COURSE UNIT DESCRIPTION - MOLECULAR VIROLOGY

Course unit title	Code
MOLECULAR VIROLOGY	

Lecturer(s)	Department(s)
Coordinator: Dr. Laura KALINIENĖ **Other(s):**	Institute of Biochemistry of Vilnius University, Mokslininkų 12, LT-08662 Vilnius

Cycle	Level of the course unit	Type of the course unit
Full-time studies (2nd stage)	1 out of 1	Elective

Mode of delivery	Period of delivered	Language(s) of instruction
Lectures, seminars, practical exercises	2nd semester, spring	Lithuanian (English)

Prerequisites and corequisities	
Prerequisites: Biochemistry, cell biology, molecular biology, genetics	**Corequisities (if any):** Immunology

Number of credits allocated to the course unit	Student's total workload	Contact hours	Self-study and research hours
5	133	64	69

Purpose of the course unit: programme competences to be developed

This course is designed to provide students with the most current knowledge of the diversity of viruses, their replication strategies and their interactions with the host at the molecular and cellular levels.

Subject specific competences:

- research based knowledge and understanding of the structure, diversity, development of viruses and their interaction with the host cell at the molecular level;
- knowledge of research methods of molecular virusology and their application areas;
- skills to analytically, critically and systemically analyze and evaluate information related to molecular virusology;
- ability to creatively apply knowledge, methods and technologies of molecular biology and related sciences in research and practical work;
- ability to select appropriate methods of research and to interpret reasonably the results obtained through those methods;
- skills to integrate knowledge of different scientific fields to solve molecular biology-related problems.

General competences:

- analytical and synthetic thinking;
- skills for self-development, study skills in order to study molecular biology;
- skills to present in written and verbal forms the knowledge on themolecular virusology;
- skills to participate in the scientific discussion;

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Describes in depth molecular aspects of virus replication strategies and host-virus interactions particularly strategies of important viruses causing human and animal diseases as well as viruses that are widespread in nature.	Lectures, seminars, tutorials, practical exercises, self-study.	Midterm exam; final exam; student presentations.
Explains the current techniques used in molecular virology and their applications in medicine or biotechnology (e.g. the construction of viral vectors for gene therapy or the expression of recombinant proteins in plants, vaccine development, etc.) as well as other important fields.	Lectures, seminars, tutorials, practical exercises, self-study.	Midterm exam; final exam; student presentations.

Demonstrates the ability to integrate knowledge from other related disciplines, such as biochemistry, molecular biology, cell biology, immunology and biotechnology.	Lectures, seminars, tutorials, practical exercises, self-study.	Midterm exam; final exam; student presentations.

Content: breakdown of the topics	**Contact hours**							**Self-study work: time and assignments**	
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	**Contact hours**	**Self-study hours**	**Assignments**
1. The diversity of viruses, virus structure	**6**	**1**	3	2			**12**	**14**	Analysis of the topic-related scientific papers; seminar presentation, practical excercises, self-directed learning.
The diversity and ecology of viruses; virus taxonomy, molecular methods for identification and classification of viruses.	1		1	2			**4**	4	
Virus structure and assembly; aquisition of an envelope: the composition and origin of viral envelopes.	3		1				**4**	5	
Virus evolution and diversification; “new and emerging viruses”: their reservoirs, origins and transmission; tracking “new viruses”.	2		1				**4**	5	
2. Virus – host interactions.	**4**			2			**6**	**8**	Analysis of the topic-related scientific papers; seminar presentation, practical excercises, self-directed learning.
Host recognition, virus receptors, attachment and cell entry; strategies for penetration: bacteriophages, plant, fungal and animal viruses.	2						**2**	3	
Overview of virus replication strategies; virus assembly, release and maturation of progeny virions; transmission of fungal and plant viruses.	2			2			**4**	5	
3. Molecular mechanisms of replication and pathogenesis of individual virus groups	**13**	**1**	3	6			**23**	**23**	Analysis of the topic-related scientific papers; seminar presentation, practical excercises, self-directed learning.
Overview of DNA virus replication strategies; small DNA viruses (polyomaviruses, papillomaviruses and adenoviruses).	1		1	2			**4**	**4**	
Large DNA viruses (herpesviruses and poxviruses)	2						**2**	**2**	
ssDNA viruses (parvoviruses) and retro-transcribing DNA viruses (hepadnaviruses)	1						**1**	**2**	
Overview of RNA virus replication strategies; synthesis of RNA from RNA templates, viral RNA polymerases; dsRNA viruses (reoviruses).	2		1	2			**5**	**5**	
Negative-strand RNA virus replication (rhabdoviruses, influenza viruses); Influenza, epidemics and pandemics.	2		1				**3**	**3**	
Positive-strand RNA virus replication strategies	2						**2**	**2**	

