Додаток 3
до наказу від 23.03.2023 р. № 244

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE
Department of Entomology Integrated pets management and quirintine

«APPROVED»
Dean of Plant protection, Biotechnologies and Ecology Faculty
Prof. Kolomiets Yu.V.
Protocol №9 від 18.05. 2023

«APPROVED»
Head of Department of Entomology,
Integrated pest management Head
and quarantine
Protocol №14 16 від 19.04.2023
Professor
Dolya M.M

«CONSIDERED»
Garant of Educational Program, Bachelor level 202
«Plant protection and Quarantine»
DSc, Associate Professor. Pikovskiy M.Yo.

Working educational program on discipline
Agricultural Entomology

Major: 202 Plant protection and Quarantine
Educational Program Bachelor level: Plant protection and Quarantine
Faculty: Plant protection, Biotechnologies and Ecology
Program Developer: PhD, Associate Professor Tatyana. R. Stefanovska

Kyiv-2023

1. Description of the course

Agricultural Entomology

Area of expertise, major, educational program, degree		
Educational degree	*Bachelor*	
Specialty	*202 Plant Protection and Quarantine*	
Educational program	*Plant Protection and Quarantine*	
Characteristics of discipline		
	Full time study	
Total hours	245	
Number of credits ECTS	7	
Number of modules	4	
Research paper	18	
Form of control	*exam*	
Indicators discipline for full-time and distance learning		
	Full time	Part time (Correspondence)
Semester 7		-
Semesters	7-8	-
Lectures	30	-
Practical	-	-
Laboratory	75	-
Independent working assignments	140	-
Personal working assignments	70	-
Number of weekly hours for full times students	3-4	-

Semester 8	Full time	Distance
Semester	7-8	-
Lectures	30	-
Practical	-	-
Laboratory	75	-
Independent working assignments	70	-
Personal working assignments	-	-
Number of weekly hours for full times students	3-4	-

2. Objectives and tasks of the course

Objective:

the formation of professional knowledge and skills in higher education applicants, identification of pests by morphological features, types of damage plants, substantiating
the expediency of carrying out individual protection measures of agricultural crops, taking
into account the phytosanitary state of crops, peculiarities of biology and phenology of harmful phytophages.

Tasks:
- to form theoretical knowledge of biology, morphology, pests, phenology of phytophages and to master the skill of their practical application;
- master the theoretical and practical skills of identifying species harmful insects;
- carry out phytosanitary monitoring of pests in crops agricultural crops and perennial plantations
according to generally accepted methods;
- to develop and introduce into production efficient, ecologically safe measures to prevent or reduce crop losses from harmful insects vegetation period of plants and during storage;
- to form theoretical ideas and practical planning skills and substantiation of the expediency of
carrying out protective measures on the basis phytosanitary information

ACQUISITION OF COMPETENCE:
Integral competence. The ability to solve complex specialized tasks and practical problems of professional activity by specialty and to apply theoretical knowledge and methods in production situations characterized by complexity and uncertainty of conditions.

General competences (GC) of a bachelor in plant protection and quarantine - the ability to implement educational and social tasks:
GK 1. Ability to abstract thinking, analysis and synthesis.
GK 2. Ability to apply knowledge in practical situations.

Professional competences (PC)of a bachelor in plant protection and quarantine - the ability to perform professional duties by types of professional work:
PC 1. The ability to carry out phytosanitary diagnostics of plant diseases, insects, mites, nematodes, rodents and weeds according to the latest principles and methods.
PC 2. The ability to predict the processes of development and spread of harmful organisms, which will allow the implementation of state policy in the field of plant protection and quarantine.
PC 3. The ability to identify, localize and eliminate regulated harmful organisms based on the results of inspection and phytosanitary examination.
PC 4. Ability to develop and apply plant protection technologies at agricultural and other facilities.
PC 5. The ability to comprehensively apply methods for long-term regulation,

development and spread of harmful organisms to an economically insignificant level based on the forecast, economic thresholds of harmfulness, the effectiveness of beneficial organisms, energy-saving and environmental protection technologies that ensure reliable protection of plants and ecological safety of the environment.
PC 6. The ability to organize measures for the protection and quarantine of plants by enterprises, institutions, organizations of all forms of ownership and citizens whose activities are related to the use of land, water bodies, the cultivation of plants for agricultural and other purposes, their sale, processing, storage and using

