

Course Syllabus
MBNS 604 Research Methodology and Techniques in Neuroscience
Academic Year 2/2024

Course ID and Name: MBNS 604 Research Methodology and Techniques in Neuroscience

Course Coordinator: Assoc. Prof. Sujira Mukda

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Instructors:

1. Prof. Duncan Richard Smith
2. Assoc. Prof. Dr. Vorasith Siripornpanich
3. Assoc. Prof. Dr. Sujira Mukda
4. Asst. Prof. Dr. Sukonthar Ngampramuan
5. Asst. Prof. Dr. Narisorn Kitiyanant
6. Asst. Prof. Dr. Kittikun Viwatpinyo
7. Asst. Prof. Dr. Jiraporn Panmanee
8. Lect. Dr. Narisra Komalawardhana
9. Lect. Dr. Lalitta Suriya-Arunroj
10. Lect. Dr. Siraprapa Boobphahom
11. Lect. Dr. Ekkaphot Khongkla

Supporting Staff:

1. Ms. Somsong Phengsukdaeng
2. Ms. Sasithorn Prommet
3. Ms. Kanda Putthaphongphuek
4. Ms. Kornkanok Promthep
5. Mr. Pannaphan Makarathut
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 an understanding of ethical issues in neuroscience research and apply ethical principles in experimental design. (aligned with PLO1(R))
2. Design a comprehensive research project that integrates neuroscientific theories with practical methodologies. (aligned with PLO3(R))

3. Analyze and interpret quantitative data using appropriate statistical methods. (aligned with PLO5(R))
4. Critically assess existing literature in neuroscience, identifying strengths and weaknesses in study designs. (aligned with PLO2(R))
5. Collaborate effectively within a team to achieve common research goals. (aligned with PLO4(R))

Alignment of teaching and assessment methods to course learning outcome:

Course learning outcome	Teaching method	Assessment method
1. Demonstrate an understanding of ethical issues in neuroscience research and apply ethical principles in experimental design.	1. Lecture 2. In-class discussion 3. Hands-on practice	1. Formative assessment using scoring rubric 2. Written examination 3. Assignments/ exercises
2. Design a comprehensive research project that integrates neuroscientific theories with practical methodologies.	1. Lecture 2. In-class discussion 3. Assignments/ Exercises	1. Written examination 2. In-class discussion 3. Assessments/ exercises
3. Analyze and interpret quantitative data using appropriate statistical methods.	1. In-class discussion 2. Assignments/ Exercises	1. Written examination 2. Assessments/ exercises 3. Oral presentation 4. In-class discussion
4. Critically assess existing literature in neuroscience, identifying strengths and weaknesses in study designs	1. In-class discussion 2. Assignments/ Exercises	1. Written examination 2. Assessments/ exercises 3. Oral presentation 4. In-class discussion
5. Collaborate effectively within a team to achieve common research goals.	1. In-class discussion 2. Hands-on practice	1. Formative assessment using scoring rubric 2. In-class discussion 3. Performance in social skills

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: 09.30-16.00

Venue: Lecture: Room A107⁽¹⁾ Institute of Molecular Biosciences

Lab: Rooms B402⁽²⁾, MB Animal Center ⁽³⁾, D401-02⁽⁴⁾, and D413⁽⁵⁾ Institute of Molecular Biosciences

