

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: egjurcevic@vef.unizg.hr  
Register No of the organisational unit:  
Zagreb, 27/02/2023

159829 REPUBLIKA HRVATSKA  
Veterinarski fakultet u Zagrebu  
Primljeno: 10.02.2023  
Klasifikacijska oznaka Org. jed.  
605-03/22-04/35 251-61-32;  
Uredbeni broj Prilozi Vrijednost  
251-61-14/319-23-71 0 -

## COURSE SYLLABUS

Course name: BIOLOGY AND PATHOLOGY OF AQUATIC ORGANISMS  
Academic year 2022/2023

Course leader: Full Professor Emil Gjurčević

Deputy course leader: Assistant Professor Krešimir Matanović

Teachers: Full Professor Emil Gjurčević  
Assistant Professor Krešimir Matanović  
Valerija Benko, DVM, PhD

First day of classes: 29/3/2023

Last day of classes: 16/6/2023

**Timetable for LECTURES academic year 2022/2023**

<b>LECTURES</b>				
<b>Date</b>	<b>Methodological unit</b>	<b>Teacher</b>	<b>Location / Time</b>	<b>Literature</b>
29/3/2023 1 <sup>st</sup> lecture	Introduction (Importance of breeding of aquatic organisms); The aquatic environment (Basic water quality parameters for aquatic organisms); Natural and artificial spawning; Breeding of aquatic organisms I.	Assistant Professor Krešimir Matanović	Laboratory room - Biology and Pathology of Fish and Bees 8am-10am	Obligatory literature No. 1, 6 Optional literature No. 7, 9, 10
31/3/2023 2 <sup>nd</sup> lecture	Breeding of aquatic organisms II; Viral fish diseases (Diseases prevented by Regulations of veterinary medicine and others important for breeding).	Full Professor Emil Gjurčević	Laboratory room - Biology and Pathology of Fish and Bees 8am-10am	Obligatory literature No. 1 – 6 Optional literature No. 8, 9, 11, 12
12/4/2023 3 <sup>rd</sup> lecture	Viral fish diseases (Diseases prevented by Regulations of veterinary medicine and others important for breeding).	Full Professor Emil Gjurčević	Laboratory room - Biology and Pathology of Fish and Bees 2pm-4pm	Obligatory literature No. 1 – 6 Optional literature No. 8, 11, 12
17/4/2023 4 <sup>th</sup> lecture	Bacterial fish diseases (Diseases important for breeding).	Assistant Professor Krešimir Matanović	Laboratory room - Biology and Pathology of Fish and Bees 4pm-6pm	Obligatory literature No. 1 – 6 Optional literature No. 8, 11, 12
19/4/2023 5 <sup>th</sup> lecture	Parasitic fish diseases (Diseases important for breeding).	Full Professor Emil Gjurčević	Laboratory room - Biology and Pathology of Fish and Bees 12pm-2pm	Obligatory literature No. 1 – 6 Optional literature No. 8, 11, 12
21/4/2023 6 <sup>th</sup> lecture	Parasitic fish diseases (Diseases important for breeding); Fungal fish diseases and diseases caused by abiotic factors; Diseases of other aquatic organisms (Diseases prevented by Regulations of veterinary medicine).	Full Professor Emil Gjurčević	Laboratory room - Biology and Pathology of Fish and Bees 8am-9am	Obligatory literature No. 1 – 6 Optional literature No. 8, 11, 12