Program learning outcomes:
PR 1. To have at the operational level the methods of observation, description, identification, classification, cultivation of objects of agrobiocenoses and maintaining their stability in order to preserve natural diversity.
PR 2. To have knowledge of professional disciplines to the extent necessary for specialized professional work in the specialty of plant protection and quarantine.
PR 3. To be able to draw up technological maps for the organization of plant protection measures, using knowledge from specialized disciplines.
PR 4. To train, monitor and evaluate the professional skills of workers involved in the implementation of plant protection and quarantine measures
The capacity to conduct contemporary techniques-based phytosanitary diagnostics of plant diseases. The ability to identify plant pathogens such as fungi, bacteria, viruses, and others based on the findings of inspection and phytosanitary testing.The capacity to examine agricultural and other businesses in

1. The program and structure of the course

Modules and themes		Hrs.											
		Full time students						Correspondent studen					
		To-tal	Including										
	week		Lectures	Practical works	Labs	Individual work	Independent	Total					
1		2	3	4	5	6	7	8	9	10	11	12	13
Semester 1													
Module 1. Polyphagous, cereals and legumes pests													
Topic 1. Pests of wheat, rye, barley, oat	1-5	19	4		10		10						
Topic 2. Pests of maize, sorghum, rice,buckwheat, millet, grasses	5-7	20	2		3		15						
Topic 3. Pests of annual legumes and perennial legume pests	7	13	2		1		5						
Total for module 1		52	8		14		30						
Module 2. *Pests of technical crops*													
Topic 4. Pests of sunflowers	8	9	2		2		5						
Topic 5. Pests of potato	9	7,5	0,5		2		5						
Topic 6. Pests of stored	10	7,5	0		2		5						

products			, 5										
Topic 7. Pests of flax and hemp	11	8	1		2		5						
Topic8. Diseases of sunflower and ripe	12- 13	10	1		4		5						
Topic 9. Diseases of hop and tobacco	14	8	1		2		5						
Topic 10. Pests of sugar beets	15	13	1		2		1 0						
Total for module 2		63	7		1 6		4 0						
Total for 1 semester		115	1 5		3 0		7 0						
Semester 2													
Module 3. *Pests of vegetable crops*													
Topic11. Pests of potato	1-2	13	2		6		5						
Topic12. Pests of tomato	3-4	8	2		4		2						

Topic 13. Pests of cabage and other braincases	4-5	11	2		4		5						
Topic 14. Pests of cucurbits	6-7	11	2		4		5						
Topic 15. Pests of carrot	7-8	8	1		4		3						
Topic 16. Pests of onion and garlic	8-9	8	1		4		3						
Total for module 3		59	1 0		2 6		2 3						
Module 4. *Pests of orchards and berries*													
Topic 17. Pests of orchards	10-12	13	3		8		2						
Topic18. Pests of small berries and grapes	13-15	21	2		1 1		8						
Total for module 4		34	5		1		1						

					9		0						
Total for 2 semester		93	15		45		33						
Total hrs.		208	30		75		70						
Research paper		18		-	-		-		-	-	-		-
Total hrs.		226	30		75		70						

2. Topics of laboratory works

#	Topic	Hrs.
	Module 1	2
1.	Polyphagous Orthopteran pests	2
2.	Polyphagous Lepidoptera pests	2
3.	Polyphagous Coleoptera pests	2
4.	Pests of cereal crops of first vegetation	2
5.	Pests of cereal crops of second vegetation	2
6.	Pests of corn	2
7.	Pests of rice, sorghum and millet	2
		2
	Module 2	
8.	Pests of stored grain and its products (Coleoptera)	4
9	Pests of stored grain and its products (Lepidoptera	4
10.	Annual legumes' pests	2
11	Perennial legumes' pests	2
12	Pests of sunflowers	2
13	Pests of flax and hemp	2
14	Pests of tobacco	2
15	Pests of rape	2
	Module 3	
16	Potato and other Solanacea crops' pests	2
17	Tomato pests	2
18	Pests of vegetables from family Brassica	4
19	Pests of vegetables from family Curcubitaceae	2
20	Pests of carrots	2
21	Onion and garlic diseases	2
22	Pests of vegetable crops in green house	3
	Module 4	
23	Orchard pests that damage foliage by piercing- sucking moth parts	4
24	Orchard pests that damage foliage by chewing moth parts	4
25	Orchard pest that damage reproductive organs	4
26	Orchard pests of branches and trunks	2
27	Raspberry pests	2
28	Strawberry pests	2
29	Blueberries and goose berries pests	2
30	Grape vine pests	2
Total		75

