

Course Syllabus
SIPS 604
Academic Year 2023
Department of Physiology
Faculty of Medicine Siriraj Hospital, Mahidol University

Course ID and name:	SIPS604: Ion Channel Physiology
Course coordinator:	Associate Professor Dr. Wattana B. Watanapa
Instructors:	Associate Professor Dr. Wattana B. Watanapa Lecturer Dr. Luecha Boontaveekul Assistant Professor Dr. Sompol Tapechum Associate Professor Dr. Panapat Uawithya Associate Professor Dr. Narawut Pakaprot
Credits:	2 (2-0-4) (lecture – laboratory – self-study)
Curriculum:	Doctor of Philosophy Program in Medical Physiology
Course type:	<input type="checkbox"/> Core <input type="checkbox"/> Required <input checked="" type="checkbox"/> Electives
Semester offering:	2 / 2023
Prerequisite:	None
Date of Latest Revision:	14 December 2023

Course Description:

Basic principles of cellular electrophysiology, definition and classification, methods in ion channel study, structures and functions of voltage-gated channels: sodium, potassium, calcium and chloride channels, structures and functions of ligand-gated and other ion channels, channel gene expression, ion channel control, ion channels in specific tissues, channelopathies

Course-level Learning Outcomes (CLOs)

Upon completion of this course, students are able to:

1. State and analyze the current fundamental concepts, including theories and hypotheses, related to ion channel physiology;
2. Apply the fundamental concepts to explain and analyze various ion channel functions and regulations in different tissues, pathophysiology resulting from selected channelopathies, and methods to study these molecules;

3. Appraise or criticize research works in the field of ion channels using the knowledge and insights acquired in the course.

Constructive Alignment of CLOs and Program's ELOs

CLOs	ELO1	ELO2	ELO3	ELO4
1. State and analyze the current fundamental concepts, including theories and hypotheses, related to ion channel physiology;	R			
2. Apply the fundamental concepts to explain and analyze various ion channel functions and regulations in different tissues, pathophysiology resulting from selected channelopathies, and methods to study these molecules;	R			
3. Appraise or criticize research works in the field of ion channels using the knowledge and insights acquired in the course.			P	

Remarks: Show the level of the course management with the symbols I, R, P, and M.

Program's Expected Learning Outcomes

1. Analyze the different concepts, theories, hypotheses related to medical physiological field of interest.
2. Conduct extensive and independent research in medical physiology that expands the frontiers of knowledge in the field of an area of interest.
3. Criticize the research work with a detailed and leading-edge knowledge of physiology in an area of interest.
4. Disseminate new insights of medical physiology to peers and the scientific community at international level.

Course Schedule and teaching/assessment plan

No.	Topics				CLOs	Teaching & learning strategy	Assessment (in-class)	Lecturers
		Lecture	Lab	Self Study				
1	Introduction; Basic cellular electrophysiology	1.5	-	3	1	Live on-line / Asynchronous	Reflection / Homework / Exam	WW
2	Classical ion channel biophysics: H & H model 1	1.5	-	3	1	Live on-line / Asynchronous	Reflection / Homework / Exam	WW
3	Methods in ion channel study	1.5	-	3	1,2	Live on-line / Asynchronous	Reflection / Examination	ST
4	Classical ion channel biophysics: H & H model 2	1.5	-	3	1	Live on-line / Asynchronous	Reflection / Homework / Exam	WW
5	Voltage-gated channels: Na channels	1.5	-	3	1,2	Live on-line / Asynchronous	Reflection / Homework / Exam	WW
6	Q & A 1	2	-	2	1,2	Live on-line	Participation	WW
7	Voltage-gated channels: Ca channels	1.5	-	3	1,2	Live on-line / Asynchronous	Reflection / Homework / Exam	WW
8	Q & A 2	2	-	2	1,2	Live on-line	Participation	WW
9	Voltage-gated channels: K & Cl channels	1.5	-	3	1,2	Live on-line / Asynchronous	Reflection / Homework / Exam	WW
10	Ligand-gated channels	1.5	-	3	2	Live on-line / Asynchronous	Reflection / Examination	NP
11	Other channels: mechanically-gated, aquaporins	1.5	-	3	2	Live on-line / Asynchronous	Reflection / Examination	PU
12	Q & A 3	2	-	2	1,2	Live on-line	Participation	WW
13	Ion channel regulation & gene expression	1.5	-	3	2	Live on-line / Asynchronous	Reflection / Examination	ST
14	Ion channels in specific tissues 1	1.5	-	3	2	Live on-line / Asynchronous	Reflection / Examination	LB
15	Ion channels in specific tissues 2	1.5	-	3	2	Live on-line / Asynchronous	Reflection / Examination	ST
16	Channelopathies 1	1.5	-	3	2	Live on-line / Asynchronous	Reflection / Examination	PU
17	Q & A 4	2	-	2	1,2	Live on-line	Participation	All
18	Channelopathies 2	1.5	-	3	2	Live on-line / Asynchronous	Reflection / Examination	WW
19	Seminar	2	-	5	1,2,3	Live on-line	Discussion / Reflection	WW
20	Q & A 5	2	-	2	1,2	Live on-line	Participation	All
Total hours of the study		33	0	57				

Course Assignments

- Reading materials
- Homework, to drive understanding in basic principles
- Short reflection after each class

Assessment Criteria

- Three open-book, essay-type examinations (internet prohibited) [70%]
- Post-learning reflections / attendance [11%]
- Two homework assignments [10%]
- Seminar discussion [5%]
- Attendance / participation [4%]

Appeal Procedure

- Any request about the course teaching and learning activities should be directed to the course coordinator.
- Otherwise, please follow the university rules and regulations.