

BEEPRO CURRICULUM

Rational use of plant protection products and fertilizers in terms of the impact on bees in the ecosystem



BeePro
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BeePro: Rational use of plant protection products and fertilizers
in terms of the impact on bees in the ecosystem
Project no. 2021-1-SK01-KA220-VET-000025257



**Funded by
the European Union**

BEEPRO CURRICULUM



AGROINŠTITÚT NITRA
štátny podnik



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Executive summary

Chapter 1, Introduction, explains the subject of this document.

Chapter 2, Overall Training Methodology, explains in more detail how the training activities will be developed, and presents methodologies and didactical structures. Also gives more details about the training structure, module topics and learning specifications.

Chapter 3, User Group Selection, details the procedures for the identification of the user groups. It explains how the user groups should be selected, what should be the target audience and other relevant specifications. Trainees' characteristics, competences and skills are also defined.

Chapter 4, Modules Outline, present the typologies of materials and documentation to be utilized and produced during the training course.

1. Introduction

The BeePro Curriculum specifies all aspects related to competences, content, timing, EQF demand and also learning outcomes which will be obtained by the participants of BeePro course. Also elaboration of the BeePro training content will be in accordance to this document.

Two crucial targets need to be addressed for training preparation: the definition of the training structure and methodology and the development of training modules. The training activities contribute to the professional training of the involved actors. Taking in consideration the **principles of Continuing VET (C-VET)** that takes place after initial education and training, or after beginning working life, the main characteristics of the BeePro training are:

- simple in form;
- friendly in access;
- easy to start;
- possible integration between modules;
- focused materials, feedback and support;
- ideal for learning of adults and professionals;
- customization of modules program and training design;
- provide ongoing guidance and support;
- provide step-by-step, research-proven materials.

According to the above-mentioned principles, the BeePro training content and tools are adapted to trainees' age, abilities, learning experiences, and working conditions.



2. Overall Training Methodology

The main goal and objective of the project is providing high quality training content about rational use of plant protection products and fertilizers in terms of the impact on bees in the ecosystem.

The objective of the training is to provide participants with the required knowledge and practice to use the BeePro knowledge and components as needed in the current society. The conclusions of the need analysis confirmed project assumptions in regard to the content of the modules to be developed in BeePro project.

It was emphasized – as a guideline that the training content must be concentrated on the modern methods/instruments in the context of the improvements of the knowledge in organic beekeeping and proper, rational and more environmentally-friendly usage of the chemical plant protection products and fertilizers.

Theoretical Background of Module design

The **Module design** follows the structure and methodology that will be the most effective for BeePro courses package, considering the factors such as:

- **Planned types, learning activities and teaching methods** - the following teaching and learning activities can be adapted and used in a range of course target groups¹:
 - Concept mapping;
 - Participatory Learning in Action (PLA) Techniques;
 - Questioning;
 - Formative quizzes;
 - Problem-solving;
 - Debates;
 - Role-plays;
 - Freewriting;
 - Small group activities;
 - Social media activities (Facebook, Twitter, Youtube);
- **Teaching hours** - the precise timing is very important part of the course design. During the syllabus development is very important to consider a time necessary for active learning and for learners to complete major assignments and prepare for exams.
- **Model of delivery** – the course content can be delivered in a variety of ways. However, the following innovative methods can be considered²:
 - *blended learning*, which encompasses a wide variety of designs, including:
 - technology enhanced learning (e.g. using pdf files or ppt presentations);
 - learning management systems as a support tool for face-to-face teaching and for storing learning materials and online discussion;
 - *online eLearning*, as a form of distance learning, with no face-to-face teaching, including:
 - courses for credits or non-credit courses, offered online and cover the relevant content, assessments, self-testing tools etc.;
 - fully open courses, such as MOOCs;

¹ Additional reading:

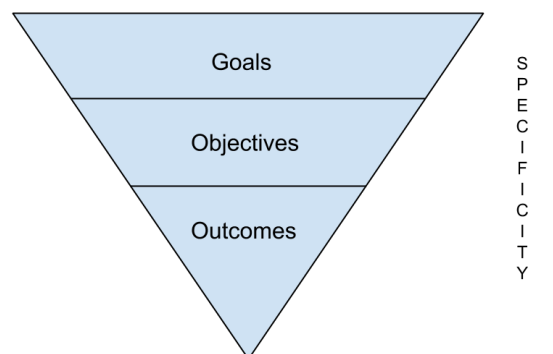
http://www.fctl.ucf.edu/TeachingAndLearningResources/CourseDesign/Assessment/content/101_Tips.pdf
<https://www.uwc.ac.za/TandL/Pages/TandL-Activities.aspx>

² Additional reading:

<http://www.tonybates.ca/2015/02/03/deciding-on-modes-of-delivery/>



- open educational resources, which can serve as supporting materials for teaching and learning.
- **EQF level** - The European Qualifications Framework (EQF) acts as a translation device to make national qualifications more readable across Europe, promoting workers' and learners' mobility between countries and facilitating their lifelong learning. The EQF aims to relate different countries' national qualifications systems to a common European reference framework. Individuals and employers will be able to use the EQF to better understand and compare the qualifications levels of different countries and different education and training systems. Since 2012, all new qualifications issued in Europe carry a reference to an appropriate EQF level³.
- **Assessment methods**⁴ – the selection of appropriate assessment methods depends on factors like as planned learning outcomes, level of study, target groups of learners and their skills, knowledge and area of expertise, available resources, and delivery mode of the course and so on. Examples of assessment methods:
 - Course exams;
 - Course assignments/projects;
 - Essays;
 - Multiple-choice tests;
 - Self-assessment.
- **Course objectives & Learning outcomes of the course unit** – course objectives clearly describe what you intend course participants to learn by the end of the course. Learning outcomes describe an intended or observed state, e.g. what your students will learn or what your students actually learned⁵.



