COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Lipids in health and disease	

Academic staff	Core academic unit(s)
Coordinating: Prof. dr. Dovilė Karčiauskaitė **Others:**	Department of Physiology, Biochemistry, Microbiology and Laboratory Medicine, Institute of Biomedical Sciences, Faculty of Medicine, Vilnius University; M. K. Čiurlionio g. 21, Vilnius

Study cycle	Type of the course unit
	Individual studies

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face, remote		English

Requisites	
Prerequisites: None	**Co-requisites (if relevant):**

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	135	67	68

Purpose of the course unit		
The purpose of the course is to provide students with a comprehensive understanding of the biochemical properties, metabolism, and physiological roles of lipids, as well as their involvement in various diseases. The course aims to bridge foundational lipid biochemistry with its clinical applications, particularly focusing on disorders such as dyslipidemia, cardiovascular disease, metabolic syndromes, neurological conditions, and cancer.		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
• Understand biochemistry of lipids, explain the structure, classification, and functions of various lipid classes describe lipid metabolism and regulation in the body; • Identify the role of lipids in human health; • Recognize the molecular and biochemical mechanisms underlying lipid-related disorders, including dyslipidemia, cardiovascular diseases, and neurodegenerative conditions; • Apply biochemical principles of lipid metabolism to clinical case studies, identifying the pathophysiological basis of lipid-related diseases; • Investigate emerging trends in lipidomics, gene therapy, and personalized medicine,	• Lectures • Seminars • Practical assignments • Small groups discussions • Presentations • Feedback • Consultations • Independent work	• Formative Assessment: feedback, reflection; • Seminar presentation of recent scientific findings in literature on a selected topic; • Written research report

evaluating their potential impact on future treatments for lipid disorders.		

Content	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship	Contact hours, total	Individual work	Tasks for individual work
1. Overview of lipids: structure, classification, and nomenclature. Biological functions of lipids (energy storage, membrane structure, and signaling). Lipid metabolism pathways, key enzymes and regulation.	2		6				8	8	To analyze learning material on virtual learning environment and to be prepared for the discussion.
2. Lipoproteins and lipid transport. Lipoprotein structure and metabolism transport mechanisms: absorption, packaging, and delivery of lipids. Apolipoproteins and their functions.	2		6				8	8	To analyze learning material on virtual learning environment and to be prepared for the discussion.
3. Dyslipidemia: hypercholesterolemia, hypertriglyceridemia, mixed dyslipidemia. Lipoprotein metabolism in dyslipidemia: lipid transport and storage dysregulation, defective receptors, and enzyme deficiencies.	2		6				8	8	To analyze learning material on virtual learning environment and to be prepared for the discussion.
4. Lipids and cardiovascular disease. Role of lipids in atherosclerosis. Markers for cardiovascular risk and pharmacological management.	2		6				8	8	To analyze learning material on virtual learning environment and to be prepared for the discussion.
5. Lipids in metabolic syndrome and diabetes. Lipid abnormalities in insulin resistance. Impact on liver function: non-alcoholic fatty liver disease (NAFLD) and steatohepatitis. Therapeutic interventions: diet, exercise, and pharmacotherapy.	2		6				8	8	To analyze learning material on virtual learning environment and to be prepared for the discussion.
6. Lipids in brain health: myelin formation, signaling lipids. Disorders of lipid metabolism in the CNS: multiple sclerosis, Alzheimer's disease, and Parkinson's disease. Role of omega-3 and omega-6 fatty	2		6				8	8	To analyze learning material on virtual learning environment and to be prepared for the discussion.

	acids in brain function and development.								
7.	Altered lipid metabolism in cancer: lipogenesis, β-oxidation, and cholesterol synthesis in tumor cells. Role of lipid signaling in tumor growth and metastasis. Lipid biomarkers in cancer: predictive and prognostic value.	2		6			8	8	To analyze learning material on virtual learning environment and to be prepared for the discussion.
8.	Lipids and inflammation. Pro-inflammatory vs. anti-inflammatory lipid mediators: eicosanoids, prostaglandins, leukotrienes. Role of lipids in immune response.	2		6			8	8	To analyze learning material on virtual learning environment and to be prepared for the discussion.
9.	Overview of the course: remarks and conclusions			3			3	4	
	Total	16		51			67	68	

Assessment strategy	Weight %	Deadline	Assessment criteria
Presentation	40 %	End of the semester	Content accuracy, communication skills, and ability to answer questions from peers.
Research paper	60 %	End of the semester	Depth of research, clarity of explanation, integration of biochemical concepts, and relevance to health and disease.
Final score	100%		Final score = (presentation evalution x 0.4) + (review paper evalution x 0.6)

Author (-s)	Publishing year	Title	Issue of a periodical or volume of a publication	Publishing house or web link
Required reading				
Christie M. Ballantyne	2023	Clinical Lipidology: A Companion to Braunwald's Heart Disease	3rd edition	Elsevier
Neale D. Ridgway, Roger S. McLeod	2021	Biochemistry of Lipids, Lipoproteins and Membranes	7th edition	Elsevier
Recommended reading				
Michael Gurr, John Harwood, and Keith Frayn	2016	Lipids: Biochemistry, Biotechnology and Health	6th edition	Wiley Blackwell