Schedule

MBNS 604 Research Methodology and Techniques in Neuroscience

Lecture: 17 March 2025 – 11 April 2025 & 16 May 2025

Course Coordinator: Assoc. Prof. Sujira Mukda

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	Date	Time	Topic	Lecturer
0	17 Mar 2025	09.30-10.00	L0: Course orientation	Sujira ⁽¹⁾
		10.00-12.00	L0: Orientation to IMB Central Instrument Facility	Sujira/ Pannaphan ⁽¹⁾
1		13.00-15.00	L1: Neuroimaging techniques	Vorasith ⁽¹⁾
2	18 Mar 2025	09.30-11.30	L2: EEG-based techniques for studying of brain functions	Vorasith ⁽¹⁾
		13.00-16.00	<i>Lab:</i> EEG experimental setup	Vorasith ⁽²⁾
3	19 Mar 2025	09.30-11.30	L3: Electrophysiology: extracellular recording	Lalitta ⁽¹⁾
		13.00-16.00	<i>Lab:</i> Electrophysiology	Lalitta ⁽¹⁾
4	20 Mar 2025	09.30-11.30	L4: Animal research in neuroscience and behavioral studies	Sukonthar ⁽¹⁾
		13.00-16.00	<i>Lab:</i> Animal models	Sukonthar ⁽³⁾
5	21 Mar 2025	09.30-11.30	L5: Cell culture technique in nervous system	Sujira ⁽¹⁾
6		13.00-15.00	L6: Bio-statistical analysis for research	Jiraporn ⁽¹⁾
7	24 Mar 2025	09.30-11.30	L7: Research ethics	Narisorn ⁽¹⁾
8		13.00-16.00	L8: Bioinformatics in neuroscience study	Jiraporn ⁽¹⁾
9	25 Mar 2025	09.30-11.30	L9: Nucleic acid isolations & amplification	Jiraporn ⁽¹⁾
		13.00-16.00	<i>Lab:</i> RNA isolation & RT-PCR I	Jiraporn/ Sujira/ Narisorn ⁽⁴⁾
	26 Mar 2025	09.00-12.00	<i>Lab:</i> RNA isolation & RT-PCR II	Jiraporn/ Sujira/ Narisorn ⁽⁴⁾
		13.00-16.00	<i>Lab:</i> How to design primers for PCR	Jiraporn/ Sujira/ Narisorn ⁽⁴⁾
10	27 Mar 2025	09.30-11.30	L10: Biosensor technology in neuroscience research	Siraprapa ⁽¹⁾
11		13.00-16.00	L11: Basic Histological Technique	Kittikun ⁽¹⁾

	Date	Time	Topic	Lecturer
Exam I	31 Mar 2025	09.00-12.00	Exam I (L1-L7)	Sujira/Somsong
12	1 Apr 2025	09.30-11.30	L12: Identifying proteins of interest	Ekkaphot ⁽¹⁾
		13.00-16.00	Lab: Protein extraction and determination	Ekkaphot/ Siraprapa ⁽⁵⁾
	2 Apr 2025	09.00-12.00	Lab: Western blotting I: Sample preparation and gel electrophoresis	Ekkaphot/ Siraprapa ⁽⁵⁾
		13.00-16.00	Lab: Western blotting II: Protein transfer and antibody incubation	Ekkaphot/ Siraprapa ⁽⁵⁾
	3 Apr 2025	09.00-12.00	Lab: Western blotting III: Detection and imaging	Ekkaphot/ Siraprapa ⁽⁵⁾
		13.00-16.00	Lab: Western blotting IV: Data analysis	Ekkaphot/ Siraprapa ⁽⁵⁾
13	4 Apr 2025	09.30-11.30	L13: Guidelines on writing a research proposal	Duncan ⁽¹⁾
14		13.00-15.00	L14: Reference management using Endnote and Zotero software	Ekkaphot ⁽¹⁾
15	8 Apr 2025	09.30-11.30	L15: Research performance analysis and technique	Naristra ⁽¹⁾
16		13.00-15.00	L16: OMICs applications in neuroscience research	Ekkaphot ⁽¹⁾
Exam II	11 Apr 2025	09.00-12.00	Exam II (L8-L15)	Sujira/Somsong
	16 May 2025	09.00-12.00	Student Presentation (join with MBNS 608 course)	RCN Lecturers

* This topic will be teaching online via Zoom:

Assessment Criteria:

Assessment Criteria	Assessment Method	Scoring Rubric
Written examination/ Assignments (40%)	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

Assessment Criteria	Assessment Method	Scoring Rubric
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 attendance (10%)	1. Number of classes signed in 1. Direct observation	1. Class attendance
Participation in in-class discussion (10%)	1. In-class discussion	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	Student moderately communicates or discusses with other students,	Student fails to communicate with others and tends to leave discussion.

Lab Performance Evaluation Rubric				
Criteria	Exemplary (score = 4)	Proficient (score = 3)	Basic (score = 2)	Inadequate (score = 1)
		verbally and non-verbally.	or when being asked.	
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 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	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.

Problem-based learning Presentation Rubric					
Criteria	Excellent (score = 5)	Very good (score = 4)	Adequate (score = 3)	Limited (score = 2)	Poor (score = 1)
			grammatical errors.		
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 interesting to audiences.

Date revised: 6 January 2025