Process of curriculum development:

³ Additional reading:

https://en.wikipedia.org/wiki/European_Qualifications_Framework

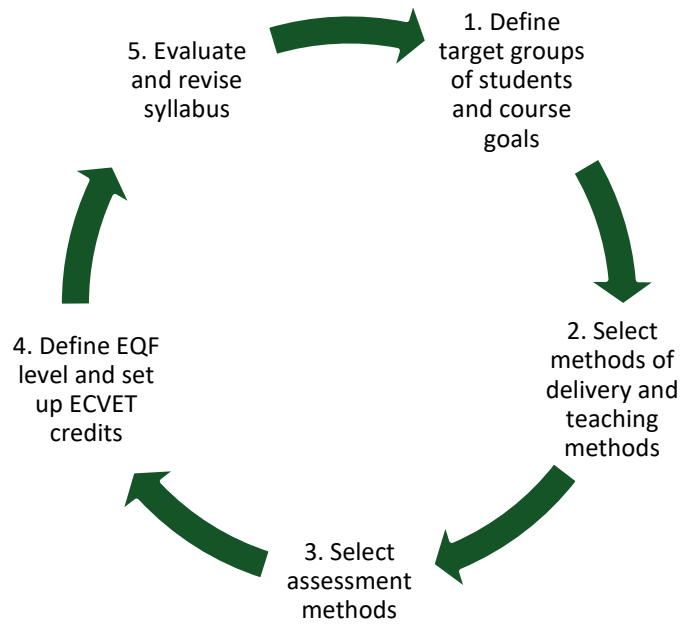
⁴ Additional reading:

<http://facultyinnovate.utexas.edu/teaching/assess-learning/methods-overview>

http://www.learningandteaching.info/teaching/assess_form.htm

⁵ Additional reading:

<http://resources.depaul.edu/teaching-commons/teaching-guides/course-design/Pages/course-objectives-learning-outcomes.aspx>





Modules Development

The topics for the development of modules were proposed according to the findings of State of the Art and distributed for elaboration to the partners following their specific competences and experience, and on the basis of mutual partner's agreement, as follows:

Module / Table of Content	Responsible partner
M0 - Introduction	Agroinstitut (SK)
M1 - Bees in the nature	ARID (PL)
M2 - Pesticides	Agroinstitut (SK) + All
<i>Pesticides 1</i> M2/1 – Insecticides M2/2 – Fungicides	Agroinstitut (SK)
<i>Pesticides 2</i> M2/3 – Acaricides M2/4 – Herbicides	CPIP (RO)
<i>Pesticides 3</i> M2/5 – Rodenticides M2/6 - Other pesticides	Servima (ES)
M3 - Fertilizers	Servima (ES)
M4 - Organic practices in agricultural production	NewEdu (SK)
M5 - Organic beekeeping	Stando (CY)
M6 - Healing of beehives	CPIP (RO)
M7 - The health of bees	NewEdu (SK)
M8 - Inventory of good agricultural practices concerning the use of chemicals	ARID (PL)
M9 - Case studies	Stando (CY)+ all partners

It is essential to select the structure and methodology that will be the most effective for its training environment, considering the factors such as:

- **The overall learning objectives:** To provide students with the general use of plant protection products (PPP) and their effects on hives. To learn basic principles of the organic beekeeping and ecological methods of plant protection. To learn how to heal a beehive and to provide good organic practices in agricultural production.
- **Who needs the training:** In our case, the training is needed by VET students, VET organizations, beekeepers working in the field of organic beekeeping, professionals in the field of proper usage of the chemical plant protection products and fertilisers, farmers, and people working in the farm production area.
- **The expected learning outcomes:** what each person trained is expected to be able to do, and expect to know, at different stages and at the conclusion of training.

The BeePro training materials will be designed in attractive and usable way and integrated into the e-learning platform, available under Creative Commons license. The first draft of the training content will be prepared in English as the working language of the partnership; Each partner will provide the draft version of elaborated module in English, and after cross-checking among the partners, elimination of possible overlaps and subsequent editing and the improvements, it will be translated into all partners' languages.



The training materials will be in compliance with the EQF documents and will be take us reference the EQF definitions for the trainee's achievements.

"Learning outcomes"	Statements of what a learner knows, understands and is able to do on completion of a learning process and which are defined in terms of knowledge, skills and competence
"Knowledge"	The outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual.
"Skills"	The ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).
"Competence"	The proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the European Qualifications Framework, competence is described in terms of responsibility and autonomy.

The level 3-5 of the EQF will be appropriate for training. All partners are free to adapt national version of the training content to higher level of EQF.

Structure of the training content

The proposed training content for each module is generally described in the next chapter of this document- Chapter 4: Modules Outline. This proposal is not binding, it is still subject to modifications, if during the creation of the training content itself it is found that certain additional chapters must be developed / another area must be described within the module.

For the development of the training materials content a common template must be used. Volume of the training materials content should be balanced across all developed modules, which means approx. 10-15 standard pages per module (one standard page is comprised of 1,800 characters with spaces) + additional resources. Also, for providing attractiveness, the materials should contain 5-10 additional resources (Photo, video, table, graph, external resources- pdf documents, ppt presentations, excel tables....). The training content together with the additional resources will be processed into interactive online modules at the Virtual Learning Environment platform, while this training content will also be the basis for the R3: Beepro Handbook.

The additional resources should also include links to relevant videos - preferably YouTube, hyperlinks to other online resources. Aside the training content itself, each module/chapter will include:

- multiple choice questions:
 - approx. 5 per chapter/module,
 - 3 answers-one correct,



- yes/no answer,
- match answers,
- move (text or picture) to image answer,
- glossary - most relevant terms with definitions.

The template for elaboration of the Training content is in Annexed file:
BeePro_R2_training_content_template.docx.

The Virtual Learning (on-line) environment

The online environment for BeePro course package will provide the transfer of the training resources prepared in BeePro Training modules (training content). The Virtual Learning Environment (VLE) will serve as the main tool for delivery of the developed training content and provide access to all other resources. The training content will be elaborated according to EQF requirements and the access to the training content will be free. VLE will be based on free and open-source learning management system (LMS) Moodle, with customizable management features, which is widely used to create online courses to achieve learning goals. The platform will ensure a learner-centered approach with many advantages for the project main target group. On one hand, the content can be delivered to a number of learners that come from geographically dispersed regions. On the other hand, such learners either have limited time to devote to learning during conventional hours, or have negative experience with the conventional learning methods of the formal education system. Last but not least, the digital platform will provide for increasing the engagement of the final target groups with digital learning.