### Timetable for PRACTICALS academic year 2022/2023

PRACTICALS						
Date	Methodological unit	Teacher	Type of practical (Article 31. of Regulation)	Group	Location / time	Literature
4/4/2023 1 <sup>st</sup> practical	Systematic of freshwater fish	Full Professor Emil Gjurgević Assistant Professor Krešimir Matanović	Laboratory	1, 2	Laboratory room - Biology and Pathology of Fish and Bees 2pm-3.30pm	Obligatory literature No. 6
11/4/2023 2 <sup>nd</sup> practical	Systematic of marine fish and shellfish; Shellfish anatomy	Full Professor Emil Gjurgević Assistant Professor Krešimir Matanović	Laboratory	1, 2	Laboratory room - Biology and Pathology of Fish and Bees 2pm-3.30pm	Obligatory literature No. 6
12/4/2023 3 <sup>rd</sup> practical	Fish anatomy I (Integument system, musculoskeletal system, respiratory system)	Full Professor Emil Gjurgević Assistant Professor Krešimir Matanović	Laboratory	1, 2	Laboratory room - Biology and Pathology of Fish and Bees 4pm-6pm	Obligatory literature No. 3, 4, 6 Optional literature No. 8
13/4/2023 4 <sup>th</sup> practical	Fish anatomy II (circulatory system, digestive system, excretory system, nervous and sensory system)	Full Professor Emil Gjurgević Assistant Professor Krešimir Matanović	Laboratory	1, 2	Laboratory room - Biology and Pathology of Fish and Bees 2pm-4pm	Obligatory literature No. 3, 4, 6 Optional literature No. 8
24/4/2023 5 <sup>th</sup> practical	Dissection of common carp	Full Professor Emil Gjurgević Assistant Professor Krešimir Matanović Valerija Benko, DVM, PhD	Clinical	1, 2	Laboratory room - Biology and Pathology of Fish and Bees 8am-10am	Obligatory literature No. 2, 4, 6 Optional literature No. 8
26/4/2023 6 <sup>th</sup> practical	Dissection of rainbow trout	Full Professor Emil Gjurgević Assistant Professor Krešimir Matanović Valerija Benko, DVM, PhD	Clinical	1, 2	Laboratory room - Biology and Pathology of Fish and Bees 8am-10am	Obligatory literature No. 4, 6 Optional literature No. 8
26/4/2023 7 <sup>th</sup> practical	Post-mortem examination of fish (necropsy)	Full Professor Emil Gjurgević Assistant Professor Krešimir Matanović	Clinical	1	Laboratory room - Biology and Pathology of Fish and Bees 4pm-6pm	Obligatory literature No. 4, 6 Optional literature No. 12

Course: Biology and Pathology of Aquatic Organisms

28/4/2023 7 <sup>th</sup> practical	Post-mortem examination of fish (necropsy)	Full Professor Emil Gjurić Assistant Professor Krešimir Matanović	Clinical	2	Laboratory room - Biology and Pathology of Fish and Bees 8am-10am	Obligatory literature No. 4, 6 Optional literature No. 12
2/5/2023 8 <sup>th</sup> practical	Dissection of marine fish and shellfish; Diseases of shellfish	Full Professor Emil Gjurić Assistant Professor Krešimir Matanović Valerija Benko, DVM, PhD	Clinical	1, 2	Laboratory room - Biology and Pathology of Fish and Bees 4pm-6pm	Obligatory literature No. 3, 4, 6 Optional literature No. 8
3/5/2023 9 <sup>th</sup> practical	Virological and bacteriological procedures	Full Professor Emil Gjurić Assistant Professor Krešimir Matanović	Clinical	1	Laboratory room - Biology and Pathology of Fish and Bees 8am-10am	Obligatory literature No. 3, 4, 5, 6
5/5/2023 9 <sup>th</sup> practical	Virological and bacteriological procedures	Full Professor Emil Gjurić Assistant Professor Krešimir Matanović	Clinical	2	Laboratory room - Biology and Pathology of Fish and Bees 8am-10am	Obligatory literature No. 3, 4, 5, 6
5/5/2023 10 <sup>th</sup> practical	Collection of samples for laboratory examinations; Diseases prevention and treatment	Full Professor Emil Gjurić Assistant Professor Krešimir Matanović	Laboratory	1, 2	Laboratory room - Biology and Pathology of Fish and Bees 4pm-6pm	Obligatory literature No. 3, 4, 6 Optional literature No. 11
9/5/2023	COLLOQUIUM			1, 2	Laboratory room - Biology and Pathology of Fish and Bees 4.30pm-5.30pm	
11/5/2023 11 <sup>th</sup> practical	Breeding of warmwater fish	Full Professor Emil Gjurić Assistant Professor Krešimir Matanović Valerija Benko, DVM, PhD	Special clinical	1, 2	Cyprinid fish farm 7am-6pm	Obligatory literature No. 1, 6 Optional literature No. 7, 10
16/6/2023 12 <sup>th</sup> practical	Breeding of salmonid fish	Full Professor Emil Gjurić Assistant Professor Krešimir Matanović	Special clinical	1, 2	Trout fish farm 7am-6pm	Obligatory literature No. 1, 6 Optional literature No. 7, 9