Topics for independent study

#	Topic	Hours
	PowerPoint presentation " Interrelation of Agriculture; entomology with other scientific disciplines"	*5*
1	PowerPoint presentation " History of agricultural entomology in UKraine	*5*
2	PowerPoint presentation "Importance of Pest Management in Agriculture"	*5*
3	Pest surveillance and Forecasting	*5*
4	Integrated pest management concept: legacy of the past and perspective for the future	*5*
5	PowerPoint presentation "Categories of Pest ".	*5*
6	. Model question paper "Weather on Pest Incidence"	*5*
7	PowerPoint presentation "Symptoms of Damages and Control Measures of Pest of Major Crops"	*5*
8	PowerPoint presentation "Pesticides and their Use in IPM - Mode of Action - Pattern -Plant Protection Equipment and their Use"	*5*
9	PowerPoint presentation " Sericulture and Lac Culture"	*5*
10	Model question paper "Eexamples of a relative method to assess economic threshold levels for an insect pest "	*5*
11	Where were the insects collected and where are they grown and reared? Introduction to molecular Biology and scope in Entomological Research,) Central Dogma, Structure of DNA and RNA, Double helix, Genes, DNA and RNA replications, and related terminology	*5*
12	Describe which chemicals do insects use to communicate messages at the following three levels, respectively: within the insect body, intra-specifically (between members of the same species), and inter-specifically (between members of different species)	*5*
13	PowerPoint presentation" Pest outbreaks tend to occur when" Scope and limitation & bio-intensive and ecological base IPM programmes	*5*
14	Cropping systems and climate insect pest management under protected conditions	*5*

Review Questions
Module1

- What polyphagous pests belong to order Orthoptera?
- What are the stages of a Migratory Locust lifecycle?
- What is the lifespan of Italian locust?
- What is the body length of a Moroccan Locust?
- What type of damage cause Blue-winged grasshopper?
- How many generations during the year has a Steppe Cricket?
- Name natural enemies of a Common Mole Cricket.
- Describe strategy of insecticide treatment to control Orthoptera pests
- Describe types of larva that Coleoptera species may have?
- What are the stages of a Common Click Beetle and European Click Beetle life cycle?
- What is the lifespan of a Corn wireworm?
- What is the body length of a Darkling Beetle?
- What type of damage caused Steppe Darkling Beetle?
- How many generations during the year has a Common cockchafer?
- Name natural enemies of a Forest cockchafer.
- What is the difference between larvae of click beetles and darkling beetles?
- What types of damage can cause darkling beetles?
- Name the insect from polyphagous Coleopteran that is very sensitive to humidity of soil
- In what stage a Leafhopper does hibernate?
- What are the stages of a British bugs life cycle?
- What is the lifespan of a Spring grain aphid?
- What is the body length of a European Wheat Stem Sawfly?
- What type of damage caused by Bird Cherry Oat Aphid?
- How many generations during the year have a Bishop's Mitre Shield Bug?
- Named natural enemies of a Wheat Stink Bug.
- Describe a Sunn Pest and Cereal Stem Flea Beetles larvaes.
- What type of mouth parts has Corn bug ?
- To what orders belong Wheat Trips, Hessian Fly, Yellow Cereal Fly, Millet Fly?
- What group of insecticides should be used to cotnrol cereal flies?
- What crops can damage *Zabrus tenebrioides*
- Describe Cambodia-formed larvae. What insect from Cereal pests group have this type of larvae?
- Name the major pests of winter wheat in stage of shoots?
- Name three pests that cause mechanical damage to grains?
- How we can distinguish the grain that is damaged by Corn bug?
- List the natural enemies of aphids on cereal crops?

