

Course: BIOLOGY AND PATHOLOGY OF BENEFICIAL INSECTS

UNIVERSITY OF ZAGREB
FACULTY OF VETERINARY MEDICINE
Heinzelova 55
Tel. 01/2390-153
Division: ANIMAL PRODUCTION AND BIOTECHNOLOGY
Organizational unit: BIOLOGY AND PATHOLOGY OF FISH AND BEES
E-mail of the course leader: itlak@vef.unizg.hr
Register No of the organisational unit: 251-61-14/24-7
Zagreb, 24/1/2024

177910		REPUBLIKA HRVATSKA	
Veterinarski fakultet u Zagrebu			
Primljeno:	25.01.2024		
Klasifikacijska oznaka	Org. jed.		
605-03/23-04/28	251-61-37;251-61-41;		
Uredbeni broj	Prilozi	Vrijednost	
251-61-14/359-24-79	0	-	

COURSE SYLLABUS

Course name: Biology and Pathology of Beneficial Insects
Academic year 2023/2024

Course leader: Full Professor Ivana Tlak Gajger

Deputy course leader: Associate Professor Krešimir Matanović

Teachers: Full Professor Ivana Tlak Gajger
Associate Professor Krešimir Matanović
Valerija Benko PhD

First day of classes: 28/2/2024

Last day of classes: 7/6/2024

Activities - Biology and Pathology of Beneficial Insects (1/3)

	Start T	End Ti	Subject	Group	Note	Length	Instructor	Room
28/02/2024	13:00	14:30	p01 Introduction	8E-1, 8E-2, 8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
29/02/2024	13:45	15:15	p02 Life and development of honeybee colony	8E-1, 8E-2, 8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
01/03/2024	14:00	15:30	v01 Hives. Beekeeping equipment	8E-1, 8E-2		1:30	Tlak Gajger I.	P_ribe i pcele
04/03/2024	12:00	13:30	v01 Hives. Beekeeping equipment	8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
06/03/2024	14:00	15:30	v02 Anatomy of honeybee I	8E-1, 8E-2		1:30	Tlak Gajger I.	P_ribe i pcele
08/03/2024	11:15	12:45	v02 Anatomy of honeybee I	8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
11/03/2024	14:30	16:00	p03 Role of veterinarians in beekeeping	8E-1, 8E-2, 8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
14/03/2024	9:30	11:00	p04 European foulbrood	8E-1, 8E-2, 8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
19/03/2024	14:30	16:00	v03 Anatomy of honeybee II	8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
20/03/2024	10:45	12:15	v03 Anatomy of honeybee II	8E-1, 8E-2		1:30	Tlak Gajger I.	P_ribe i pcele
21/03/2024	10:15	11:45	v04 Anatomy of honeybee III	8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
25/03/2024	9:05	10:35	p05 Parasitic diseases	8E-1, 8E-2, 8E-3		1:30	Matanovic K.	P_fizika
26/03/2024	8:00	9:30	v04 Anatomy of honeybee III	8E-1, 8E-2		1:30	Tlak Gajger I.	P_ribe i pcele
27/03/2024	11:45	13:15	v05 Diagnostic, control and eradication of honeybee diseases I	8E-1		1:30	Tlak Gajger I.	P_ribe i pcele
27/03/2024	13:30	15:00	v05 Diagnostic, control and eradication of honeybee diseases I	8E-2		1:30	Tlak Gajger I.	P_ribe i pcele

Activities - Biology and Pathology of Beneficial Insects (2/3)								
	Start T	End Ti	Subject	Group	Note	Length	Instructor	Room
27/03/2024	15:15	16:45	v05 Diagnostic, control and eradication of honeybee diseases I	8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
08/04/2024	8:00	9:30	v06 Diagnostic, control and eradication of honeybee diseases II	8E-3, V_ribe i pcele		1:30	Tlak Gajger I.	P_ribe i pcele
08/04/2024	14:30	16:00	v06 Diagnostic, control and eradication of honeybee diseases II	8E-1, V_ribe i pcele		1:30	Tlak Gajger I.	P_ribe i pcele
09/04/2024	14:15	15:45	v06 Diagnostic, control and eradication of honeybee diseases II	8E-2, V_ribe i pcele		1:30	Tlak Gajger I.	P_ribe i pcele
22/04/2024	8:15	9:00	p06 Non-infection diseases	8E-1, 8E-2, 8E-3		0:45	Tlak Gajger I.	P_ribe i pcele
23/04/2024	8:15	9:45	v07 Morphological identification of exotic parasites	8E-1, V_ribe i pcele		1:30	Tlak Gajger I.	P_ribe i pcele
23/04/2024	15:30	17:00	v07 Morphological identification of exotic parasites	8E-2		1:30	Tlak Gajger I.	P_ribe i pcele
24/04/2024	8:00	9:30	v08 Biology and pathology of bumblebees	8E-2		1:30	Matanovic K.	P_ribe i pcele
24/04/2024	13:00	14:30	v07 Morphological identification of exotic parasites	8E-3		1:30	Tlak Gajger I.	P_ribe i pcele
25/04/2024	16:00	17:30	v08 Biology and pathology of bumblebees	8E-1		1:30	Matanovic K.	P_ribe i pcele

