NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENT SCIENCE OF UKRAINE

Molecular biology, microbiology and biosafety department

"*ASSERT*"
Faculty of plant protection,
biotechnology and ecology
_____ J.V. Kolomiets
"_____"_____2020

WORKER EDUCATIONAL COMPLEX

ECOLOGY OF BIOLOGICAL SYSTEMS (MICROBIOLOGY AND VIROLOGY)

specialty 101 – «Ecology»

faculty of Plant Protection, Biotechnology and Ecology

Kiev – 2020

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REVIEWED AND APPROVED

At the Molecular biology, microbiology and biosafety department

meeting

Protocol number 10 of 2 June 2020

Head of Department

_____ Starodub N.F.

WORKER EDUCATIONAL PROGRAM

ECOLOGY OF BIOLOGICAL SYSTEMS (MICROBIOLOGY AND VIROLOGY)

specialty_____ 101 – «Ecology»

faculty of plant protection, biotechnology and ecology

Developers: Associate Professor, PhD Antipov I.O.,

Associate Professor, PhD K.V. Hrynchuk

Kiev – 2020

1. Description of Ecology of biological systems (microbiology and virology) discipline

Industry knowledge, profession, education level		
Educational qualification	bachelor	
specialty	101 – «Ecology»	
Characteristics of the course		
Kind	Custom	
Total number of hours	37	
credits ECTS	1,8	
Number of content modules	2	
Form of control	test	
Indicators of the course for full-time and part-time		
	Full-time teaching	Correspondence form of training
Year of study (course)	1	-
semester	37 h.	-
Lectures	15 h.	-
Practical, seminars		-
Laboratory sessions	15 h.	-
Independent work		-
Individual		-
Number of weekly classroom hours for full-time	2 h.	-

2. The purpose and objectives of the course

Purpose: In process of passing a course a student gain the knowledge from virology with provision for classical and modern scientific approaches, which harmonious unite the perception and understanding practical and theoretical knowledge for students. Most detailed presented modern principle a nomenclature of plants viruses, particularity of construction and expression their genome. Emphases is conducted spreading, diagnostics and identifications of viral diseases.

Objectives: Main purpose of study General microbiology and virology (virology) discipline there is assimilations of theoretical bases and shaping corresponding to practical habits at study of biological objects with provision for classical and modern scientific approaches. Special part discipline enables to possess the main methods in work with infectious material, realize the diagnostics, identification of viruses by means of biological testing, electronic microscopy, methods of molecular biology and ELISA and get the unviral landing material by microclonal propagation in vitro method. Practical part of program enables the students to master the main rules of functioning in virological laboratory, main methods of practical diagnostics and identifications of viral diseases and perfect

the methods of reception of unviral landing material by means of modern methods a biotechnology.

Following the completion of the course the student should

know:

- History of Virology
- Structure and structural components of plant viruses
- Modern principles of nomenclature and classification of plant viruses
- Replication features of viruses
- Pathogenesis of viral infections
- How to transfer viruses
- Methods of diagnosis and identification of viruses
- Plant physiology of infected plant
- Environmental aspects viruses
- The nature and characteristics of natural resistance to plant viruses

be able to:

- Have by plant indicator
- Have by electron microscopy
- To diagnose viral diseases serological methods
- Use the ELISA method
- To PCR analysis
- Allocate viruses from plant tissues
- Receive virus-free planting material

3. The program and structure of the course for the full term of full-time (correspondence) studies.

Name of content modules and topics	hours												
	Full-time							Distance form					
	weeks	total	Including					total	Including				
			l	p	lab	ind	s. w.		l	p	lab	ind	s. w.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Semantic module 1. Characteristics and structure of plant viruses. Basis of replication													
Theme 1. Virology. History and modern principles of nomenclature and classification of plant viruses.	1-2	8	2		2	4							
Theme 2. Purification and composition of plant viruses. Architecture and assembly of virus particles	3-4	8	2		2	4							
Theme 3. Genome organization.	5-6	8	2		2	4							
Theme 4. Expression of viral genomes. Virus replication	7-8	10	2		2	6							
Together for meaningful module 1	34		8		8	18							
Semantic module 2. Pathogenesis of viral infections and world spreading													
Theme 5. Induction of disease. Virus movement through the plant and effect on plant metabolism. Disease symptoms and host range	9-10	8	2		2	4							
Theme 6. Virus Transmission	11-12	8	2		2	4							
Theme 7. Methods for viruses assay	13-14	8	2		2	4							
Theme 8. Detection and diagnostics	15	8	1		1	6							
Together for meaningful module 2	32		7		7	18							
Total hours	66		15		15	36							

