

Course Syllabus
SIPS 521
Academic Year 2024
Department of Physiology
Faculty of Medicine Siriraj Hospital, Mahidol University

Course ID and name:	SIPS521: Physiological Biochemistry
Course coordinator:	Assoc. Prof. Sorachai Srisuma, MD, PhD
Instructors:	Assoc. Prof. Suwattanee Kooptiwut, MD, PhD Assist. Prof. Sompol Tapechum, MD, PhD Assoc. Prof. Sorachai Srisuma, MD, PhD Assoc. Prof. Panapat Uawithya, MD, PhD Assoc. Prof. Reawika Chaikomin, MD, PhD Assoc. Prof. Narawut Pakaprot, MD, PhD Assoc. Prof. Chantacha Sitticharoon, MD, PhD Instr. Thaksaon Kittipassorn, MD, PhD Instr. Rujapope Sutiwisesak, MD, PhD Instr. Patamat Nitiwarangoon, MD, PhD Instr. Thanus Teeratitayang-gool, MD, Diploma Thai Board of Anesthesiology
Credits:	2 (2-0-4) (lecture – laboratory – self-study)
Curriculum:	Masters of Science Program in Medical Physiology
Course type:	☐ Core ☐ Required ☒ Electives
Semester offering:	2/2024
Prerequisite:	None
Date of Latest Revision:	January 26, 2025

Course Description:

Core biochemistry: structure and mechanism of enzymes; structures and metabolism of biological molecules with physiological significance including lipid, lipoprotein, carbohydrate, protein, amino acid, nucleic acid; introduction to bioenergetics; intercellular and intracellular signaling; structures of chromosome and gene; regulation of gene expression. Applied biochemistry in medical physiology: omic studies; blood, lymph and circulating blood cells,

hemostasis; neurochemistry, neuroendocrine regulation of food intake and body mass; liver functions; integration of metabolism, effect of gut microbial metabolites on human physiology; pathogenesis of obesity, diabetes, dyslipidemia and the metabolic syndrome

Course-level Learning Outcomes (CLOs)

Upon completion of this course, students are able to:

1. Describe the biochemical principles on body function and regulation.
2. Explain biochemical changes and/or adaptations of common clinical problems due to stress or disturbance of organ systems.
3. Evaluate experimental/laboratory data to determine the biochemical changes of common clinical problems.
4. Participate in discussion of biochemical changes of common clinical problems in endocrine system, cardiovascular system, hepatobiliary system and nervous system.

Constructive Alignment of CLOs and Program's ELOs

CLOs	ELO1	ELO2	ELO3	ELO4
1	R			
2	R			
3		R		
4				R

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

Program's Expected Learning Outcomes

1. Demonstrate the current medical physiological knowledge for common clinical application.
2. Evaluate the scientific research and major research developments.
3. Perform medical physiology research with a technique in an ethical way to test an idea or hypothesis in an area of interest.
4. Communicate knowledge and ideas of medical physiological research clearly to peers and the scientific community at national level.

Course Schedule and teaching/assessment plan

No.	Topic	Hours			CLOs	Teaching & learning strategy	Assessment (in-class)	Lecturers
		Lecture	Laboratory	Self Study				
1	Introduction, course objectives	0.5	-	1	all	lecture	-	Dr.Sorachai
2	Amino acid structure, classification and physiological roles	1	-	2	1	lecture	post-learning exercise	Dr.Panapat
3	Hemoglobin and myoglobin: structural properties, and physiological roles	0.5	-	1	1	lecture	post-learning exercise	Dr.Sorachai
4	Problem-solving: Abnormalities arising from amino acid structure or protein structural defects	1	-	2	2,4	discussion	performance by rubric	Dr.Panapat
5	Enzyme structure, enzyme mechanisms, kinetics, allosteric regulation and coenzymes 1	1	-	2	1	lecture	post-learning exercise	Dr.Panapat
6	Enzyme structure, enzyme mechanisms, kinetics, allosteric regulation and coenzymes 2	1	-	2	1	lecture	post-learning exercise	Dr.Panapat
7	Problem-solving: Enzyme kinetics in clinical scenarios	1	-	2	2,3,4	discussion	performance by rubric	Dr.Panapat
8	Molecular Basis of Physiological Processes: DNA/RNA, Chromosomes, and Protein Synthesis	1.25	-	2.5	1	lecture	post-learning exercise	Dr.Sorachai
9	KSA: Mechanisms of gene regulation: transcription factors, epigenetics, microRNAs	2	-	4	2,3,4	discussion	performance by rubric	Dr.Rujapope

