Course Syllabus

MBNS757 Drug Development for Neurological Diseases

Academic Year 2025-1

Course ID and Name: MBNS757 Drug Development for Neurological Diseases

Course Coordinator: Jiraporn Panmanee, Ph.D.

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Instructors:

1. Prof. Banthit Chetsawang
2. Assoc. Prof. Vorasith Siripornpanich
3. Assoc. Prof. Sujira Mukda
4. Assoc. Prof. Poochit Nonejuie
5. Asst. Prof. Sukonthar Ngampramuan
6. Asst. Prof. Sitthivut Charoensutthivarakul
7. Asst. Prof. Matthew Phanchana
8. Asst. Prof. Jiraporn Panmanee
9. Lecturer Dr. Ittipat Meewan
10. Lecturer Dr. Nopphon Petchyam
11. Lecturer Dr. Phorutai Pearngam

Supporting Staff:

1. Ms. Somsong Phengsukdaeng
2. Ms. Sasithorn Prommet
3. Ms. Kornkanok Promthep

Credits: 2 (1-2-3)

Curriculum: Doctor of Philosophy Program in Neuroscience (elective course)

Semester offering: First semester

Pre-requisites: None

Course learning outcomes (CLOs):

Upon completion of this course, students are able to:

1. Understand the basic principle in the field of drug discovery and neurological diseases. (PLO2) P
2. Demonstrate many stages of the drug research and development process and the ethical and legal requirements. (PLO1) R (PLO2) P
3. Integrate the fundamentals of target identification, target validation and drug discovery methodologies. (PLO3) P
4. Describe the different drug target classes and the specific methods utilized for target validation and identification. (PLO2) P

5. Demonstrate teamwork, interpersonal skills, and responsibilities for the assigned and group work (PLO4) R
6. Apply the preclinical and current drug development processes work by different bioinformatic tools. (PLO5) P

Alignment of teaching and assessment methods to course learning outcome:

Course learning outcome	Teaching method	Assessment method
1. Understand the knowledge in the field of drug discovery and neurological diseases	(1) Lecture (2) Class discussion	(1) Written examination (2) Reports (3) In-class discussion
2. Demonstrate many stages of the drug research and development process and the ethical and legal requirements	(1) Lecture (2) Class discussion	(1) Written examination (2) Oral presentation (3) In-class discussion
3. Integrate the fundamentals of target identification, target validation and drug discovery methodologies	(1) Lecture (2) Practice-based learning	(1) Reports (2) Oral presentation (3) In-class discussion
4. Describe the different drug target classes and the specific methods utilized for target validation and identification	(1) Assignment (2) Practice-based learning (3) Class discussion	(1) Assessment of assigned work (2) Written examination (3) In-class discussion
5. Demonstrate teamwork, interpersonal skills, and responsibilities for the assigned and group work	(1) Assignment (2) Class discussion	(1) Assessment of assigned work (2) In-class discussion
6. Apply the preclinical and current drug development processes work by different bioinformatic tools	(1) Assignment (2) Practice-based learning	(1) Assessment of assigned work (2) Oral presentation

Course description:

The fundamentals of drug development and discovery; neurological and neuropsychiatric disease-relevant drug targets; biomarker identification in neurological diseases; the concepts and strategies of target identification and validation in drug development; the principles of target-based screening in computer-aided drug design; bioinformatics tools for drug developments; lead identification and optimization; various classes

of therapeutic agents; ethical and legal issues of drug development; Drug discovery via cytological profiling platform

Course schedule:

Date: Monday, Wednesday, and Friday (and Thursday 2nd and 16th)

Time: 09.00-16.00

Venue: Institute of Molecular Biosciences, Mahidol University, Salaya **(Room: Please refer to the schedule for room details on each date)**

Lectures: online for MAPC students

Lab: onsite only

Schedule

MBNS757 Drug Development for Neurological Diseases

Lecture: 20 Oct 2025 – 3 Dec 2025 **| Lab:** 20 Oct 2025 – 3 Dec 2025 **|**

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Date	Time	Topic	Lecturer
20 Oct 2025	13.00-13.30	**L0:** Course orientation	Jiraporn (A401?)
20 Oct 2025	13.30-16.30	**L1**: Neurological disease-relevant drug targets **L2:** Neuropsychological disease-relevant drug targets	Vorasith (A401?)
22 Oct 2025	10.00-11.30	**L3:** The fundamentals of drug discovery and development	Jiraporn (A401?)
22 Oct 2025	13.00-16.00	*Lab 1:* Basic databases for drug development: Primary and secondary databases	Jiraporn (A401?)
24 Oct 2025	10.30-12.00	**L4:** Biomarker identification in neurological and neuropsychological diseases	Sujira (A401?)
24 Oct 2025	13.30-15.30	*Lab 2:* Basic tools for drug development: Sequence homology and conservation analysis	Jiraporn (A401?)
Course Break (27 Oct – 2 Nov) for The 28th annual Thai neuroscience society conference and IBRO school 2025			