4. Topics of seminars.

№	topic	hours

5. Topics of practics.

№	topic	hours

6. Topics laboratory studies.

№	topic	hours
1	Basic principles, structure and functions of virology laboratories	2
2	Experimental inoculation plants indicators with plant viruses.	2
3	Identification of the virus via infected plant indicator	2
4	Methods for cleaning viruses	2
5	Bold, purification and concentration plant viruses. Concentration of the virus by ultracentrifugation.	2
6	Methods and principles of electron microscopy.	2
7	Studying the interaction of the virus with the cells using the method of ultra thin sections.	2
8	Serologic methods plant viruses.	1

7. Test kits to determine the level of learning students

Task 1

Question 1

100	DNA-viruses replicate in:
1	Mitochondrion
2	Membrane
3	Nucleus
4	Cytoplasm
5	Chloroplast

Question 2

50	Movement virus in plant through:
1	Plasmodesmata
2	Nucleus
3	Cell wall
4	Diffusion
5	Apoplasts

Question 3

100	Energy required for virus reproduction provided by:
1	ribosome
2	nucleus
3	nucleoside triphosphates
4	membrane

5	chromosomes

Question 4

100	Little or no effect on the plant to virus inoculation:
1	immune
2	infectible
3	resistant
4	sensitive
5	tolerant

Question 5

100	Capsid consist of:
1	lipids
2	enzymes
3	proteins
4	nucleic acids
5	membranes

Question 6

100	RNA-dependent RNA polymerase involves in process
1	transcription
2	translation
3	splicing
4	replication
5	reverse transcription

Question 7

100	Function of promoters involved in:
1	replication
2	transcription
3	transfection
4	translation
5	transduction

Question 8

100	If virus transport in plant tissue with well-defined symptoms
1	Immunity
2	System lesion
3	tolerance
4	necrosis
5	Supersensitivity

Question 9

100	The poly-A tail function is:
1	stability
2	transport

3	translation
4	infectivity
5	processing

Question 10

100	Which enzyme involved to transcription:
1	ATP polymerase
2	RNA polymerase
3	Ribosome
4	Helicase
5	Revertase

Question 11

100	Viruses is no use enzyme:
1	DNA dependent DNA polymerase
2	UTP dependent GTP polymerase
3	DNA dependent RNA polymerase
4	RNA dependent RNA polymerase
5	RNA dependent DNA polymerase

Question 12

75	Virus Protein that not includs into the virion composition
1	Albumin
2	Antigen
3	Nonstructural
4	Nonstructural
5	Capsomer

Question 13

75	In viruses DNA it is not Found Bases
1	Cytosine
2	Revertase
3	Thymine
4	Adenine
5	Guanine

Question 14

75	Virus Protein that producing by viral genome, present in virion
1	Structural
2	Nonstructural
3	Albumin
4	Antigen
5	Capsomer

Question 15

100	Vector transmission plant viruses by:
1	mechanical
2	nematode worms
3	wind
4	seed
5	pollen

Question 16

100	Cell chemicals that using by Virus for protein synthesize
1	nucleolus
2	ATP
3	plasmodesm
4	cell membrane
5	cell wall

Question 17

75	The viruses were discovered by:
1	Martinus Beijerinick
2	Robert Koch
3	Louis Pasteur
4	Dmitri Iwanowski
5	Freidrich Loeffler

Question 18

100	RNA-dependent DNA polymerase involves in process
1	reverse transcription
2	translation
3	splicing
4	replication
5	processing

Question 19

100	The first discovered virus was:
1	Hop mosaic virus
2	Tobacco mosaic virus
3	Alfalfa mosaic virus
4	Beet mosaic virus
5	Cauliflower mosaic virus

Question 20

100	Complete infective virus particle is:
1	capsid
2	capsomer
3	nucleocapsid
4	envelop

5	virion

Question 21

100	Viruses is no use enzyme:
1	RNA dependent RNA polymerase
2	RNA dependent DNA polymerase
3	DNA dependent RNA polymerase
4	ATP dependent ATP polymerase
5	DNA dependent DNA polymerase

Question 22

75	Type of link of aminoacid to protein:
1	Antigen
2	Neutral
3	Phosphodiester
4	Peptides
5	Globular

Question 23

75	Viruses that have a envelope:
1	simple
2	enveloped
3	pleomorphic
4	nonenveloped
5	nucleocapsid

Question 24

75	Nucleic acid of TMV:
1	(-) RNA
2	dsRNA
3	(+) RNA
4	ss DNA
5	ds DNA

Question 25

75	Replication is:
1	Process of DNA doubling
2	Process of RNA synthesis on DNA matrix
3	Process of protein synthesis
4	Process of genetic information changing
5	Process of virus genome integration into cell genome

