

Academic Year/course: 2022/23

28438 - Bee Production and Health

Syllabus Information

Academic Year: 2022/23

Subject: 28438 - Bee Production and Health

Faculty / School: 105 - Facultad de Veterinaria

Degree: 451 - Degree in Veterinary Science

ECTS: 3.0

Year:

Semester: Second semester

Subject Type: Optional

Module:

1. General information

1.1. Aims of the course

The general goal of the course is the acquisition by the students of the learning of Apiculture Management, Production and Health.

In order to achieve this general objective, the specific learning objectives of the subject of Bee Production and Health are:

- knowing the population, behavior, needs and management of the hive.
- Knowing the breeds and bee reproduction
- Knowing beekeeping production
- Knowing the flora and melliferous vegetation
- Knowing the beekeeping pathology
- Know the quality criteria of beekeeping products
- To know the economy and commercialization of apiculture products.
- Being Familiar with beekeeping legislation

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>), so that the acquisition of the learning outcomes of the subject provides training and competence to contribute to some extent to their achievement:

- Goal 2: Zero Hunger. Target 2.3 Doubling of small-scale agricultural productivity and incomes. Target 2.4 Sustainable and resilient agricultural practices. Target 2.A Increase investment in agriculture.
- Goal 3: Health and well-being. B Support R&D for vaccines and essential medicines. D Strengthen health risk management.
- Goal 4: Quality education. Target 4.3 Ensure equal access to higher education. Target 4.4 Increase employability skills. Target 4.5 Eliminate gender disparity and vulnerable groups. Target 4.7 Promote global education for Sustainable Development.
- Goal 8: Decent work and economic growth. Target 8.3 Promote small and medium-sized enterprises. Target 8.4 Improve efficient and respectful production and consumption.
- Goal 9: Industry, innovation and infrastructure. Target 9.4 Modernisation of infrastructure, clean technology. Target 9.5 Increase scientific research, technological capacity.
- Goal 11: Sustainable cities and communities. Target 11.4 Protection of cultural and natural heritage. A Support urban, peri-urban and rural linkages.
- Goal 12: Responsible production and consumption. Target 12.2 Achieve efficient use of natural resources.
- Target 13: Climate action. Target 13.3 Improve environmental education and awareness.
- Target 15: Life of terrestrial ecosystems. Target 15.8 Prevention of invasive species. Target 15.9 Integration of environmentally sensitive plans.

1.2. Context and importance of this course in the degree

The subject of Beekeeping Production and Health should help students acquire the necessary skills to be able to know in an integrated way all those aspects related to beekeeping production and health.

1.3. Recommendations to take this course

The student should have taken the subjects of Biology and Biochemistry, Economics and Business, Agronomy, Genetics, Microbiology, Parasitology and Pharmacology and pharmacotherapy.

It is important that the student informs if he suffers any type of allergies (especially to bee stings).

2. Learning goals

2.1. Competences

On successful completion of this course, students will be able to:

1. Know the population, behavior, needs and management of the hive.
2. Know the main species, subspecies and breeds of the bees and with it to be able to apply the programs of genetic improvement to obtain more productive and resistant populations to pathologies. To be able to apply reproductive strategies and procedures to production.
3. Understand the basics of beekeeping management and production.
4. Differentiate and value different types of species and important plant formations in beekeeping production, at both local and regional scales. To interpret bee transhumance in relation to the availability of food associated with the phenology of plant species. To value the contribution of beekeeping to pollination and biodiversity. To value the importance of the type of food (melliferous flora) in the organoleptic and analytical qualities.
5. Know the pathological processes that affect bees and to apply the theoretical and practical knowledge of beekeeping pathology to real contexts.
6. Know and typifying apiculture products. To know the parameters that determine their quality control.
7. Understand the economic relevance of the beekeeping sector. Analyse production costs and interpret the economic value of production and explain what factors influence consumption.
8. Know the legislation related to the beekeeping sector as well as to know how to use the tools for its interpretation. Interpreting and applying the corresponding legislation in different situations that may arise in their professional environment.
9. Communicate correctly and effectively, using the appropriate scientific terminology related to the subject.