Activities - Biology and Pathology of Beneficial Insects (3/3)									
	Start T	End Ti	Subject	Group	Note	Length	Instructor	Room	
26/04/2024	14:15	15:45	v08 Biology and pathology of bumblebees	8E-3		1:30	Matanovic K.	P_ribe i pcele	
21/05/2024	16:15	17:15	Biology and Pathology of Beneficial Insects	8E-1, 8E-2, 8E-3	Kolokvij	1:00	Tlak Gajger I.	P_ribe i pcele	
06/06/2024	8:00	16:00	v09 Field work- Apiary I	8E-1, 8E-2		9:00	Tlak Gajger I.		
06/06/2024	8:00	16:00	v09 Field work- Apiary I	8E-3		9:00	Tlak Gajger I.		
06/06/2024	16:15	17:15	Biology and Pathology of Beneficial Insects	8E-1, 8E-2, 8E-3	Kolokvij - I. ponavljanje	1:00	Tlak Gajger I.	P_ribe i pcele	
07/06/2024	8:00	16:00	v10 Field work- Apiary II	8E-1, 8E-2		9:00	Tlak Gajger I.		
07/06/2024	8:00	16:00	v10 Field work- Apiary II	8E-3		9:00	Tlak Gajger I.		
Total: 32						76:15			

STUDENT OBLIGATIONS

Lecture attendance	Attending lectures: 3-6 points (1 lecture hour equals 0.54 point)
Practicals attendance	Attending practicals: 8-12 points. Student must attend at least 17 hours of practicals to achieve minimum of 8 points.
Active participation in seminars and practicals	Participation at exercises: 5-10 points (evaluated with short oral tests)
Final exam	Final exam – oral: 24-40 points (5 questions): 1 question equals 8 points
Examination requirements	Student requirements are defined in the Regulations on the Integrated Undergraduate and Graduate Study of Veterinary Medicine (2022). Given the above, the student must acquire a minimum number of points from all assessment elements in order to take the final exam. Regulations On Intergraduate And Graduate Studies, Article 41: a student can justifiably be absent from up to 50% of the lectures; 30% of the seminars and 30% of the exercises.

GRADING AND EVALUATING STUDENT WORK

Continuous knowledge-checking (mid-terms)	Continuous knowledge checking (1 preliminary exam – 20 questions): 20-32 points (1 question equals 1.6 points)
Final exams (dates)	18/3/2024, 15/4/2024, 17/6/2024, 17/7/2024, 9/7/2024, 2/9/2024 i 24/9/2024
Form of final exam	Oral

LITERATURE

Obligatory literature	<ol style="list-style-type: none">1. VIDAL-NAQUET, N. (2015): Honeybee Veterinary Medicine: Apis mellifera L. 5m Publishing Benchmark House, Sheffield, UK.2. SNODGRASS, R. E., E. H. ERIKSON (2005): The anatomy of the honey bee. The hive and the honey bee (ed. J. M. Graham). Dadant and Sons, Hamilton, USA.3. SOUTHWICK, E. E. (2005): Physiology and social physiology of the honey bee. The hive and the honey bee (ed. J. M. Graham). Dadant and Sons, Hamilton, USA.4. GARY, N. E. (2005): Activities and behavior of honey bees. The hive and the honey bee (ed. J. M. Graham). Dadant and Sons, Hamilton, USA.5. BAILEY, L., B. BALL (1991): Honey bee pathology. Academic Press, London.6. TLAK GAJGER, I. (2021): Honeybee Diseases in Modern Production. University of Zagreb Faculty of Veterinary Medicine, Zagreb.
Optional literature	<ol style="list-style-type: none">6. TAUTZ, J. (2008): The buzz about bees – biology of a superorganism. Springer, Germany.7. CARON, D. M., L.J. CONNOR (2013): Honey bee biology and beekeeping. Wicwas Press, Pennsylvania, USA.

