**Course Syllabus**

**MBNS 604 Research Methodology and Techniques in Neuroscience**

**Academic Year 2/2023**

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

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

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

E-mail: sujira.muk@mahidol.edu

**Instructors:**

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

**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<br>2. Hands-on practice | 1. Class Attendance (complete and punctual?)<br>2. Examination (cheating?)<br>3. Assignments (plagiarism?)<br>4. MU Labpass certificate |
| 2. Acquire new knowledge in research techniques in Neuroscience | 1. Lecture<br>2. In-class discussion<br>3. Assignments/ Exercises | 1. Written examination<br>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<br>2. Assignments/ Exercises | 1. Written examination<br>2. Assessment of assigned work/ exercises<br>3. Oral presentation<br>4. In-class discussion |
| 4. Demonstrate teamwork, interpersonal skills and responsibilities for the work assignments | 1.Group/individual assignment | 1.Direct observation<br>2.Assessment of assigned work<br>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<br>2.Oral presentation<br>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:** 09.30-16.00

**Venue:** Lecture: Room (TBA) [1] Institute of Molecular Biosciences

Lab: Rooms B402[2], D401-02[3], and MB Animal Center [4] Institute of Molecular Biosciences

**Schedule**

**MBNS 604 Research Methodology and Techniques in Neuroscience**

**Lecture:** 18 March 2024 – 12 April 2024 & 17 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 | 18 Mar 2024 | 09.00-09.30 | **L0:** Course orientation | Sujira[(1)] |
| | | 09.30-11.30 | **L0:** Orientation to IMB Central Instrument Facility | Sujira/Umnaj[(1)] |
| 1 | | 13.00-15.00 | **L1:** Neuroimaging techniques | Naiphinich/ Vorasith[(1)] |
| 2 | 19 Mar 2024 | 09.30-11.30 | **L2:** EEG-based techniques for studying of brain functions | Vorasith[(1)] |
| | | 13.00-16.00 | *Lab:* EEG experimental setup | Vorasith[(2)] |
| 3 | 20 Mar 2024 | 09.30-11.30 | **L3:** Identifying proteins of interest | Ekkaphot[(1)] |
| | | 13.00-16.00 | *Lab:* Protein extraction and determination | Ekkaphot/ Siraprapa[(3)] |
| | 21 Mar 2024 | 09.00-12.00 | *Lab:* Western blotting I: Sample preparation and gel electrophoresis | Ekkaphot/ Siraprapa[(3)] |
| | | 13.00-16.00 | *Lab:* Western blotting II: Protein transfer and antibody incubation | Ekkaphot/ Siraprapa[(3)] |
| | 22 Mar 2024 | 09.00-12.00 | *Lab:* Western blotting III: Detection and imaging | Ekkaphot/ Siraprapa[(3)] |
| | | 13.00-16.00 | *Lab:* Western blotting IV: Data analysis | Ekkaphot/ Siraprapa[(3)] |
| 4 | 25 Mar 2024 | 09.30-11.30 | **L4:** Cell culture technique in nervous system | Sujira[(1)] |
| 5 | | 13.00-15.00 | **L5:** Basic Histological Technique | Kittikun[(1)] |
| 6 | 26 Mar 2024 | 09.30-11.30 | **L6:** Electrophysiology: extracellular recording | Lalitta[(1)] |
| | | 13.00-16.00 | *Lab:* Electrophysiology | Lalitta[(1)] |
| 7 | 27 Mar 2024 | 09.30-11.30 | **L7:** Animal research in neuroscience and behavioral studies | Sukonthar[(1)] |
| | | 13.00-16.00 | *Lab:* Animal models | Sukonthar[(4)] |

| | Date | Time | Topic | Lecturer |
|---|---|---|---|---|
| 8 | 28 Mar 2024 | 09.30-11.30 | **L8:** Nucleic acid isolations & amplification | Jiraporn [(1)] |
| | | 13.00-16.00 | *Lab:* RNA isolation & RT-PCR I | Sujira/Siraprapa[(3)] |
| | 29 Mar 2024 | 09.00-12.00 | *Lab:* RNA isolation & RT-PCR II | Sujira/Siraprapa[(3)] |
| | | 13.00-16.00 | *Lab:* How to design primers for PCR | Sujira/Siraprapa[(3)] |
| Exam I | 1 Apr 2024 | 09.00-16.00 | **Exam I (L1-L8)** | Sujira/Somsong |
| 9 | 2 Apr 2024 | 09.30-11.30 | **L9:** Bioinformatics in neuroscience study | Jiraporn [(1)] |
| 10 | | 13.00-16.00 | **L10:** Research ethics | Narisorn[(1)] |
| 11 | 3 Apr 2024 | 09.30-11.30 | **L11:** Bio-statistical analysis for research | Jiraporn[(1)] |
| 12 | | 13.00-15.00 | **L12:** Guidelines on writing a research proposal | Duncan[(1)] |
| 13 | 4 Apr 2024 | 09.30-11.30 | **L13:** Reference management using Endnote and Zotero software | Ekkaphot[(1)] |
| 14 | | 13.00-15.00 | **L14:** Research performance analysis and technique | Narisra[(1)] |
| 15 | 5 Apr 2024 | 09.30-11.30 | **L15:** Biosensor technology in neuroscience research | Siraprapa |
| | | 13.00-15.00 | **L16:** OMICs applications in neuroscience research | Ekkaphot[(1)] |
| Exam II | 9 Apr 2024 | 09.00-16.00 | **Exam II (L9-L16)** | Sujira/Somsong |
| | 17 May 2024 | 09.00-12.00 | **Student Presentation (join with MBNS 608 course)** | Banthit/Sujira/ RCN Staff |

**Assessment Criteria:**

| Assessment Criteria | Assessment Method | Scoring Rubric |
|---|---|---|
| Written examination/ Assignments (50%) | 1. Written examination<br>2. Report | 1. Comprehension |
| Laboratory performance (20%) | 1. Direct observation<br>2. Practical examination<br>3. In-class discussion | 1. Ability to follow procedure or to design a procedure for experiment<br>2. Use of equipment<br>3. Working area and safety<br>4. Group work |
| Problem-based learning presentation (20%) | 1. Presentation<br>2. In-class discussion | 1. Ability to apply knowledge to solve research problems<br>2. Ability to answer questions |
| Class attendant (10%) | 1. Number of classes signed in | 1. Class participation |

| Assessment Criteria | Assessment Method | Scoring Rubric |
|---|---|---|
| | 1. 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)** |
| **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 | Students has some degree of knowledge of topics being | Student has very little or no knowledge about topics being |

| Lab Performance Evaluation Rubric | | | | |
|---|---|---|---|---|
| **Criteria** | **Exemplary (score = 4)** | **Proficient (score = 3)** | **Basic (score = 2)** | **Inadequate (score = 1)** |
| | | topics being discussed and evaluated. | studied, but could be improved in certain points. | 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 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. | Speaker appears to be fairly confident. Eye | Speaker appears to be generally at ease. | Speaker appears uneasy, insecure or | Speaker is obviously uncomfortable for |

| Problem-based learning Presentation Rubric | | | | | |
|---|---|---|---|---|---|
| **Criteria** | **Excellent (score = 5)** | **Very good (score = 4)** | **Adequate (score = 3)** | **Limited (score = 2)** | **Poor (score = 1)** |
| | Effective uses of eye contacts and gestures are presented to support the presentation. | contacts and gestures are generally used. | Moderate use of eye contact and gesture but not very effective. | panicked. Eye contact and gesture are rarely used. | 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:** 22 January 2024