2.2. Learning goals

If students complete the course successfully, they should be able to:

1. Know the population, behaviour and needs of bees. It is also able to inspect a hive, control defensive behaviour, assess the risk of stinging and overcome fear.
2. Know the main species, subspecies and breeds. It also knows how to apply genetic improvement programmes.
3. Know the reproductive characteristics of the different individuals of the hive and the reproductive management procedures that allow the increase of productivity and health of the hive, as well as carrying out the management for the breeding and rational exploitation of a hive.
4. Know the main types of hives and their components, as well as the complementary material. Know the beekeeping calendar and the main management actions to be carried out in each season.
5. Differentiate the main groups and plant species of interest for beekeeping production, as well as to indicate their geographical distribution and the relationship of their phenology with transhumance. In addition, it is able to value in melliferous terms, different types of vegetation and to describe the ecological services provided by beekeeping.
6. Know and recognise the different pathologies that affect bees and of carrying out the differential diagnosis of the different processes. It must also demonstrate that it has acquired the necessary skills to collect samples and carry out certain diagnostic tests in order to identify the causal agent, as well as to apply therapeutic protocols and appropriate strategies for the prevention, control and/or eradication of the main diseases.
7. Know the hygienic, nutritional and pharmacological characteristics of the products of the beehive, as well as their properties and quality indicators. They must know their classification according to technological and legal criteria and they must know how to carry out an adequate quality control by means of appropriate analysis methods.
8. Know the economic importance of the Spanish beekeeping sector. Understands and is able to explain the economic concepts of "market failure" and "externality". He knows the productive structures of Spanish beekeeping and the economic characteristics. Knows the Spanish and EU foreign trade of apiculture products and the characteristics of the internal market and consumption. Find out what are considered to be the strengths and weaknesses of the Spanish beekeeping sector. Get to know the systems of support for the sector implemented in Spain.
9. Know and interprets the legislation related to the beekeeping sector.

2.3. Importance of learning goals

They make it possible to understand and know the fundamental aspects of Apiculture Production and Health.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Evaluation activities

The student must demonstrate that has achieved the intended learning outcomes through the following assessment activities

- **Theoretical sessions** will be evaluated by means of a written exam consisting of 50 multiple choice questions (with 4 options), with error penalty (value of the question divided by the number of options). The questions will be representative of the different thematic blocks. Passing these tests will accredit the achievement of learning outcomes 1, 2, 3, 4, 5, 6, 7, 8, and 9.

The grade will be from 0 to 10, and it will be necessary to obtain a 5 to overcome it.

The grade will be 70% of the student's final grade in the subject, as long as it has been passed.

- **Practice sessions** the attendance, the use and the acquisition of abilities and skills in the execution of the different practices (laboratory and visits to exploitations and industries of the sector) will be assessed.

Overcoming them will guarantee the achievement of part of learning outcomes 1, 3, 4, 5, 6, 7 and 9. Failure to attend any of the practices will lead to the examination of the same in the official calls together with the theory test.

The grade will be from 0 to 10, and it will be necessary to obtain a 5 to pass it.

The grade will be 30% (15% laboratory practice + 15% field practice) of the student's final grade in the subject, provided it has been passed.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning process that is designed for this subject is based on the following:

The theoretical class is structured into 8 thematic blocks, divided into 24 lessons and taught in 19 sessions (fifty minutes each), and 11 hours of practical training, divided into 6 hours of laboratory practices and 5 hours of field practices to visit apiaries and industries related with the sector.

The lectures will develop the theoretical concepts detailed in the program of the subject (see program). It is planned to deliver the documentation for each issue available to students in the virtual campus of the University (ADD) or in the reprographics service.

In the laboratory, the practical program detailed below (see program) is performed. The laboratory training consists in 6 hours of practice, distributed in 4 sessions. Initially an explanation of the session is taught and then students do the practice under the supervision of the teacher. Students will have a handbook of practical activities to work in the laboratory. Field practices consist in an visit to apiaries; to visit an apiary and melliferous flora and vegetation types identification around the beehives (3h) and an industry of bee products (honey, wax, propolis) (2h). In the activity, the teacher and the owner of the industry will be present.

4.2. Learning tasks

The program offered to the student in order to achieve the expected results includes the following activities:

Theoretical classes: 19 hours of theoretical activities, divided into 8 thematic blocks and consisting in 24 lessons.

Laboratory practice: 6 hours of practical training, divided into four sessions.

Field practices: 5 hours of field training consisting of supervised visits to apiaries and to industries and businesses in the sector.