OBJECTIVES AND LEARNING OUTCOMES

Course objectives	During lectures and exercises student must obtain general knowledge about honeybee breeding in order to comprehend the importance and role of veterinarians in recognizing and controlling diseases. The skills which one must accomplish are proper examination of honeybee colonies, recognition of clinical signs, sampling and sending the materials for laboratory procedures, and also apply prevention and therapy of honeybee diseases.
Learning outcomes	<p>The course is linked to the basic veterinary courses in previous years of study, and represents synthesis of previous veterinary disciplines applicable to the biology and pathology of beneficial insects. The course prepares students for laboratory and field work in biology and pathology of beneficial insects array.</p> <p>Learning outcomes:</p> <ol style="list-style-type: none">1. Annotate the role of honeybee in natural ecosystems2. Explain manner of life and activities of honeybee colony, construction of combs and development of brood3. Recognize different types of hives, feeders and water suppliers, and beekeeping equipment4. Describe individual organs of health honeybee and alterations caused by diseases5. Distinguish diseases of brood and adult bees based on characteristic signs6. Apply basic clinical and diagnostic techniques with aim to appoint suspicion on honeybee diseases7. Define role of veterinarian in procedure of sampling and sending materials for laboratory examinations, treatments and sanitation of diseases.

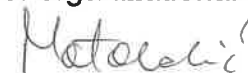
GRADING SCHEME

<i>Points</i>	<i>Grade</i>
Up to 59	1 (F)
60-76	2 (D,E)
77-84	3 (C)
85-92	4 (B)
93-100	5 (A)

Course leader



Head of organizational unit:



Note: The course leader is required to submit a Course Syllabus to all teachers and associates pertaining to the Course

Timetable for LECTURES academic year 2023/2024

LECTURES				
Date	Methodological unit	Teacher	Location / Time	Literature
28/2/2024 1 st lecture	Introduction. Species and races of honeybees. Honeybee colony. Development of honeybee brood. Apian products.	Full Professor Ivana Tlak Gajger	Practice Room Biology and Pathology of Fish and Bees 1pm-2.30pm	No. 1, 3, 4, 6, 7 student notes
29/2/2024 2 nd lecture	Life and development of honeybee colony.	Full Professor Ivana Tlak Gajger	Practice Room Biology and Pathology of Fish and Bees 1.45pm-3.15pm	No. 1, 3, 4, 6, 7 student notes
11/3/2024 3 rd lecture	Role of veterinarians in beekeeping. Recognizing of diseases signs. Legislation. Bacterial diseases. American foulbrood.	Full Professor Ivana Tlak Gajger	Practice Room Biology and Pathology of Fish and Bees 2.30pm-4pm	No. 1 student notes
14/3/2024 4 th lecture	European foulbrood. Virus diseases. Nosemosis.	Full Professor Ivana Tlak Gajger	Practice Room Biology and Pathology of Fish and Bees 9.30am-11am	No. 1
25/3/2024 5 th lecture	Parasitic diseases (Varroosis, Acarosis); Fungal diseases (Chalkbrood disease, Stonebrood disease).	Associate Professor Krešimir Matanović	Practice Room Biology and Pathology of Fish and Bees 9.15am-10.45am	No. 1
22/4/2024 6 th lecture	Non-infection diseases. Toxicology in beekeeping. Pests (Aethina tumida).	Full Professor Ivana Tlak Gajger	Practice Room Biology and Pathology of Fish and Bees 8.15am-9am	No. 1, 5

Timetable for PRACTICALS academic year 2022/2023

PRACTICALS						
Date	Methodological unit	Teacher	Type of practical (Article 31. of Regulation)	Group	Location / time	Literature
1/3/2024 1 st practical	Hives. Beekeeping equipment. Beeswax combs and comb foundations.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Laboratory	1,2	Practice Room Biology and Pathology of Fish and Bees 2pm-3.30pm	No. 7, 2 student notes
4/3/2024 1 st practical	Hives. Beekeeping equipment. Beeswax combs and comb foundations.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Laboratory	3	Practice Room Biology and Pathology of Fish and Bees 12pm-1.30pm	No. 7, 2 student notes
6/3/2024 2 nd practical	Anatomy of honeybee I (Exoskelet, legs, wings; organs for feeding).	Full Professor Ivana Tlak Gajger Valerija Benko PhD	Laboratory	1,2	Practice Room Biology and Pathology of Fish and Bees 2pm-3.30pm	No. 2
8/3/2024 2 nd practical	Anatomy of honeybee I (Exoskelet, legs, wings; organs for feeding).	Full Professor Ivana Tlak Gajger	Laboratory	3	Practice Room Biology and Pathology of Fish and Bees 11.15am-12.45pm	No. 2
19/3/2024 3 rd practical	Anatomy of honeybee II (Alimentary channel, respiratory system, circulatory system, nervous and sensory system).	Full Professor Ivana Tlak Gajger	Laboratory	3	Practice Room Biology and Pathology of Fish and Bees 2.30pm-4pm	No. 2
20/3/2024 3 rd practical	Anatomy of honeybee II (Alimentary channel, respiratory system, circulatory system, nervous and sensory system).	Full Professor Ivana Tlak Gajger Valerija Benko PhD	Laboratory	1,2	Practice Room Biology and Pathology of Fish and Bees 10.45am-12.15pm	No. 2