Technical specifications / suggestions:

- Based on free and open-source LMS Moodle
- Customizable management features
- Possibility to use different modules / activities
- Asynchronous e-learning activities
- Webhosting with minimal requirements: PHP 7.3, MariaDB 10.2.29 or MySQL 5.7 or Postgres 9.6

Main steps for implementation:

- Domain registration: specific domain name for the platform (subdomain)
- Installation of Moodle environment on server, entry level configuration of LMS, user policy settings, GDPR settings
- Development of the BeePro Virtual Learning Environment structure- creation, installation and set-up of the main platform modules, tools and activities; setup of the modules, tools and activities (books, glossary, feedback module, self-assessment module, quizzes, question banks, blog...); creation of multilingual versions: EN and all partner languages
- Training content (R2/A1: Training structure and content elaboration) implementation into the BeePro Virtual Learning Environment - processing the content (will be provided in English and all partner languages):
 - Training modules,
 - Glossary
 - Questions for the self-evaluation tests, questionnaires...etc.
- Integration of all other results into the Virtual Learning Environment:
 - R1/A1 - State of the Art
 - R1/A2 - Training methodology
 - R1/A3 - Curriculum



- R3 – BeePro Handbook
- R2/A3- Pilot Testing: Testing the Training Content and the BeePro Virtual Learning Environment; in the final phase of the development of individual results, verification of their content and form by selected participants during the pilot testing; then the final results will be adjusted and improved in line with feedback and recommendations received. The main tool for pilot testing will be the BeePro Virtual Learning Environment.

What to consider when designing the VLE:

- User registration: self-registration (the participant registers himself) / manual registration (the participant is registered by the course manager);
- What data about the participants will be required during registration process (consider also the data needed for the certificate) – this will be the basis for GDPR info, which we must develop and integrate into the e-Learning system;
- Structuring the content into individual modules, consider the use of graphics, tables, graphs, photos, audio files, videos in the text; use of hypertext links (in case of external sources, eg legislation, links to other existing online sources ...);
- Suitability and possibility of using other interactive tools;
- Availability of modules and other tools (unlimited; conditional - for example, the participant will get to the next module /activity only after completing the previous one, the test / evaluation questionnaire will be available only after completing all modules, etc.);
- Form of tests / quizzes: questions (multiple answers, true / false, agreement, numerical - these are evaluated automatically; short answer - the need for evaluation by the lecturer), availability of tests (unlimited, only during a specific time period), number of attempts per test (1x, multiple attempts, unlimited), test attempt duration (limited to xx minutes, unlimited);
- Form of evaluation: percentage, point, minimum limit for obtaining a certificate.
- Certificate form (if any) - generated automatically by the e-learning system / standard certificate issued by the project consortium.

In addition, the form of training materials should be processed through usual technologies and requirements – using multimedia elements and Web technologies. In terms of the content, the processed information should be brief, clear and pertinent in order to obtain the expected results.

The training methodology will be based mainly on online education methods, including: primarily distance education methods, such as e-Learning and m-Learning, but it is recommended to combine the training with face-to-face training, e.g. seminars, workshops, practical training... etc.

Training provision

All modules in English and in all partner's languages will be available for testing during pilot testing phase. The Pilot Testing phase of the BeePro project will take place in each partner country: Slovakia, Poland, Romania, Cyprus and Spain. At least 100 learners (farmers / beekeepers / other relevant stakeholders) will participate in the pilot events (20 in each partner country).

The results of the pilot testing and the feedback from the participants will help the partnership to identify the weaknesses of the training content and the Virtual Learning Environment and subsequently modify, improve and adapt the developed content and training tools to the specific needs of the target groups. After implementation of the pilot testing activity, relevant partners will elaborate national reports and the leading partner will elaborate common transnational report.



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Once the Pilot testing is completed and the feedback from the pilot testing participants is processed in the Transnational report on pilot testing, all language versions of the Training content and the Virtual Learning Environment will be modified, improved and adapted (where needed) to the specific needs of the target groups.



3. User Group Selection

The trainees/Target groups

Our target groups at local and regional level, the groups among whom we aim to disseminate the project are:

LOCAL LEVEL:

- Beekeepers working in the field of organic beekeeping and/or proper usage of the chemical plant protection products and fertilisers
- Farmers in crop production
- VET students
- VET organisations
- Agricultural advisors
- Regional administration
- Local government
- Technical companies
- Educational community (teachers and students)
- Youth associations
- Adult education
- Wide Public
- Other

NATIONAL LEVEL:

- Umbrella bodies responsible for VET and entrepreneurship,
- National policy makers and accreditation bodies;
- Entrepreneurship agencies and economic development bodies;
- Chambers of Commerce,
- Social inclusion bodies
- Development agencies, education and advisory institutions;
- Private sector including NGOs involved in the research, innovation and education activities and companies oriented on tourism development.

EUROPEAN LEVEL:

- Umbrella bodies responsible for VET and entrepreneurship
- Networks and clusters.

Admission conditions

The training course is open for everyone interested in beekeeping activities and fulfil following admission conditions:

- successful completion of the general course / work experience related to PPP and/or beekeeping;
- fill in the previous experience table;



Previous Experience

	Not at all	Some degree	A lot
Previous trainings in organic beekeeping			
Previous trainings in proper usage of the chemical plant protection products and fertilisers			
Responsibilities in developing organic beekeeping activities using the chemical plant protection products and fertilisers			
Responsibilities in implementing organic beekeeping strategy using the chemical plant protection products and fertilisers			
Experience in European work / European projects			
Interest in providing organic beekeeping activities outside the region /country			



4. Modules Outline

This chapter serves as the guideline for development of BeePro training content.

The template refers to what is offered by the BeePro training content and covers the knowledge, attitude, behaviour, manner, performance and skills that are imparted or inculcated in a student. It contains the teaching methods, lessons, assignments, exercises, activities, projects, study material, tutorials, presentations, assessments, test series, learning objectives, and so on.

The sections of module outline can be defined as follows:

Title of the module

- Please, provide the title of the module in English and in all partners' languages

Module content

- Explain concisely what the course is about and how the overall course will support student learning in the relevant disciplines.
- In this part you can describe details of the background of the course and its overall aims and the prior knowledge the trainees should have. You can also include information how the course relates to the other BeePro modules.
- To filling this part, answer on following questions can help you:
 - What is the course about?
 - Why is it relevant, interesting, or significant?
 - What questions will your course answer?
 - What is the main argument of your course?

Learning outcomes

Learning outcomes refer specifically to what students are expected to achieve or learn at the end of the course. Bloom's taxonomy to identify verbs to describe student learning can be used. Examples of learning outcomes verbs for library instruction include:

- Knowledge/Remembering: define, list, recognize;
- Comprehension/Understanding: characterize, describe, explain, identify, locate, recognize, sort;
- Application/Applying: choose, demonstrate, implement, perform;
- Analysis/Analysing: analyse, categorize, compare, differentiate;
- Evaluation/Evaluating: assess, critique, evaluate, rank, rate;
- Synthesis/Creating: construct, design, formulate, organize, synthesize.