10	Omics in physiology	0.5	-	1	1,2	lecture	post-learning exercise	Dr.Rujapope
11	Receptor and intracellular signalings	1	-	2	1,2	lecture	post-learning exercise	Dr.Suwattanee
12	Intracellular signalings 2	1	-	2	1,2	lecture	post-learning exercise	Dr.Sompol
13	Glycolysis, gluconeogenesis, glycogen metabolism, pentose phosphate pathway and their regulation 1	1	-	2	1,2	lecture	post-learning exercise	Dr.Rujapope
14	Glycolysis, gluconeogenesis, glycogen metabolism, pentose phosphate pathway and their regulation 2	1	-	2	1,2	lecture	post-learning exercise	Dr.Rujapope
15	Oxidative phosphorylation	1	-	2	1	lecture	post-learning exercise	Dr.Thaksaon
16	Fatty acid metabolism, lipogenesis, ketogenesis and lipoprotein transport 1	1	-	2	1	lecture	post-learning exercise	Dr.Suwattanee
17	Fatty acid metabolism, lipogenesis, ketogenesis and lipoprotein transport 2	1	-	2	1	lecture	post-learning exercise	Dr.Suwattanee
18	Amino acid metabolism, urea cycle, nitrogen balance, protein turnover and physiological regulation	1	-	2	1,2	lecture	post-learning exercise	Dr.Sorachai
19	Energy metabolism: Energy expenditure measurement	1	-	2	2,3	lecture	post-learning exercise	Dr.Sorachai
20	KSA: Energy metabolism in exercise, fed state and fasting	1	-	2	2,4	discussion	performance by rubric	Dr.Chantacha
21	KSA: Insulin signaling and role of carbohydrate metabolism in diabetes and obesity	1	-	2	2,3,4	discussion	performance by rubric	Dr.Suwattanee

22	KSA: Pathogenesis of dyslipidemia and metabolic syndrome	1	-	2	2,3,4	discussion	performance by rubric	Dr.Patamat
23	Hepatic metabolism: Detoxification, bile production, and systemic metabolic integration	1	-	2	1,2	lecture	post-learning exercise	Dr.Reawika
24	Liver function test: Biochemical markers for hepatic health	0.5	-	1	2,3	lecture	post-learning exercise	Dr.Patamat
25	KSA: Liver function test interpretation and metabolic dysfunction-associated steatohepatitis	1	-	2	2,3,4	discussion	performance by rubric	Dr.Patamat
26	Role of gut microbiota in health and disease	1	-	2	1,2	lecture	post-learning exercise	Dr.Reawika, Dr.Patamat
27	KSA: Biochemistry of prebiotics, probiotics and gut health and roles in metabolic syndrome	1	-	2	2,3,4	discussion	performance by rubric	Dr.Reawika, Dr.Patamat
28	Neurochemistry	1	-	2	1,2	lecture	post-learning exercise	Dr.Narawut
29	Neuroendocrine regulation of food intake, energy balance and body weight	1	-	2	1,2	lecture	post-learning exercise	Dr.Chantacha
30	KSA: Neurochemical disruptions in neurological disorders	1	-	2	2,4	discussion	performance by rubric	Dr.Narawut
31	Blood, lymph, blood cell metabolism and function	1	-	2	1,2	lecture	post-learning exercise	Dr.Thaksaon
32	Hemostasis and regulation	1	-	2	1,2	lecture	post-learning exercise	Dr.Thanus
Total hours of the study		31.25		62.50				

* KSA – knowledge-synthesizing activities

Course Assignments

- In-class post-learning exercise, 22 lectures
- Participation in knowledge-synthesizing activities, assessed with a rubric, conducted eight times

Assessment Criteria

- Each CLO (Course Learning Outcome) is considered passed if the score is at least 50%.
- Written examinations are conducted twice to assess CLO1, CLO2, and CLO3.
- CLO4 is assessed through participation in knowledge-synthesizing activities, which are conducted nine times and evaluated using a rubric.

GRADE DISTRIBUTION

70%	Summative examination (twice)
30%	Performance in discussion classes (9 times)

	4	3	2	1	0
How well does the student participate in class by presenting data/asking questions/offering ideas? (Frequency of contributions)	Frequently and voluntarily (*Does not prevent others from answering)	Voluntarily	Responses only after being questioned or named	Rarely, reluctantly	Never
How good is the quality of student's contributions? (Quality of contributions)	Demonstrates comprehensive knowledge and critical thinking skills	Mostly relevant, reflecting understanding of knowledge	Somewhat relevant, reflecting some levels of understanding of knowledge	Not relevant, reflecting insufficient understanding of knowledge	Lacks understanding of knowledge or infrequent contributions
How well does the student behave during presentation? (Behavior in class)	Actively and respectfully pays attention to peers/instructor; full engagement throughout the class	Pays attention to peers/instructor; engages most of the time in class	Listens to peers/instructor	Sometimes does not listen to peers/instructor; sometimes displays inappropriate behavior	Fails to pay attention; displays inappropriate behavior in class

GRADE SCALE

A	80% to 100%, with all CLOs passed (minimum 50% each)
B+	65% to <80%, with al CLOs passed (minimum 50% each)
B	50% to <65%, with all CLOs passed (minimum 50% each)
F	< 50%

Actions Based on CLO Status:

I-1	Retake the exam and/or complete the assigned work within one month after the exam results are announced, if at least one CLO (CLO1-3) is failed.
I-2	Complete the assigned work and undergo a new evaluation within the next semester if all CLOs are failed.
I-3	Repeat the course when it is next offered, if all CLOs are failed.

Appeal Procedure

Students may inquire about their scores or grades directly with the course coordinator through in-person contact, telephone, or email within one week of the scores or grades being announced. Additionally, an appeal process is available through the program.