Question 26

75	Capsid consist
1	lipids

2	Enzymes
3	Membranes
4	Nucleic acid
5	proteins

Question 27

100	Electron microscopy resolution is:
1	80-100 A
2	50-75 A
3	20-40 A
4	10-20 A
5	1-10 A

Question 28

50	Tobacco mosaic virus has:
1	helical symmetry
2	cubic symmetry
3	pyramidal symmetry
4	triangle symmetry
5	circle symmetry

Question 29

100	Tobacco mosaic virus has:
1	ssDNA
2	dsDNA
3	ssRNA(-)
4	ssRNA(+)
5	dsRNA

Question 30

100	How many type RNA present in plant cell:
1	1
2	2
3	3
4	4
5	5

8. Methods of study.

Success depends on training in general internal activity of students on the nature of their activities, it is the nature of the activity, the degree of autonomy and creativity should be important criteria in choosing a method.

Explanatory, illustrative technique. Students acquire knowledge by listening to the story, lecture on educational or instructional materials through screen guide in "ready" form. Perceiving and interpreting the facts, evaluations, conclusions, they remain within the reproductive (reproduction) thinking. This method is used

to transfer the widest possible array of significant information. It can be used to express facts and learning approaches, assessment, conclusions.

The reproductive method. This refers to the application on the basis of the sample studied or regulations. Activities of trainees is algorithmic, ie with the instructions, orders, rules - in the present sample of similar situations.

The method of problem statement. Using any sources and means teacher before teaching material, poses the problem, formulating cognitive task, and then opening the system proofs, comparing views, different approaches, shows the way to solve the problem. Students are like witnesses and accomplices scientific research.

Partly retrieval or heuristic method. Its essence - in finding solutions for the organization of nominated teacher (or self-contained) or cognitive tasks under the supervision of a teacher or heuristic-based programs and guidance. The process of thinking becomes productive character, but it gradually directs and supervises the teacher or students themselves based on the work programs (including the computer) and manuals. This method is one form of which is heuristic conversation - a proven way to enhance thinking, motivation to cognition.

The research method. After reviewing the material, production problems and objectives and short oral or written instruction of those who teach self-study literature sources are monitoring and measurements and performing other search action. The initiative, independence, creativity found in research activities fully. Methods of academic work directly pass into the methods that mimic and sometimes implement scientific research.

9. Forms of control

Control of knowledge and skills of students (current and final) with exercise discipline according to credit-modular system of educational process. Rating assimilation of student discipline is determined by the 100 point scale. It consists of rating of educational work, for which the assessment is assigned 70 points and ranking of certification (exam) - 30 points.

Criteria for evaluation of the level of knowledge in laboratory seminars and workshops. At the laboratory classes each student for each topic takes individual task. Level of knowledge estimated "excellent" - the student gives detailed justification theoretically and almost right answers to no less than 90% of the questions, problems and decisions right Laboratory exercises demonstrating knowledge textbooks, manuals, instructions, generalization holds and findings, gently draws problem was Those present at the lecture, a compendium of essays or lectures on the main themes of the course; "Good" - when a student possesses knowledge of the material, but allows insignificant errors in formation terms, categories and calculations, but with the help of a teacher and locates quickly orientate right answers was to lecture are present, a compendium of essays or lectures on the main themes of the course; "Satisfactory" - the student gives the correct answer is not less than 60% of the questions or the question is not all detailed, inexhaustible answer, allows mistakes, which corrects the help of a teacher. This takes into account the presence of compendium on the topic

objectives and independence; "Unsatisfactorily with the possibility of re-drafting" - the student gives the correct answer is not less than 35% of issues or questions on all makes not detaled, inexhaustible answer, allows errors. Has a partial outline of lectures.

Total (overall evaluation) course discipline. Is the amount of rating estimations obtained by separate estimate forms of educational activity: current and Final test level of adoption theoretical material during classroom and work independently (control module); evaluation (points) for laboratory research. Final exposed after a full evaluation of learning discipline, which is derived as the sum of intermediate evaluations for semantic modules. The final evaluation of the level of knowledge consists of rating of educational work, for which the assessment is assigned 70 points and ranking of certification (exam) - 30 points.