Training and Evaluation Standard

- Learning activities
 - Please, list the components of the course (e.g., face to face meeting in auditorium, interactive/3D learning materials, library activities, field-trip via the pathway, etc.).
 - Educational activities consist not only of the study of theoretical learning sources. Student must spend substantial part of the educational activities on the practical exercises. Please, plan activities of the topic/subject in the way to cover not only the theoretical but also interactive assessments.
- Assessment type
 - Assessments are part of the learning activities and must match to the planned learning outcomes. Please, describe how the assessment task(s) help to students achieve the planned learning outcomes.



- Required and recommended readings
 - Please, provide list of references and additional readings. The lists can include links to online resources and/or eBooks.

Module Outline Template:

Module Number	Module Title
Module content	
Learning Objective	
Topic/Subject	Contents/main points
Learning Outcomes	
Learning Objective	
Knowledge	
Skills	
Competences	
Training and Evaluation Standard	
Planned learning activities and teaching methods	
Mode of delivery	
Teaching hours	
EQF level	
Assessment methods	
Recommended or required reading	



Module 1	Bees in nature
Module content	
Learning Objective	Students should have knowledge about plant pollination as one of the most important mechanisms for maintaining life on Earth, about the role of the honeybee in human life, its impact on the ecosystem and the natural environment; about basic terms related to organic honey bee breeding and cultivation of honey plants.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • Bee Colony Biology • Melliferous Plants • Role In the Environment • Bee Honey and Immunity • Interesting Facts About Bees 	<ul style="list-style-type: none"> • Information on the honeybee and wild bee species, their impact on human life and the environment; • Growing honey plants; • Natural bee products ; • Principles of good agricultural practice .
Learning Outcomes	
Knowledge	The student knows that: <ul style="list-style-type: none"> • bees and other pollinators play a key role in our ecosystem; • the populations of all insects in the world are drastically declining; • the disappearance of so many species of insects will spell a massive ecological disaster; • the plants they pollinate will disappear together with the pollinators, and then the animals that feed on them; • bees provide us with healthy and natural products, such as: honey, pollen, propolis, bee and royal jelly.
Skills	Student defines basic terms related to: <ul style="list-style-type: none"> • Organic honey bee breeding • The cultivation of honey plants
Competences	The effect of teaching is the student's awareness to: <ul style="list-style-type: none"> • bees and other pollinators play a key role in our ecosystem • the populations of all insects in the world are drastically declining • the disappearance of so many species of insects will spell a massive ecological disaster • the plants they pollinate will disappear together with the pollinators, and then the animals that feed on them • bees provide us with healthy and natural products, such as: honey, pollen, propolis, bee and royal jelly
Training and Evaluation Standard	
Planned learning activities and teaching methods	<ul style="list-style-type: none"> • Online Learning • Face to face learning • Meeting and field trips
Mode of delivery	Blended approach - the online and face-to-face methods will be used to ensure that individuals comprehend the course
Teaching hours	3 hours
EQF level	3 - 4
Assessment methods	The individuals' full understanding of the subject will be tested by using a multiple-choice assessment method to ensure there are no gaps in their knowledge about topic.
Recommended or required reading	<ul style="list-style-type: none"> • https://www.ior.poznan.pl/plik,2361,kodeks-dobrej-praktyki-ochrony-roslin-pdf.pdf • https://piragro.pl/wp-content/uploads/2020/04/Dobra-praktyka-ochrony-ro%C5%9Blin-Ochrona-zapylaczy-podczas-stosowania-%C5%9Brodka-C3%B3w-ochrony-ro%C5%9Blin.pdf • https://dzicyzapylacze.pl/



Module 2	Pesticides
Module content	
Learning Objective	Students should understand what generally pesticides are, the kind of existing pesticides and their main characteristics and toxicity. Students should be familiar with the principles in working with pesticides, basic safety rules, storage conditions, and its proper application. Students should be aware about alternative and more environmentally friendly methods in plant protection products.
Topic/Subject	Contents/main points
<ul style="list-style-type: none">• Introduction to Pesticides• Division of Pesticides• Pesticide Formulation• Main Principles in Working with Pesticides• Effects on Humans, Animals and the Environment• Can Pesticides Affect Pollinators and Bees?• Studies on the Effects of Pesticides on Bees• Ecological Pesticides Available in Market• Integrated Pest Management	<ul style="list-style-type: none">• What are the pesticides? Characteristics;• Theoretical background on pesticides;• Main types of pesticides- contact and systemic;• Basic principles in working with pesticides, basic health and safety rules, storage conditions, and its proper application;• How to reduce risks for wildlife and bees when using pesticides? How individual pesticides are attractive to bees?;• Environmentally sensitive approach to pest management: Integrated Pest Management, organic pesticides, advantages of organic pesticides.
Learning Outcomes	
Knowledge	Students define basic terms related to the effect of basic pesticides and list most important types of pesticides, know about the main principles in working with pesticides in terms of health and safety and proper application of pesticides. Students know the fundamentals of effective and environmentally sensitive approach to pest management.
Skills	Students are able to implement measures to reduce risks for wildlife and for pollinators when using pesticides.
Competences	Student's awareness to the importance of reducing the use of pesticides and preventing and reducing risks for wildlife and for pollinators when using them.
Training and Evaluation Standard	
Planned learning activities and teaching methods	E-learning course, Face-to-face lessons, Personalized learning, Problem-based learning, Field trips, Video lessons, Quizzes.
Mode of delivery	Blended learning
Teaching hours	12
EQF level	4
Assessment methods	Online test / Oral response with explanation
Recommended or required reading	<ul style="list-style-type: none">• Čermáková, T. (2016). Riziko používania pesticídov pre včely a ostatný užitočný hmyz. In: Ekologie chovu včel. Pavel Mervart, 151-163, ISBN 978-80-7465-215-8.• Bokšová, A., Kazda, J., Stejskalová, M. 2022. Vlastnosti ovlivňující včely u pesticidů aplikovaných v období květu řepky. Agromanual 7, 2022• Debach, P., Rosen, D. 1991 (second edition) Biological control by natural enemies Cambridge University Press, Cambridge, UK xiv + 440 pages ISBN 0-521-39191-1• Kazda, J., Stejskalová, M. Atraktivita a repelence pesticidů• https://vcelstva.czu.cz/o-postricich/atraktivitapesticidu