Module 2

- In what stage a Flax Flea Beetles does hibernate?
- What are the stages of a Flax Trips life cycle?
- What is the lifespan of a Hemp Flea Beetle ?
- What is the body length of a Eurasian Hemp Moth?
- In what stage a Beet weevil does hibernate?
- What are the stages of a Beet Tortoise lifecycle?
- What is the lifespan of a Mangold Flea Beetle?
- What is the body length of a Beet carrion beetle?
- What type of damage cause Pigmy Mangold Beetle?
- How many generations during the year has a Mangold Fly?
- Named natural enemies of a Black bean aphid.
- Describe a sugar-beet flea beetle and Beet Caspid Bug larvae

Module 3

- What are the stages of a Colorado Potato Beetle life cycle?
- What is indirect damage of potato aphids?
- List the polyphgous pests that can damage potato?
- What do you think about GM crops to control Colorado potato beetle?
- What are the stages of a *Calandra granaria* L. lifecycle?
- What is the lifespan of a *Calandra (sitophilus) oryzae*?
- What is the body length of a Saw-toothed Grain Beetle?
- How many generations during the year have a Tropical Warehouse Moth?
- Named natural enemies of a Meal moth.
- Describe a Indian meal moth and Angoumois grain moth larvae
- In what stage a Turnip Sawfly does hibernate?
- What are the stages of a Cabbage Flea Beetle life cycle?
- What is the lifespan of a Red Turnip Beetle?
- What is the body length of a Mustard Leaf Beetle?
- What type of damage cause Rape Pollen Beetle?
- How many generations during the year has a Rape Bug?
- Name natural enemies of a Cabbage Aphid.
- Describe a Large Cabbage White larva.
- What type of mouth parts has *Delia florales*?
- In what stage a Cotton Aphid does hibernate?
- What is the lifespan of a Onion trips?
- What is the body length of a Greenhouse whitefly?
- Describe symptoms of Encarsia parasitism of White fly?
- What types of damage cause Fungus gnats?

Module 4

- In what stage a Apple Sucker does hibernate?
- What are the stages of a Pear Psylla life cycle?
- What is the lifespan of a Green Apple Aphid and Mealy Plum Aphid?
- What type of damage cause Mussel Scale?
- How many generations during the year have a European Fruit Scale?

- In what stage Apple Ermine Moth does hibernate?
- What are the stages of a Small Ermine Moth life cycle?
- What is the lifespan of a Winter Moth?
- What type of damage cause Gypsy Moth?
- How many generations during the year has a Browntail Moth?
- In what stage a Peach Weevil does hibernate?
- What are the stages of an Apple Blossom Weevil life cycle?
- What type of damage cause Plum Fruit worm?
- How many generations during the year has an Apple Sawfly?
- Describe a European Cherry Fruit Fly larvae.
- What is difference between types of damages of Codling moth and Apple Sawfly?
- Describe the larvae of *Rhynchites bacchus* L.
- Name the natural enemies of Codling moth
- How many generations during the year have a *Aegeria myopaeformis*?
- Name the natural enemies of bark beetles
- In what stage a Strawberry blossom weevil does hibernate?
- What are the stages of a Raspberry Beetle life cycle?
- What is the lifespan of a Small raspberryaphid ?
- What type of damage caused *Zophodia grossulariella* Zinck.?
- How many generations during the year has a Clearwing Moth?
- Describe a Strawberry leaf beetle adults.
- What type of mouth parts has *Pteronidea ribesii*?
- To what orders belong *Perrisia tetensi*?
- In what stage a Turkish Vine Weevil does hibernate?
- What are the stages of a Crimean Vine Weevil life cycle?
- What is the lifespan of a European Grape Berry Moth?
- What is the body length of a European vine moth?
- What type of damage cause Grape Leaf roller?