Rating assimilation of student discipline is determined by the 100 point scale. It consists of rating of educational work, for which the assessment is assigned 70 points and ranking of certification (exam) - 30 points. Each module contents also measured at 100 point scale. The form of semantic knowledge control module 1 is the implementation of modular, consisting of 30 questions (tasks issued to each student). Module 2 is estimated based on the results of laboratory work and protection module of 2.

In the ranking of academic work by the decision of the chair may affect the rating of the additional work 20 rating points and free (with a negative sign) to 5 points.

Student rating for Academic R HP given by

$$R_{HP} = \frac{0{,}7 \cdot (R^{(1)}_{OM} + R^{(2)}_{OM})}{2} + R_{DR} - R_{SHTR},$$

where R (1) OM, R (2) OM - ratings of respectively the 1st, 2nd and content modules on a 100-point scale; RDR, RSHTR - in accordance with the rating and ranking of more free.

Students who scored educational work 60 or more points, can not take the examination and receive test scores "Automatic", according to the number of points typed, translated into national assessment and evaluation of ECTS according to Table. 2.6. In this case the rating of student discipline is RDYS rankings on educational work

$$R_{DIS} = R_{HP}.$$

If a student wants to improve their ranking and evaluation to improve the discipline, he must pass certification semester - an examination. Latest necessarily pass students who scored for Academic less than 60 points. For admission to the attestation student has to score at least 60 points on each of the semantic module as a whole - at least 42 points out of academic work.

Rating student with certification RAT determined on a 100-point scale.

Rating student on discipline RDYS calculated by the formula

$$R_{DIS} = R_{HP} + 0{,}3 \cdot R_{AT}.$$

10. Distribution points that get students

Rating student scores	Definition of assessment ECTS	
	exam	credit test
90-100	perfectly	pass
74-89	good	
60-73	unsatisfactorily	
0-59	unsatisfactorily	fail

11. Supportive

Scientific methods of teaching includes: state educational standards, curricula and training programs for all standard and optional subjects; program of educational, industrial and other practices; textbooks and teaching aids; instructional and teaching materials for seminars, practical and laboratory lessons; individual educational and research objectives; tests; text and electronic versions of tests for current and final control, teaching materials for the students individual work.

12. Suggested science literature

Basic:

1. Hull R. Matthews' plant virology / Academic press. – 2002. – 1037p
2. R. Hull Comparative plant virology / second edition. - Emeritus Fellow Department of Disease and Stress Biology John Innes Centre Norwich, UK. – 2009. – 376 p.
3. C.M. Fauquet, M.A. Mayo, J. Maniloff, U. Desselberger and L.A. Ball Virus Taxonomy Classification and Nomenclature of Viruses / Eighth Report of the International Committe on the Taxonomy of Viruses. - Virology Division International Union of Microbiological Societies. – 2005. – 1273 p.
4. D. Knipe, P. Howley, D. Griffin, R. Lamb, M. Martin, B. Roizman, S. Straus Fundamental Virology / Fourth Edition. – 2001. – 1381p.
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9. Bukrynskaya AG Vyrusolohyya. - M. - 1986.
10. A. Gibbs, Harrison B. Fundamentals vyrusolohyy plants. - M. - 1978.
11. RV Hnutova Serology ymmunohymyya viruses and plants. - M. - 1994.

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13. Luria, S., J. Darneya. General vyrusolohyya. 1981.
14. Markov IL Workshop of agricultural plant pathology. - K., Vintage - 1998.
15. Melnychuk MD, Kozhukalo VE, Smirnov SA, Martin G. - Guidelines for practical training course of general fitovirusolohiv National Agrarian University. - Kyiv - 2000.

Secondary:

1. Melnychuk MD, Novak TV, Levenko BO Principles of plant biotechnology. - Kyiv - 2000.

2. T. Mathews R. Viruses rastenyy.- AM-1973.

3. AV Nikolaev Ymmunolohycheskye Modern methods in diagnosis viruses massovoy plants. - M. - 1986.

4. Polischuk VP, IG Budzanivska, Rizhuk SM, Patyka VP, Boyko AL Monitoring of plant virus infections in biocenoses Ukraine - K.:. Phytocenter. 2001

5. S. Tarr Fundamentals pathology plants. - M. – 1975

13. Information Resources

http://www.virology.net/garryfavwebplant.html
http://pvo.bio-mirror.cn/refs.htm
http://ictvonline.org/virusTaxonomy.asp
http://www.journals.elsevier.com/virology/
http://www.virologyj.com/about
http://link.springer.com/journal/705