Module 2/1		Insecticides	
Module content			
Learning Objective		Students should understand what insecticides are, the kind of existing insecticides and their main characteristics and toxicity. Students should know how to reduce risks for wildlife and for pollinators when using insecticides.	
Topic/Subject		Contents/main points	
<ul style="list-style-type: none">• What are insecticides? Characteristics.• Main types of insecticides• How do they work and how toxic are they• Can fungicides affect pollinators and bees? How to reduce risks for wildlife and bees?		<ul style="list-style-type: none">• What are the insecticides? Characteristics.;• Main types of insecticides;• Active substances allowed in Europe;• How do they work and how toxic are they?• Division of insecticides according to the mode of action;• Division of insecticides according to the method of application;• Main principles in working with insecticides (pesticides);• Can they affect pollinators and bees?• How to reduce risks for wildlife and bees?• How individual insecticides are attractive to bees?• Botanical insecticides.	
Learning Outcomes			
Knowledge		Students define basic terms related to the effect of chlorinated hydrocarbons, organophosphates, carbamates and pyrethroids and list most important types of insecticides - chlorinated hydrocarbons, organophosphates, carbamates and pyrethroids.	
Skills		Students are able to implement measures to reduce risks for wildlife and for pollinators when using insecticides.	
Competences		Student's awareness of the importance of reducing the use of insecticides and preventing and reducing risks for wildlife and for pollinators when using them.	
Training and Evaluation Standard			
Planned learning activities and teaching methods		E-learning course, Face-to-face lessons, Personalized learning, Problem-based learning, Field trips, Video lessons, Quizzes.	
Mode of delivery		Blended learning	
Teaching hours		8	
EQF level		4	
Assessment methods		Online test / Oral response with explanation	
Recommended or required reading		<ul style="list-style-type: none">• Zbirovský, M., Myška, J. 1959. Insekticídy, fungicidy, rodenticidy, Praha, SPN, 563 s.• Cagáň, L., Hudec, K. 2003. Chemická ochrana rastlín proti chorobám a škodcom. Nitra. SPU, 130 pp. ISBN 80-8069-177-0• Stenersen, J. 2004. Chemical insecticides. CRC Press. 296 pp. ISBN 0748409106• Iwasa, T., Motoyama, N., Ambrose, J. T., & Roe, R. M. (2004). Mechanism for the differential toxicity of neonicotinoid insecticides in the honey bee, <i>Apis mellifera</i>. <i>Crop Protection</i>, 23(5), 371-378	



Module 2/2	Fungicides
Module content	
Learning Objective	Students should understand what fungicides are, the kind of existing fungicides and their main characteristics and toxicity. Students should know how to reduce risks for wildlife and for pollinators when using fungicides.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • What are the fungicides? Characteristics • Main types of fungicides • Division of fungicides according to the mode of action • Division of fungicides according to the method of application 	<ul style="list-style-type: none"> • What are the fungicides? Characteristics.; • Main types of fungicides ; • Active substances allowed in Europe; • How do they work and how toxic are they? • Division of fungicides according to the mode of action; • Division of fungicides according to the method of application; • Can they affect pollinators and bees? • How to reduce risks for wildlife and bees? • How individual fungicides are attractive to bees? • Botanical fungicides.
Learning Outcomes	
Knowledge	Students define basic terms related to the effect of basic fungicides and list most important types of fungicides.
Skills	Students are able to implement measures to reduce risks for wildlife and for pollinators when using fungicides.
Competences	Student's awareness to the importance of reducing the use of fungicides and preventing and reducing risks for wildlife and for pollinators when using them.
Training and Evaluation Standard	
Planned learning activities and teaching methods	E-learning course, Face-to-face lessons, Personalized learning, Problem-based learning, Field trips, Video lessons, Quizzes.
Mode of delivery	Blended learning
Teaching hours	8
EQF level	4
Assessment methods	Online test / Oral response with explanation
Recommended or required reading	<ul style="list-style-type: none"> • CAGÁŇ, Ľ. a kol. (ed.): Choroby a škodcovia poľných plodín. SPU, Nitra, s. 39-129. ISBN 978-80-552-0354-6 • Cullen, M.G., Thompson, L.J., Carolan, J.C., Stout, J.C. & Stanley, D.A., Fungicides, herbicides and bees: A systematic review of existing research and methods, PLOS ONE, 14, 12, 2019, 1-17. • Raučinová, Ľ., Vargová, Z. 2000. Metodická príručka pre ochranu rastlín. AT publishing. 117 pp. ISBN 80-88954-08-8



Module 2/3	Acaricides
Module content	
Learning Objective	Students should understand what acaricides are, why are Acaricides used and their action, toxicity level of Acaricides, side effects of the use of Acaricides
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • What are Acaricides? Characteristics. • Use, action and toxicity of Acaricides • Effects of Acaricides on Bees 	<ul style="list-style-type: none"> • Introduction and definition – Characteristics of Acaricides; • Use, action and toxicity of Acaricides; • Effects of Acaricides on Bees, environment and people; • Rational use of Acaricides.
Learning Outcomes	
Knowledge	Student are able to: <ul style="list-style-type: none"> • Show basic knowledge on what Acaricides are and their basic use and action • Show basic knowledge on the side effects of Acaricides • Show basic knowledge on the consequences of irresponsible usage of Acaricides
Skills	The student is able to : <ul style="list-style-type: none"> • identify the proper ways of using Acaricides according to their scheme of action and the toxicity • offer practical and theoretical information on Acaricides
Competences	The effect of teaching is the student's awareness to generate knowledge and responsibility on proper use of Acaricides
Training and Evaluation Standard	
Planned learning activities and teaching methods	Self-learning, Online learning, Concept mapping, Quiz assessment, Student-centered learning.
Mode of delivery	Online platform
Teaching hours	4
EQF level	4
Assessment methods	Multiple-choice assessment quiz
Recommended or required reading	<ul style="list-style-type: none"> • Marcic, D. Acaricides in modern management of plant-feeding mites. <i>J Pest Sci</i> 85, 395–408 (2012). https://doi.org/10.1007/s10340-012-0442-1 • Tihelka, Erik. (2018). Effects of synthetic and organic acaricides on honey bee health: A review. <i>Slovenian Veterinary Research</i>. 55. 10.26873/SVR-422-2017. • Johnson RM, Dahlgren L, Siegfried BD, Ellis MD (2013) Acaricide, Fungicide and Drug Interactions in Honey Bees (<i>Apis mellifera</i>). <i>PLOS ONE</i> 8(1): e54092. https://doi.org/10.1371/journal.pone.0054092 • de Mattos, I.M., Soares, A.E.E. & Tarpy, D.R. Effects of synthetic acaricides on honey bee grooming behavior against the parasitic <i>Varroa destructor</i> mite. <i>Apidologie</i> 48, https://doi.org/10.1007/s13592-017-0491-9