Date	Time	Topic	Lecturer
5 Nov 2025	10.00-12.00	**L5:** The concepts and strategies of target identification and validation in drug development	Jiraporn (A401?)
5 Nov 2025	13.00-15.00	*Lab 3:* Protein-Protein interaction analysis for omics data	Jiraporn (A401?)
7 Nov 2025	10.30-12.00	**L6:** Bioinformatic tools for drug developments	Phorutai (A401?)
7 Nov 2025	13.30-15.30	*Lab 4:* Biomarker identification from biological databases	Phorutai (A401?)
10 Nov 2025	10.30-11.30	**L7:** The principles of target-based screening in computer-aided drug design	Ittipat (A401?)
10 Nov 2025	13.00-16.00	*Lab 5:* Computer-aided drug design: Protein modeling	Nopphon/Jiraporn (A401?)
12 Nov 2025	10.30-11.30	**L8**: Computer-aided drug design: Protein-ligand interaction	Matthew (A401?)
12 Nov 2025	13.00-16.00	*Lab 6:* Computer-aided drug design: Protein-ligand interaction, Structural visualization and analysis (Pymol)	Nopphon/Jiraporn (A401?)
14 Nov 2025	10.30-12.00	**L9:** Lead identification and optimization	Sitthivut (A401?)
14 Nov 2025	13.30-16.30	*Lab 7:* Molecular Docking	Jiraporn/Nopphon (A401?)
17 Nov 2025	13.00-16.00	**Exam I (L1-L7)**	Somsong (A401?)
19 Nov 2025	9.30-10.30	**L10:** Various classes of therapeutic agents	Banthit (A401?)
19 Nov 2025	11.00-12.00	**L11:** Ethical and legal issues of drug development	Sukonthar (A401?)
19 Nov 2025	13.00-16.00	*Lab 8:* Virtual screening and Molecular dynamic simulation	Jiraporn (A401?)
21 Nov 2025	10.00-12.00	**L12:** Drug discovery via cytological profiling platform	Poochit (A407?)
21 Nov 2025	13.00-16.00	*Lab 9:* Computer-aided drug design: Lead optimization	Ittipat/Nopphon (A401?)
24 Nov 2025	10.30-12.00	**L.13:** Introduction to AI-driven drug discovery and development	Ittipat (A401?)

Date	Time	Topic	Lecturer
24 Nov 2025	13.00-16.00	*Lab10*: Computer-aided drug design: Targeted design for neurological diseases	Jiraporn (A407?)
28 Nov 2025	13.00-16.00	**Exam II (L8-L13)**	Somsong (A401?)
3 Dec 2025	13.00-16.00	Student Presentation (Targeted design for neurological diseases)	Faculty staff (A401?)

Assessment Criteria:

Assessment Criteria	Assessment Method	Scoring Rubric
Assignments/ Written Examination (40%)	(1) Assigned Report (2) Written examination	(1) Comprehension
Laboratory performance (40%)	(1) Direct observation (2) Lab report (3) In-class discussion	(1) Ability to follow procedure or to design a procedure for experiments (2) Use of tools (3) Group work
Practice-based learning presentation (10%)	(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:

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	**Excellent (score = 4)**	**Good (score = 3)**	**Fair (score = 2)**	**Need Improvement (score = 1)**
Active participation	Students are enthusiastically involved in participation and discussion with friends and teachers and show evident leadership skills	Students are actively involved in participation in class with friends and teachers	Students are present in class and show moderate interest during study	Students show no interest in participation or fail to present in class
Data collection and analysis	Accurately collects and records data, analyzes data using appropriate statistical techniques, and interprets and communicates results effectively	Accurately collects and records data and analyzes data using appropriate statistical techniques, but may have difficulty interpreting and communicating results	Accurately collects and records data, but may have difficulty analyzing data and interpreting and communicating results	Struggles with accurate data collection and analysis
Problem-solving and critical thinking	Identifies and troubleshoots problems effectively, develops creative solutions to problems, and asks relevant questions and proposes hypotheses	Identifies and troubleshoots problems effectively and asks relevant questions, but may have difficulty developing creative solutions to problems	Identifies and troubleshoots problems, but may have difficulty asking relevant questions or developing creative solutions	Struggles with problem-solving and critical thinking

Practice-based learning Presentation Rubric					
Criteria	Outstanding (score = 5)	Above average (score = 4)	Average (score = 3)	Below average (score = 2)	Poor (score = 1)
Information quality and organization of topic presented (including answering the questions) (5%)	The information presented is accurate, comprehensive, and well-organized, with a clear and logical structure	The information presented is mostly accurate and well-organized, with a clear structure	The information presented is generally accurate and adequately organized, with a clear structure	The information presented is partially accurate and poorly organized, with a confusing structure	The information presented is inaccurate and poorly organized, with a very confusing structure
Verbal communication and English language proficiency (2%)	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 (1%)	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 (2%)	The visual tools used (e.g. slides,	The visual tools used are	The visual tools used	The visual tools used are	Mostly no visual aids are

Practice-based learning Presentation Rubric					
Criteria	**Outstanding (score = 5)**	**Above average (score = 4)**	**Average (score = 3)**	**Below average (score = 2)**	**Poor (score = 1)**
	charts, diagrams) are visually appealing, relevant, and effectively support the presentation	visually appealing and relevant, but could be better integrated into the presentation	are adequate and relevant, but could be improved	poorly designed and not well integrated into the presentation	used, and very poorly designed.

Date revised: 17 June 2025