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21/3/2024 4 th practical	Anatomy of honeybee III (Eye, wax glands, scent glands, sting and poisoning gland).	Full Professor Ivana Tlak Gajger	Laboratory	3	Practice Room Biology and Pathology of Fish and Bees 10.15am-11.45am	No. 2
26/3/2024 4 th practical	Anatomy of honeybee III (Eye, wax glands, scent glands, sting and poisoning gland).	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Laboratory	1,2	Practice Room Biology and Pathology of Fish and Bees 8am-9.30am	No. 2
27/3/2024 5 th practical	Diagnostic, control and eradication of honeybee diseases I.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	1	Practice Room Biology and Pathology of Fish and Bees 11.45am-1.15pm	No. 1, 5 student notes
27/3/2024 5 th practical	Diagnostic, control and eradication of honeybee diseases I.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	2	Practice Room Biology and Pathology of Fish and Bees 1.30pm-3pm	No. 1, 5 student notes
27/3/2024 5 th practical	Diagnostic, control and eradication of honeybee diseases I.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	3	Practice Room Biology and Pathology of Fish and Bees 3.15pm-4.45pm	No. 1, 5 student notes
8/4/2024 6 th practical	Diagnostic, control and eradication of honeybee diseases II.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	3	Practice Room Biology and Pathology of Fish and Bees 8am-9.30am	No. 1, 5 student notes
8/4/2024 6 th practical	Diagnostic, control and eradication of honeybee diseases II.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	1	Practice Room Biology and Pathology of Fish and Bees 2.30pm-4pm	No. 1, 5 student notes
9/4/2024 6 th practical	Diagnostic, control and eradication of honeybee diseases II.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	2	Practice Room Biology and Pathology of Fish and Bees 2.15pm-3.45pm	No. 1, 5 student notes
23/4/2024 7 th practical	Morphological identification of exotic parasites and pests (Aethina tumida; Tropilaelaps	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	1	Practice Room Biology and Pathology of Fish and Bees 8.15am-9.45am	No. 1, 5

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23/4/2024 7 th practical	Morphological identification of exotic parasites and pests (<i>Aethina tumida</i> ; <i>Tropilaelaps</i> spp.).	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	2	Practice Room Biology and Pathology of Fish and Bees 3.30pm-5pm	No. 1, 5
24/4/2024 8 th practical	Biology and pathology of bumblebees and solitary bees – <i>Osmia</i> spp.	Associate Professor Krešimir Matanović Valerija Benko PhD	Clinical	2	Practice Room Biology and Pathology of Fish and Bees 8am-9.30am	student notes
24/4/2024 7 th practical	Morphological identification of exotic parasites and pests (<i>Aethina tumida</i> ; <i>Tropilaelaps</i> spp.).	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Clinical	3	Practice Room Biology and Pathology of Fish and Bees 1pm-2.30pm	No. 1, 5
25/4/2024 8 th practical	Biology and pathology of bumblebees and solitary bees – <i>Osmia</i> spp.	Associate Professor Krešimir Matanović Full Professor Ivana Tlak Gajger	Clinical	1	Practice Room Biology and Pathology of Fish and Bees 4pm-5.30pm	student notes
26/4/2024 8 th practical	Biology and pathology of bumblebees and solitary bees – <i>Osmia</i> spp.	Associate Professor Krešimir Matanović Full Professor Ivana Tlak Gajger	Clinical	3	Practice Room Biology and Pathology of Fish and Bees 2.15pm-3.45pm	student notes
6/5/2024	COLLOQUIUM			1,2,3	Laboratory room - Biology and Pathology of Fish and Bees 4.15pm-5.15pm	
21/5/2024	COLLOQUIUM Repatd			1,2,3	Laboratory room - Biology and Pathology of Fish and Bees 4.15pm-5.15pm	
6/6/2024 9 th practical	Clinical examination of honeybee colony I.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović Valerija Benko PhD	Special clinical	1,2,3	Apiary I 8am-4pm	No. 1
7/6/2024 12 th practical	Clinical examination of honeybee colony II.	Full Professor Ivana Tlak Gajger Associate Professor Krešimir Matanović	Special clinical	1,2,3	Apiary II 8am-4pm	No. 1

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		Valerija Benko PhD				
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