Module 2/4	Herbicides
Module content	
Learning Objective	Students should understand what herbicides are, why are Herbicides used and their action, toxicity level of Herbicides, side effects of the use of Herbicides.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • What are Herbicides? Characteristics. • Use, action and toxicity of Herbicides • Effects of Herbicides on Bees, environment and people • Rational use of Herbicides 	<ul style="list-style-type: none"> • Introduction and definition – Characteristics of Herbicides; • Use, action and toxicity of Herbicides; • Effects of Herbicides on Bees, environment and people; • Rational use of Herbicides.
Learning Outcomes	
Knowledge	Student are able to: <ul style="list-style-type: none"> • Show basic knowledge on what Herbicides are and their basic use and action • Show basic knowledge on the side effects of using Herbicides • Show basic knowledge on the consequences of irresponsible usage of Herbicides
Skills	The student is able to: <ul style="list-style-type: none"> • identify the proper ways of using Herbicides according to their scheme of action and the toxicity • offer practical and theoretical information on Herbicides
Competences	The effect of teaching is the student's awareness to generate knowledge and responsibility on proper use of Herbicides
Training and Evaluation Standard	
Planned learning activities and teaching methods	Self-learning, Online learning, Concept mapping, Quiz assessment, Student-centered learning
Mode of delivery	Online platform
Teaching hours	4
EQF level	4
Assessment methods	Multiple-choice assessment quiz
Recommended or required reading	<ul style="list-style-type: none"> • Sherwani, S. I. , Arif, I. A. , & Khan, H. A. (2015). Modes of Action of Different Classes of Herbicides. In A. Price, J. Kelton, & L. Sarunaite (Eds.), <i>Herbicides, Physiology of Action, and Safety</i>. IntechOpen. https://doi.org/10.5772/61779 • Valavanidis, Athanasios. (2018). Glyphosate, the Most Widely Used Herbicide. Health and safety issues. Why scientists differ in their evaluation of its adverse health effects. • European Food Safety Authority BEST MANAGEMENT PRACTICES https://www.efsa.europa.eu/en/topics/topic/glyphosate • https://hracglobal.com/prevention-management/best-management-practices • Guideline to the Management of Herbicide Resistance https://hracglobal.com/files/Management-of-Herbicide-Resistance.pdf



Module 2/5	Rodenticides
Module content	
Learning Objective	Students should understand what are rodenticides, the kind of existing rodenticides and their main characteristics and toxicity. Students should know how to reduce risks for wildlife and for pollinators when using rodenticides.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • What are Rodenticides? Characteristics. • Main types of rodenticides • How do they work and how toxic are they? • Active substances allowed in Europe • Effects on wildlife. Can they affect pollinators and bees? How to reduce risks?	<ul style="list-style-type: none"> • Main types of rodenticides: Anticoagulants, Non-anticoagulants; • How do they work and how toxic are they? • List of active substances allowed in Europe; • Effects on wildlife. Can they affect pollinators and bees? • How to reduce risks? Potential impact on non-target wildlife.
Learning Outcomes	
Knowledge	Student defines basic terms related to the effect of anticoagulant and non-anticoagulant rodenticides, list some types of rodenticides, anticoagulant and non-anticoagulant.
Skills	Student is able to implement measures to reduce risks for wildlife and for pollinators when using rodenticides.
Competences	Student's awareness to the importance of reducing the use of rodenticides and preventing and reducing risks for wildlife and for pollinators when using them.
Training and Evaluation Standard	
Planned learning activities and teaching methods	Concept mapping, Participatory Learning in Action (PLA) Techniques, Questioning, Formative quizzes, Freewriting
Mode of delivery	Online e-Learning
Teaching hours	3
EQF level	4
Assessment methods	Multiple-choice tests, Self-assessment
Recommended or required reading	<ul style="list-style-type: none"> • https://guide.rrac.info/es/alternativas-a-los-anticoagulantes/no-anticoagulantes.html • Moreno Marí, Josefa, López Ferrer, Jesús, & Jiménez Peydró, Ricardo. (2004). El control de los roedores: revisión de los rodenticidas registrados en el ámbito de la sanidad ambiental en España. Revista Española de Salud Pública, 78(1), 05-16. Recuperado en 22 de agosto de 2022, de http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1135-57272004000100002&lng=es&tlng=es



Module 2/6	Other pesticides
Module content	
Learning Objective	Students should know the exiting types of pesticides different of herbicides, insecticides, fungicides, acaricides and rodenticides and the main active substances that they include. Students should understand the importance of using ecological pesticides whenever possible in order to prevent risks in the ecosystems.
Topic/Subject	Contents/main points
Types of other pesticides	<ul style="list-style-type: none"> Types of pesticides (different of herbicides, insecticides, fungicides and acaricides): Nematicides, Molluscicides, Growth regulators; (phytohormones), Treatment of wood, fibre and derivatives, Post-harvest - grain treatment; How do they act? Active substances that these pesticides include; How do they affect bees? How to reduce risks for wildlife and bees when using these pesticides; Ecological pesticides available in market.
Learning Outcomes	
Knowledge	Students define basic terms related to nematicides, mollusquicides and other specific pesticides, list the most usual types of these specific pesticides and the most usual types of ecological pesticides available for these plagues and define basic terms related to their correct use to reduce risks.
Skills	Students are able to differentiate ecological and non-ecological pesticides available in market and to implement measures to reduce risks for wildlife and for pollinators when using these pesticides.
Competences	The effect of teaching is the student's awareness to the importance of using more ecological pesticides whenever possible.
Training and Evaluation Standard	
Planned learning activities and teaching methods	Concept mapping, Participatory Learning in Action (PLA) Techniques, Questioning, Formative quizzes, Freewriting
Mode of delivery	Online e-Learning
Teaching hours	2
EQF level	3
Assessment methods	Multiple-choice tests, Self-assessment
Recommended or required reading	<ul style="list-style-type: none"> Other pesticides: https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/nematicide https://www.sciencedirect.com/topics/medicine-and-dentistry/molluscicide