(picornaviruses, coronaviruses, togaviruses).									
Retro-transcribing RNA viruses (retroviruses); oncogenic viruses:transformation and oncogenesis.	2						**2**	**3**	
Overview of bacterial and archaeal viruses: morphological complexity and molecular mechanisms of infection.	1			1			**2**	**2**	
4. The host response to viral infection: virus offence meets host defence.	**3**		1	1			**5**	**6**	Analysis of the topic-related scientific papers; seminar presentation, practical excercises, self-directed learning
5. Techniques used in molecular virology. Applications of viruses: from individual molecules to the solution of global problems.	**3**		1	5			**9**	**9**	Analysis of the topic-related scientific papers; seminar presentation, practical excercises, self-directed learning
6. Antiviral drugs and their mode of action; vaccines: history, current status and future perspectives.	**3**	**1**	1	4			**9**	**9**	Analysis of the topic-related scientific papers; seminar presentation, practical excercises, self-directed learning
Total	**32**	**3**	**8**	**21**			**64**	**69**	

Assessment strategy	**Weight,%**	**Assessment period**	**Assessment criteria**
Topics 1-3 -related seminar presentation	5	1st to 7th week of the course	2-4 (insufficient) 5 (sufficient) 6 (satisfactory) 7(highly satisfactory) 8 (good) 9 (very good) 10 (excellent)
Midterm exam I	45	8thweek of the course	Test of 50 questions from topics 1 - 3. <24 answered questions - 2-4 (insufficient) 24 answered questions - 5 (sufficient) 25-29 answered questions -6 (satisfactory) 30-34 answered questions - 7(highly satisfactory) 35-39 answered questions -8 (good) 40-44 answered questions -9 (very good) 45-50 answered questions --10 (excellent)
Topics 3-6 -related seminar presentation,	5	9th to 15th week of the course	2-4 (insufficient) 5 (sufficient) 6 (satisfactory) 7(highly satisfactory) 8 (good) 9 (very good) 10 (excellent)
Exam	45	16th week of the course	Test of 25 questions from topics 3-6 <11 answered questions - 2-4 (insufficient) 11-12 answered questions - 5 (sufficient) 13-15 answered questions - 6 (satisfactory) 16-18 answered questions - 7(highly satisfactory) 19-20 answered questions - 8 (good) 21-23 answered questions - 9 (very good) 24-25 answered questions -10 (excellent)
Total	100		

Author	Year of publica-tion	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsory reading				
S. J. Flint, L.W. Enquist, V. R. Racaniello, A. M. Skalka.	2009	Principles of virology. (3rd ed.))	Volume I and II	ASM Press (USA)
A. J. Cann	2013	Principles of Molecular Virology	Vol. I	Academic Press (USA)
Course-related reviews papers	2008-2013	Nature Reviews, Science, Clinical Microbiology Reviews, Cell Press, Journal of Virology, Virology.		PubMed.gov
Optional reading				
L. C. Norkin.	2009	Virology: Molecular biology and pathogenesis		ASM Press (USA)
B. W. J. Mahy, M. H. V. van Regenmortel	2010	Desk Encyclopedia of General Virology	Volume I	
				http://www.virology.net