

**Course Syllabus**  
**MBNS 752 Research Methodology in Cognitive Neuroscience**  
**Academic Year 2025**

**Course ID and Name:** MBNS 752 Research Methodology in Cognitive Neuroscience  
**Course coordinator:** Assoc. Prof. Vorasith Siripornpanich, M.D., Ph.D.  
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**Instructors:**

1. Prof. Banthit Chetsawang, Ph.D.
2. Assoc. Prof. Vorasith Siripornpanich, M.D., Ph.D.
3. Assoc. Prof. Nuanchan Chutabhakdikul, Ph.D.
4. Lecturer Siraprapa Boobphahom, Ph.D.
5. Lecturer Sumeth Klomchitcharoen, Ph.D.
6. Guest lecturers

**Supporting Staffs:**

1. Ms Kanda Putthaphongpheuk
2. Ms Somsong Phengsukdaeng

**Credits:** 2 (1-2-3)  
**Curriculum:** Doctor of Philosophy Program in Neuroscience (elective course)  
**Semester offering:** Second semester  
**Pre-requisites:** Research Methodology in Neuroscience

**Course learning outcomes (CLOs):**

Upon completion of this course, students are able to:

1. Acquire new knowledge in research techniques in cognitive neuroscience (PLO1)  
**P**
2. Integrate and apply comprehensive knowledge in research techniques in cognitive neuroscience to solve scientific research questions (PLO2) **P**
3. Analyze and present lab data by using appropriate information and communication technologies (PLO3) **P**
4. Demonstrate scientific integrity, responsibility, and safety practice (PLO4) **P**
5. Demonstrate teamwork, interpersonal skills and responsibilities for the work Assignments (PLO5) **P**

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

<b>Course learning outcome</b>	<b>Teaching method</b>	<b>Assessment method</b>
1. Acquire new knowledge in research techniques in cognitive neuroscience	(1) Lecture (2) Class discussion	(1) Written examination (2) Reports (3) In-class discussion
2. Integrate and apply comprehensive knowledge in research techniques in cognitive neuroscience to solve scientific research questions	(1) Class discussion (2) Problem-based learning	(1) Direct observation (2) Oral presentation (3) In-class discussion
3. 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
4. Demonstrate scientific integrity, responsibility, and safety practice	(1) Assignment (2) Lab safety guidelines (3) Hands-on practice	(1) Assessment of assigned work (2) Direct observation (3) Class attendance (4) Lab performance
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:**

Principles and methods used in the cognitive neuroscience; electroencephalography; event-related potential; the quantitative analysis of electroencephalography; analysis of event-related potential waveforms; cognitive assessment; functional near-infrared spectroscopy; nuclear medicine imaging; sleep tests; transcranial magnetic stimulation; transcranial direct current stimulation; computational methods for behavioral analysis; machine learning; research ethics in humans

**Course schedule:**

Date: Monday to Friday

Time: 09.00 – 16.00

Rooms: TBA

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**TEACHING SCHEDULE**

<b>Date/Time</b>	<b>Topic/Details</b>	<b>Number of Hours</b>	<b>Class Activity</b>	<b>Lecturer</b>
<b>Mon 20 Apr 26</b>				
9.00-10.00	<b>Lecture 1:</b> Introduction to Research in Human	1	Lecture/ In-class discussion	Vorasith
10.00-12.00	<b>Lecture 2:</b> EEG and Event-related potential (ERP) for cognitive research	2	Lecture/ In-class discussion	Vorasith
13.00-16.00	<b>Lab 2:</b> Recording and Analysis of EEG and ERP data	3	Lab/ In-class discussion	Vorasith
<b>Tue 21 Apr 26</b>				
9.30-11.30	<b>Lecture 7:</b> Sleep and cognitive research	2	Lecture/ In-class discussion	Vorasith
13.00-16.00	<b>Lab 8:</b> Demonstration of biosensor design and preparation	3	Lab/ In-class discussion	Siraprapa
<b>Wed 22 Apr 26</b>				
9.30-11.30	<b>Lecture 3:</b> Cognitive tasks and learning	2	Lecture/ In-class discussion	Nuanchan
13.00-16.00	<b>Lab 3:</b> Assessment of cognitive tasks	3	Lab/ In-class discussion	Nuanchan
<b>Thu 23 Apr 26</b>				
9.00-12.00	<b>Lab 4:</b> Brain-computer interface	3	Lab/ In-class discussion	Sumeth
13.00-16.00	Self study	-	-	-
<b>Fri 24 Apr 26</b>				
13.00-16.00	<b>Lab 7:</b> Polysomnography for sleep study	3	Lab/ In-class discussion	<b>Phirawan/</b> Vorasith
<b>Mon 27 Apr 26</b>				
9.30-11.30	<b>Lecture 6:</b> Functional near-infrared spectroscopy (fNIRS)	2	Lecture/ In-class discussion	Nuanchan