Module 3	Fertilizers
Module content	
Learning Objective	Students should understand what is a fertilizer, understand the difference between organic and synthetic/mineral fertilizers, know some of the main types of mineral fertilizers, understand the environmental effects of fertilizers and how they can affect pollinators.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • Macronutrients and micronutrients • Classification and types of fertilizers • Application methods • Environmental impacts • Effects on pollinators and bees. How to reduce risks for bees. • Regulations 	<ul style="list-style-type: none"> • What are fertilisers? Characteristics; • Classification of fertilisers: Organic and inorganic or synthetic fertilisers (mineral), Single nutrient fertilisers & multinutrient fertilisers, NPK fertilisers; • Main macronutrients and effect in plants, Secondary macronutrients, Micronutrients; • Application: Liquid and solid application. Slow- and controlled-release fertilisers. Foliar application; • Environmental impact of fertilisers in soil, surface water, and groundwater. Impact on the Nitrogen Cycle; • Possible effects on pollinators and bees, How to reduce effects and risks for wildlife and bees? • European Union's Nitrates Directive and National regulations.
Learning Outcomes	
Knowledge	Students understand the difference between organic and synthetic fertilizers. Students define basic terms related to macronutrients and micronutrients and their effects in plants, list main types of fertilizers, explain the environmental effects of agriculture with large consumption of fertilizers and how it can affect soil, surface water, and groundwater and understand the possible effects of incorrect fertilizers' application on pollinators and bees
Skills	Based on the acquired knowledge, the student is able to categorize different types of fertilizers and reduce risks for wildlife and for pollinators during the application of fertilizers (especially liquid and foliar application).
Competences	The effect of teaching is the student's awareness to the importance of reducing the use of fertilizers and the importance of preventing risks for wildlife and for pollinators during the fertilizer's application. Students' critique of the environmental impact of agriculture with large consumption of fertilizers and how it affects the Nitrogen Cycle.
Training and Evaluation Standard	
Planned learning activities and teaching methods	Concept mapping, Participatory Learning in Action (PLA) Techniques, Questioning, Formative quizzes, Freewriting
Mode of delivery	Online e-Learning
Teaching hours	5
EQF level	4
Assessment methods	Multiple-choice tests, Self-assessment
Recommended or required reading	<ul style="list-style-type: none"> • Consumo de fertilizantes en la Unión Europea 2019-2029: https://www.grupofertiberia.com/es/blog/2020/enero/consumo-de-fertilizantes-en-la-uni%C3%B3n-europea-2019-2029/ • Metodos de Aplicacion de Fertilizantes: https://www.tipsytemasagronicos.com/metodos-de-aplicacion-de-fertilizantes/ • The new fertiliser regulation – consequences for farmers: https://nutrیمان.net/EU-Fertiliser-Regulation



Module 4	Organic practices in agricultural production
Module content	
Learning Objective	Students should understand organic farming for both crops and livestock and improve farm sustainability, longevity and reduce environmental footprint.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • Key points of the Organic Agriculture • Benefits of the Organic Agriculture • Organic agriculture in European Union • Organic management practices 	<ul style="list-style-type: none"> • Key indicators of sustainable agriculture; • Farming and climate change; • Concepts and principles of organic farming; • Plant protection measures, biopesticides, natural predators, cultural practice; • Rotation design for organic system; • Transition to organic agriculture, farming system; • Standards of organic food and marketing.
Learning Outcomes	
Knowledge	Students define terms related to key principles of organic crop production, farm management, and market strategies, focusing on specialty crops and animals in the region.
Skills	Based on the acquired knowledge, the student is able to implement relevant types of farm management practices suitable for organic production, under each of 6 categories (soil, water, weed, insect pest, disease management, and marketing).
Competences	The effect of teaching is the student's awareness to discuss the scope and nature of organic farming in today's world and understand the environmental, economic and political issues concerning organic farming.
Training and Evaluation Standard	
Planned learning activities and teaching methods	Online Learning, face to face meeting and field trips.
Mode of delivery	Online e-Learning
Teaching hours	5 – 10
EQF level	3
Assessment methods	Multiple-choice self- evaluation tests
Recommended or required reading	<ul style="list-style-type: none"> • Dima, S., Otero, A. Organic Farming for Sustainable Agricultural Production. A Brief Theoretical Review and Preliminary Empirical Evidence. <i>Environmental and Resource Economics</i> 10, 177–188 (1997). https://doi.org/10.1023/A:1026472410031 • Migliorini, P., Wezel, A. Converging and diverging principles and practices of organic agriculture regulations and agroecology. A review. <i>Agron. Sustain. Dev.</i> 37, 63 (2017). https://doi.org/10.1007/s13593-017-0472-4 • D. Rigby, D. Cáceres, Organic farming and the sustainability of agricultural systems, <i>Agricultural Systems</i>, Volume 68, Issue 1, 2001, ISSN 0308-521X, https://doi.org/10.1016/S0308-521X(00)00060-3 https://www.sciencedirect.com/science/article/pii/S0308521X00000603



Module 5	Organic beekeeping
Module content	
Learning Objective	Students should understand what organic beekeeping and organic farming are, as well as what ecological plant protection methods are and how they relate to bees in nature.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> Importance of Bees Principles and Regulations Ecological (bee-friendly) methods of plant protection Alternative Organic Methods of Pest Management 	<ul style="list-style-type: none"> What is organic beekeeping, methods of organic beekeeping and European regulations; What is organic farming, methods of organic farming and European regulations; Organic farming and how to use pesticides without harming the bees, environment, and humans.
Learning Outcomes	
Knowledge	Students define basic terms related to organic beekeeping and integrated pest management.
Skills	Based on the acquired knowledge, the student can carry out the steps of organic beekeeping in conformity with the principles.
Competences	The effect of teaching is the students become more aware of the need to take action in order to reduce irrational chemical use in fields and adopt an organic farming, beekeeping, and pest management consciousness.
Training and Evaluation Standard	
Planned learning activities and teaching methods	Online Learning, face to face Meeting and field trips.
Mode of delivery	Blended approach - The online and face-to-face methods will be used to ensure that individuals comprehend the course.
Teaching hours	3
EQF level	3 - 4
Assessment methods	The individuals' full understanding of the subject will be tested by using a multiple-choice assessment method to ensure there are no gaps in their knowledge about topic.
Recommended or required reading	<ul style="list-style-type: none"> Conrad,R. (2013) Natural Beekeeping: Organic Approaches to Modern Apiculture (2nd ed.).Chelsea Green Publishing. Ontario Beekeepers` Association .(n.d.). Organic Beekeeping Management Retrieved July 22, 2022, from https://www.ontariobee.com/outreach/fact-sheets-and-publications