4.3. Syllabus

Theoretical teaching (19 hours)

1. Population, behaviour, requirements and management of a colony (2h)

Lesson 1.- Introduction: historical and current relevance of beekeeping. Anatomy, physiology and biology of the bee (*Apis mellifera*). Worker, queen and drone. Biological cycle.

1. Genetics and Reproduction (3h)

Lesson 2.- Species and breeds. Breed concept in beekeeping. The ideal breed. Main species. Main European and African breeds of *Apis mellifera*. Asiatic breeds. Crossbreeds.

Lesson 3.- Queen bee and drone genital organs. Nuptial flights. Worker bee genital organs features.

Lesson 4.- Development. Sex determination and castes. Parthenogenesis.

Lesson 5.-Swarming and hive reproductive management.

Lesson 6.- Rearing queen bees and artificial insemination.

3. Beekeeping production (2h)

Lesson 7.- The hive. Introduction. Hive types. General characteristics. Parts of a common hive. Equipment and materials in beekeeping. All it is needed to obtain honey and other products from the bees. General tools.

Lesson 8.- Management general in the practical beekeeping. Beekeeping calendar. Main activities to do before and after the honeydew. How prepare the hive to the winter time and other periods with low global activity.

1. Melliferous flora and vegetation (2h)

Lesson 9.- Melliferous flora and vegetation. Main plant resources for bees: nectar, pollen, honeydew, juices, propolis. Geographic areas with bee foraging resources.

Lesson 10.- Phenology and Transhumances.

Lesson 11.- Ecosystem services of Beekeeping: entomophilous pollination. Plant-bee co-evolution.

Lesson 12. - Assessment of the feeding value of melliferous vegetation types. Regional assessment.

1. Bee pathology (4h)

Lesson 13.- Factors affecting disease outbreaks and severity.

Lesson 14.- Fungal diseases. Chalkbrood (*Ascosphaera*). Stonebrood (*Aspergillus*)

Lesson 15.- Bacterial diseases. American foulbrood, European foulbrood. Other bacterial diseases.

Lesson 16.- Viral diseases: Paralysis virus, Sac brood virus. Other viral diseases.

Lesson 17.- Parasitic diseases: varroosis, nosemosis and acaraposisis

Lesson 18.- Colony Collapse Disorder (CCD). Other processes (biotic and abiotic) that affect bees and hives.

1. Quality control of bee products (2h)

Lesson 19.- Quality of honey. Definition. Types of honey. Bromatological composition. Components of nutritional interest. Contaminants. Toxic honeys. Quality control.

Lesson 20.- Other products of the hive. Definition. Types of bee products. Bromatological composition. Components of nutritional interest. Contaminants. Quality control

1. Economics and marketing of apiculture/beekeeping products (2h)

Lesson 21.- Introduction to the Spanish economy concerning beekeeping sector. The economic and environmental importance of the sector. Market failure and externality concepts.

Lesson 22.- Production structures, production, demand and marketing. Censuses, agricultural holdings and regional distribution. Production costs. Economic quantity and value in the production. Consumption: differentiated products and quality schemes. Spanish and E.U. foreign trade. Market prospects.

Lesson 23.- Support systems. The strengths and weaknesses of the sector. Structural and quality support measures. National Beekeeping Plan. Future prospects of the beekeeping sector. Strategic recommendations.

1. Legislation (2h)

Lesson 24. - Current legal framework on beekeeping activity, production and bee health.

Practical training (11 hours)

- Laboratory training: (6h)

Practical activity 1. - Anatomy of *Apis mellifera* (brood and adult). Laboratory diagnosis of infectious and parasitic diseases (3h).

Practical activity 2. Presentation of semen collection and queen bee artificial insemination (1h).

Practical activity 3. - Melliferous flora and vegetation types identification (1h)

Practical activity 4.- Sensory evaluation of honey. Quality of honey (1h).

-Field training: (5h)

- . Visit to an apiary: biology, management and health beekeeping
- . Recognition of flora and honey bee vegetation
- . Visit to industry and / or commerce of the sector: beekeeping and hygienic-sanitary aspects of the production and commercialization of the products.

4.4. Course planning and calendar

Schedule sessions and presentation of works

The dates and key milestones of the subject are described in detail, (along with those of the rest of subjects of fourth year in the Degree in Veterinary Medicine), on the website of the Faculty of Veterinary Medicine (link: <http://veterinaria.unizar.es/gradoveterinaria/>). This link will be updated at the beginning of each academic year.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28438>