep 2023	09.00-11.00	<b>L5:</b> Cell culture technique in nervous system	Sujira <sup>(1)</sup>
6		13.00-15.00	<b>L6:</b> Basic Histological Technique	Kittikun <sup>(1)</sup>
7	26 Sep 2023	09.00-11.00	<b>L7:</b> Identifying proteins of interest	Sujira <sup>(1)</sup>
		13.00-16.00	<i>Lab:</i> Protein extraction and determination	Sujira/Jiraporn/ Siraprapa <sup>(3)</sup>
	27 Sep 2023	09.00-12.00	<i>Lab:</i> Western blotting I	Sujira/Jiraporn/ Siraprapa <sup>(3)</sup>
		13.00-16.00	<i>Lab:</i> Western blotting II	Sujira/Jiraporn/ Siraprapa <sup>(3)</sup>

	Date	Time	Topic	Lecturer
	28 Sep 2023	09.00-12.00	Lab: Western blotting III	Sujira/Jiraporn/ Siraprapa <sup>(3)</sup>
		13.00-16.00	Lab: Western blotting IV	Sujira/Jiraporn/ Siraprapa <sup>(3)</sup>
8	29 Sep 2023	09.00-11.00	<b>L8:</b> Animal research in neuroscience and behavioral studies	Sukonthar <sup>(1)</sup>
		13.00-15.00	Lab: Animal models	Sukonthar <sup>(4)</sup>
Exam I	2 Oct 2023	09.00-16.00	<b>Exam I (L1-L8)</b>	Sujira/ Somsong
9	4 Oct 2023	09.00-11.00	<b>L9:</b> Bioinformatics in neuroscience study	Jiraporn <sup>(1)</sup>
10		13.00-16.00	<b>L10:</b> Bio-statistical analysis for research	Jiraporn <sup>(1)</sup>
11	6 Oct 2023	09.00-11.00	<b>L11:</b> Research ethics	Banthit <sup>(1)</sup>
12		13.00-15.00	<b>L12:</b> Guidelines on writing a research proposal	Duncan <sup>(1)</sup>
13	9 Oct 2023	09.00-11.00	<b>L13:</b> Reference management using Endnote software	Nuanchan <sup>(1)</sup>
14		13.00-15.00	<b>L14:</b> Research performance analysis and technique	Narisra <sup>(1)</sup>
15	11 Oct 2023	09.00-11.00	<b>L15:</b> Biosensor technology in neuroscience research	Siraprapa
Exam II	16 Oct 2023	09.00-16.00	<b>Exam II (L9-L15)</b>	Sujira/ Somsong
	20 Oct 2023	09.00-12.00	<b>Student Presentation</b>	Sujira & RCN Staff

#### Assessment Criteria:

Assessment Criteria	Assessment Method	Scoring Rubric
Assignments/ Examination (50%)	(1) Report (2) Written examination	(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	(1) Ability to apply knowledge to solve research problems (2) Ability to answer questions
Class attendant (10%)	(1) Number of classes signed in	(1) Class participation

Assessment Criteria	Assessment Method	Scoring Rubric
	(2) Direct observation	

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)
<b>Active participation</b>	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.
<b>Group communication</b>		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.
<b>Theory knowledge</b>		Student shows profound background	Students has some degree of knowledge of	Student has very little or no knowledge about

Lab Performance Evaluation Rubric				
Criteria	Exemplary (score = 4)	Proficient (score = 3)	Basic (score = 2)	Inadequate (score = 1)
		knowledge on topics being discussed and evaluated.	topics being studied, but could be improved in certain points.	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)
<b>Information quality and organization of topic presented (including answering the questions)</b>	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.
<b>Verbal communication and English language proficiency</b>	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.
<b>Non-verbal communication</b>	Speaker appears to be comfortable	Speaker appears to be fairly	Speaker appears to be generally at	Speaker appears uneasy,	Speaker is obviously uncomfortable

Problem-based learning Presentation Rubric					
Criteria	Excellent (score = 5)	Very good (score = 4)	Adequate (score = 3)	Limited (score = 2)	Poor (score = 1)
	and confident. Effective uses of eye contacts and gestures are presented to support the presentation.	confident. Eye contacts and gestures are generally used.	ease. Moderate use of eye contact and gesture but not very effective.	insecure or panicked. Eye contact and gesture are rarely used.	for presentation. No eye contact or gesture is presented.
<b>Visual tools</b>	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 interesting to audiences.

Date revised: 11 April 2023