Date/Time	Topic/Details	Number of Hours	Class Activity	Lecturer
13.00-16.00	<b>Lab 1:</b> Cognitive neuroscience research in Human	3	Lab/ In-class discussion	Banthit
<b>Tue 28 Apr 26</b>				
9.00-12.00	<b>Lab 6.1:</b> Demonstration of fNIRS	3	Lab/ In-class discussion	Kullawat/ Nuanchan
13.00-16.00	<b>Lab 6.2:</b> Demonstration of fNIRS	3	Lab/ In-class discussion	Kullawat/ Nuanchan
<b>Wed 29 Apr 26</b>				
9.30-11.30	<b>Lecture 4:</b> Quantitative and computational methods for linking cognitive functions to behaviors	2	Lecture/ In-class discussion	Sumeth
13.00-15.00	<b>Lecture 8:</b> Machine learning and multivariate analyses of brain signals	2	Lecture/ In-class discussion	Sumeth
<b>Fri 1 May 26</b>				
9.30-11.30	<b>Lecture 5:</b> Brain stimulation techniques (TMS and tDCS)	2	Lecture/ In-class discussion	Wanalee
13.00-16.00	<b>Lab 5:</b> Demonstration of TMS and tDCS * *Faculty of Physical Therapy, MU	3	Lab/ In-class discussion	Wanalee
<b>Wed 6 May 26</b>				
9.00-12.00	Written Examination (Lecture part)	3	-	-
<b>Mon 11 May 26</b>				
9.00-12.00	<b>Lab 9:</b> Knowledge and Practice in Nuclear Medicine ** **Faculty of Medicine Ramathibodi Hospital, MU	3	Lab/ In-class discussion	Wichana
<b>TBA</b>				
13.00-16.00	Student Presentation	3	Problem-based learning/ In-class discussion	RCN staffs

**Assessment Criteria:**

<b>Assessment Criteria</b>	<b>Assessment Method</b>	<b>Scoring Rubric</b>
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 (2) 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:

<b>Percentage</b>	<b>Grade</b>
85 -100	A
80 - 84	B+
70 - 79	B
60 - 69	C+
50 - 59	C
45 - 49	D+
40 - 44	D
< 40	F

**ATTENTION**

***(1) According to the Faculty of Graduate Studies regulation, enrolled students are required to attend classed more than 80% of total class time. Students will be disqualified from examination if they failed to comply with this regulation.***

<b>Lab Performance Evaluation Rubric</b>				
<b>Criteria</b>	<b>Exemplary (score = 4)</b>	<b>Proficient (score = 3)</b>	<b>Basic (score = 2)</b>	<b>Inadequate (score = 1)</b>
<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 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.

<b>Problem-based learning Presentation Rubric</b>					
<b>Criteria</b>	<b>Excellent (score = 5)</b>	<b>Very good (score = 4)</b>	<b>Adequate (score = 3)</b>	<b>Limited (score = 2)</b>	<b>Poor (score = 1)</b>
<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</b>	Speaker's voice is very	Speaker's voice is	Speaker's voice is	Speaker's voice is	Speaker fails to deliver

<b>Problem-based learning Presentation Rubric</b>					
<b>Criteria</b>	<b>Excellent (score = 5)</b>	<b>Very good (score = 4)</b>	<b>Adequate (score = 3)</b>	<b>Limited (score = 2)</b>	<b>Poor (score = 1)</b>
<b>and English language proficiency</b>	steady, clear and confident. Spoken language is very fluent and grammatically corrected.	steady and confident. Spoken language is fluent and mostly grammatically corrected.	moderately confident but could be developed. Spoken language is mediocre and has some grammatical errors.	unsteady and lacks confident. Use of spoken language needs to be improved, and many errors can be recognized.	proper presentation orally. Unable to deliver presentation via spoken English language.
<b>Non-verbal communication</b>	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.
<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 interested by audiences.

**Date revised:** February 4th, 2026