Example of review test

Multiple Choice

1. Which pest is leaf-biting cutworm
A. *Mamestra brassica*
B. *Gryllotalpa gryllotalpa*
C. *Autographa gamma*
D. *Heliothis viriplaca*
E. *Agrotis segetum*

2.What is entomopathagous of Mole cricket ?
A. *Apanteles glomeratus*
B. *Encarsia formosa*
C. *Pteromalus puparum*
D. *Lara anathema*
E. *Trichogramma evanescence*

3. How many generations *Locustra migratoria* does have?
A. One per year
B. One per two years
C. One per three years
D. Two per year
E. Three per year

4. Which size of *Sitona lineatus* does have?
A. 1-2 mm
B. 3-4 mm
C. 5-6 mm
D. 7-8 mm
E. 9-10 mm

5. Where vole cricket does hibernate?
A. Under decomposing plant matter
B. In the forest belt
C. In mined of damaged leaves
D. In chambers in the ground at a depth of 30-40 cm.
E. In egg pods in the ground

6. Mechanical control use the following strategies:
A. Tillage
B. Using fertilizers
C. Cleaning field equipment
D. Quarantines
E. Use of pesticides

7. Grub is a larva of which pest?
A. May beetle (commom coackchafer)
B. Granary weevil
C. Black bean aphid

D. Mole cricket
E. Yellow mealworm

8. Name two insect that belong to complete methamorphosis?
A. *Botynoderes punctiventris*
B. *Calliptamus italicus*
C. *Agrotis segetum*
D. *Grillus desrtus*
E. Euridema ventralis

9. Which pest hoes have chewing moth part in the adult stage?
A. Green house white fly
B. Potato aphid
C. May beetle
D. Rape bug
E. Turnip Moth

10.Wich Locus is migratory?
A. *Scistocerca gregaria*
B. *Calliptamus italicus*
C. *Tettigonia viridissima*
D. *Pieris brassicae*
A. *Atomaria linearis*

11.What is wingspan of large white butterfly
A. 50 mm
B. 30-35 mm
C. 20-25 mm
D. 70 mm
E. 65-70 mm

12. Which pest does cause damage to cabbage
A. *Mamestra brassica*
D. *Leptinotarsa desemlineata*
C. *Locusta mogratoria*
D. *Bruchus pisorum*
E. *Tenebrio molitor*

13. Name pest of winter wheat of second part of vegetation
A. Hessian fly
B. Frit Fly
C. Cereal ground beetle
D. Cereal Stem Flea beetles
E. Wheat grain beetle

14. What type of damage cause larvae of Wheat Chafer (grain beetle)?
A. Role leaves and pollute with excrement
B. Larvae and Adult suck juice from ears. The ears have small grains
C. Larvae bore into the lower part of stem and gnaw through internodes of stem

D. Adult eats young shoots
E. Larva eat humus and small roots

15. In which stage *Oscinella pusila* does hibernate?
A. Adult
B. Larvae
C. Eggs
D. Pupae
E. In all stages

16. Name the family to which belong Cereal Stem Flea beetle
A. Chrisomelidae
B. Tortricidae
C. Pyralidae
D. Thripidae
E. Cecidomiidae

17. Name the place where *Eurigaster integriceps* lay eggs beetle lay eggs
A. Upper side of leaves
B. In the soil, close to root system at 2-5 cm depth
C. Lower side of leaves and stems
D. In the soil at 15-20 cm depth
E. On ears

18. Choose the stage for "spraying of winter wheat in order to control Wheat chafer
A. Ripening- Milk ripening
B. Booting
C. Tillering
D. Jointing

19. Choose the appropriate insecticide in order to control
A. Phastak
B. Phusilad
C. Cruizer
D. Maxim
E. Lepidocyd

20. How many generation does *Siczaphis graminum* have?
A. On per two years
B. One per year
C. Two per year
D. Five per year
E. 12 per year
Matching:

21. Match each insect in the left column with correct order name in the right column

	A. Coleoptera
	B. Orthoptera
Darkling beetle *Opatrum sabulosum*	C. Lepidoptera
	D. Hymenopthra
Peach aphid	E. Homopthera
	F. Diptera
Mole cricket	G. Blattodea

22. Match stage of hibernation in the left column with correct name of pest in the right column

Adult	A. European leafroller
Larvae	B. Apple weevil
Eggs	C. Fruit tree thortrix

23. Match each pest with the group of crops which it cause damage

Pea weevil	A. Storage
Granary weevil	B. Orchards
Green apple aphid	C. Legumes
Cabbage aphid	D. Cabbage