Module 6	Healing of beehives
Module content	
Learning Objective	Student should understand the concept of apitherapy, the benefits of apitherapy, the different methods and products related to apitherapy.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • Introduction to Apitherapy • Healing properties • Products and techniques of Apitherapy 	<ul style="list-style-type: none"> • Healing properties of beehives – Introduction to Apitherapy; • Healing properties - Effects and use of Apitherapy; • Products and techniques of Apitherapy.
Learning Outcomes	
Knowledge	Student is able to <ul style="list-style-type: none"> • Provide a definition of apitherapy • Show knowledge about the health benefits of apitherapy • Show basic knowledge of different products from bees and hives
Skills	Based on the acquired knowledge, the student is able to: <ul style="list-style-type: none"> • Distinguish between different types of products extracted from bees and hives • Use the apitherapy products according to their properties
Competences	The effect of teaching is the student's awareness to understand the benefits of apitherapy and different methods and products that can be used in this type of therapy.
Training and Evaluation Standard	
Planned learning activities and teaching methods	Self-learning, Online learning, Concept mapping, Quiz assessment , Student-centered learning
Mode of delivery	Online platform
Teaching hours	4
EQF level	3
Assessment methods	Multiple-choice self-assessment quiz
Recommended or required reading	<ul style="list-style-type: none"> • Metod Šuligoj (2021) Origins and development of apitherapy and apitourism, Journal of Apicultural Research, 60:3, 369-374, DOI: 10.1080/00218839.2021.1874178 • J.M. Sforcin Biological properties and therapeutic applications of propolis Phytother. Res., 30 (6) (2016) • Braakhuis Evidence on the health benefits of supplemental propolis Nutrients, 11 (2019) • Habryka, M. Kruczek, B. Drygaś Bee products used in apitherapy World Sci. News, 48 (2016) • B. Denisow, M. Denisow-Pietrzyk Biological and therapeutic properties of bee pollen: a review J. Sci. Food Agric., 96 (2016)



Module 7	The health of bees
Module content	
Learning Objective	Students should understand with the most common diseases and parasites of bee families. Emphasis is placed on the identification of disease units or parasites, on the indication of methods of prevention and control.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> • Diagnosis of bee diseases • Hygiene and disinfection treatment • The most important diseases of bees and methods of their control • Bee Poisoning • Good beekeeping practice for healthy bees 	<ul style="list-style-type: none"> • The importance of bee family health and economic consequences of bee diseases; • Diagnosing bee diseases and sampling for diagnostic tests; • Hygiene and disinfection treatments; • The most important bee diseases and methods of diseases control; • The most important bee parasites and methods of its control.
Learning Outcomes	
Knowledge	Students define basic terms related to the importance of bee family health and the economic consequences of bee diseases. They understand the most important diseases of bees and methods of their control and knowledge to recognize bee poisoning.
Skills	Based on the acquired knowledge, the student is able to provide diagnoses of bee diseases and sampling for diagnostic tests. He/she can provide hygienic and disinfectant treatments.
Competences	The effect of teaching is the student's awareness of the importance of the honeybees in multiple ecosystem services and can improve the understanding of the factors affecting honey bees and beekeeping. The students can explore factors affecting bees and beekeeping, test the hypothesis that honeybee colony losses are associated with agricultural land-use intensity, and discuss the role of beekeeping in rural development.
Training and Evaluation Standard	
Planned learning activities and teaching methods	Online Learning, face to face focus groups activities and field trips.
Mode of delivery	Online e-Learning
Teaching hours	5 - 10
EQF level	3
Assessment methods	Multiple-choice self-assessment tests
Recommended or required reading	<ul style="list-style-type: none"> • Topolska G., Gajda A., Imińska U. 2018. Atlas chorób pszczół najbardziej istotnych dla polskich pszczelarzy. Powszechne Wydawnictwo Rolnicze i Leśne. Warszawa. • W. Ritter. Zdrowie pszczół. 2016. Zapobieganie chorobom, ich rozpoznawanie i leczenie. Wydawnictwo RM. Warszawa. • Chorobiński P. Choroby i szkodniki pszczoły miodnej. ISBN 978-83-940543-1-1



Module 8	Inventory of good agricultural practices concerning the use of chemicals
Module content	
Learning Objective	Students should understand using of plant protection products, which requires extensive knowledge and responsibility of people who perform chemical treatments, compliance with the regulations governing their conduct and cooperation with apiary owners and care for them.
Topic/Subject	Contents/main points
<ul style="list-style-type: none"> Pollinators and Pesticides Bee Poisoning Good Practices 	<ul style="list-style-type: none"> Good practices of the plant protection; The use of plant protection products should comply with the conditions of permitted use, that is, in accordance with the label; The minimum necessary amount of chemical plant protection products should be used and chemical methods should be combined with other methods (e.g., mechanical and biological), where possible and economically justified.
Learning Outcomes	
Knowledge	Student defines basic terms related to good practices of the plant protection
Skills	The student is able to use the plant protection products in compliance with the conditions of permitted use, that is, in accordance with the label; the minimum necessary amount of chemical plant protection products should be used and chemical methods should be combined with other methods (e.g., mechanical and biological), where possible.
Competences	The effect of teaching is the student's awareness of that: <ul style="list-style-type: none"> there are more and more beekeepers in the world who run their apiaries without the use of toxic chemicals and they are productive and self-sufficient good plant protection practice is to ensure not only the acceptable effectiveness of the treatments performed, but also to minimize the risk to human, animal and environmental health properly applied insecticides should not poison the bees
Training and Evaluation Standard	
Planned learning activities and teaching methods	Online Learning, Face to face learning, Meeting and field trips
Mode of delivery	Blended approach - the online and face-to-face methods will be used to ensure that individuals comprehend the course
Teaching hours	3
EQF level	3
Assessment methods	The individuals' full understanding of the subject will be tested by using a multiple-choice assessment method to ensure there are no gaps in their knowledge about topic
Recommended or required reading	<ul style="list-style-type: none"> Topolska G., Gajda A., Imińska U. 2018. Atlas chorób pszczół najbardziej istotnych dla polskich pszczelarzy. Powszechnie Wydawnictwo Rolnicze i Leśne. Warszawa. W. Ritter. Zdrowie pszczół. 2016. Zapobieganie chorobom, ich rozpoznawanie i leczenie. Wydawnictwo RM. Warszawa. Chorobiński P. Choroby i szkodniki pszczoły miodnej. ISBN 978-83-940543-1-1



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in terms of the impact on bees in the ecosystem

Project no. 2021-1-SK01-KA220-VET-000025257



**Funded by
the European Union**

Module 9

Case studies

Case studies on Rational use of plant protection products and fertilizers in terms of the impact on bees in the ecosystem.