True/ False session:

24.Granary weevil has less generations then rise weevil

25. Yellow mealworm is a primary storage pest

26.Angomious grain moth can damage wheat in open field

27. Methylbromide treatment is allowed in grain storages and warehouses

28.Precautionary approach (prevention) is the best strategy manage storage products pests

29. Describe Integrated pest management of sugar beet pests

30. Provide information about control of perennial legumes

6. Teaching methods

Explanatory and illustrative technique.
By listening to the tale or lecture on educational or instructional materials through the on-screen guide in the "ready" form, students gain information. They continue to think in terms of reproduction while observing and analyzing facts, assessments, and conclusions. As many people as possible use this way to send enormous amounts of data. It can be applied to the presentation and incorporation of facts, methodologies, evaluations, and conclusions.
Small groups method. Student-centered approach where all students join together in a free discussion on a particular topic and engage in active learning. Properly designed small group learning activities create an active and safe learning environment with beneficial opportunities for peer- peer interactions
Reproductive method. This refers to the application of learned from sample or regulations. Activities of trainees is algorithmic, corresponding instructions, orders, rules - similar to the present sample situations.
The method of problem presentation. Using any source and means lecturer before teaching material, poses the problem, formulating cognitive tasks, and then exposing the system is proved by comparing the views, different approaches shows way to solve the problem. Students are like witnesses and accomplices in scientific research.
Heuristic method. It is a method of teaching which involves our placing of students as far as possible in the attitude of a discoverer. In this method, the student has to find out the answer to his/her own problem by unaided efforts. The process of thinking becomes productive nature, but it gradually directs and supervises the teacher or the students on the basis of the above programs (including computer) and handouts.
The research method. After examining the information, production issues and tasks, brief oral or written instructions, and other search actions are performed by individuals who instruct self-study literature sources. Initiative, independence, and inventiveness were all clearly displayed during research tasks.
7. Forms of control

Rating of student from mastering of discipline is determined on a 100 ball scale. It consists of rating from educational work at the evaluation of which 70 points target, and rating, from attestation (to examination) - 30 points.
Every semantic module is also estimated on a 100 ball scale.

8 Evaluation of student performance

Rating from discipline,points	Estimation national	
	exam	credit
90-100	excellent	credited
74-89	good	
60-73	satisfactory	
0-59	unsatisfactory	not credited

9. Recommended literature

Basic

- T.R. Stefanovska, S.V. Kucherovska., V.V. Kava. 2016, Agricultural Entomology, Komprint Press, Kiev, 375 p. ISBN 978-966-929-352-7.

Additional

- Stankevich S.P., Kava L.P., Likar Ya.O., Stefanovska T.R. 2017. Integrated Pest Management. Komprint Press, Kiev, 270 p. (in ukr.).
- Сільськогосподарська ентомологія: підручник / Байдик Г. В. та ін.; за ред. Б. М. Литвинова, М. Д. Євтушенка. Київ: Вища освіта, 2005. 511 с. 2. Федоренко В. П., Покозій Й. Т., Круть М. В. Шкідники сільськогосподарських рослин. Київ: Колобіг, 2004. 356 с
- Рубан М.Б., Гадзало Я.М. та ін. Сільськогосподарська ентомологія : Підручник – К.: Арістей, 2008. – 520с. 2. Рубан М.Б., Гадзало Я.М. та ін.. Практикум із сільськогосподарської ентомології: – К.: Арістей, 2009. – 472с.
- Kenneth M. Smith. 1999 A text book of agricultural entomologyCambridge University Press Online ISBN:9781316530269
- Kaul, D. S. 2021. *Objective Guide In Entomology* ([edition unavailable]). NEW INDIA PUBLISHING AGENCY (NIPA). Retrieved from https://www.perlego.com/book/1975479/objective-guide-in-entomology-pdf (Original work published 2021)
- Pedigo, L.P. and Marlin, E. R. 2009. Entomology and Pest Management, 6th Edition, Person Education Inc., Upper Saddle River, New Jersey 07458, U.S.A.