### **STUDENT OBLIGATIONS**

<b>Lecture attendance</b>	Attending lectures: 3-6 points (1 lecture hour equals 0.54 point)
<b>Practicals attendance</b>	Attending practicals: 9.6-12 points. Student must attend at least 20 hours of practicals to achieve minimum of 9.6 points.
<b>Active participation in seminars and practicals</b>	Participation at exercises: 5-10 points (evaluated with short oral tests)
<b>Final exam</b>	Final exam – oral: 24-40 points (5 questions): 1 question equals 8 points
<b>Examination requirements</b>	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. <b>Article 41:</b> a student can justifiably be absent from up to 50 % of the lectures; 20% of the seminars and 20 % 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)	3/7/2023, 14/7/2023, 4/9/2023 and 20/9/2023
Form of final exam	Oral

### LITERATURE

<b>Obligatory literature</b>	<ol style="list-style-type: none"><li>1. BARDACH, J. E., J. H. RYTER, W. O. McLARNEY (1972): Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms. Wiley-Interscience, New York, London, Sydney, Toronto.</li><li>2. HOLE, D., D. BUCKE, P. BURGESS, I. WELLBY (2001): Diseases of carp and other cyprinid fishes. Fishing News Books, London.</li><li>3. NOGA, E. J. (2000): Fish disease: Diagnosis and Treatment. Iowa State University Press, Ames.</li><li>4. ROBERTS, R. J. (2001): Fish pathology. 3<sup>rd</sup> ed., W. B. Saunders, London.</li><li>5. WOO, P. T. K., D. W. BRUNO (1999): Fish Diseases and disorders. Vol. 3.: Viral, bacterial and fungal infections. CABI Publishing, Wallingford.</li><li>6. PP presentations of lectures and practicals.</li></ol>
<b>Optional literature</b>	<ol style="list-style-type: none"><li>1. BOYD, C. E. (1990): Water Quality in Ponds for Aquaculture. Auburn University, Alabama.</li><li>2. FERGUSON, H. W. (2006): Systemic pathology of fish: A text and atlas of normal tissues in teleosts and their responses in disease. Scotian Press, London.</li><li>3. GREENBERG, D. B. (1960): Trout farming. Chilton company – book division, Philadelphia, New York.</li><li>4. HORVATH, L., G. TAMAS, C. SEAGRAVE (1992): Carp and pond fish culture. Fishing News Book, Oxford.</li><li>5. PLUMB, J. A. (1999): Health maintenance and principal microbial diseases of cultures fishes. Iowa State University.</li><li>6. SINDERMAN, C. J. (1990): Principal diseases of marine fish and shellfish. Academic Press, London.</li></ol>

### **OBJECTIVES AND LEARNING OUTCOMES**

<b>Course objectives</b>	During lectures and exercises, students obtain general knowledge about breeding of aquatic organisms in order to comprehend the importance and role of veterinarians in recognising and controlling aquatic organism diseases. The skills which one must accomplish are proper examination of aquatic organisms, recognition of clinical signs, sampling and sending the materials for laboratory procedures, and also prevention and therapy in aquaculture.
<b>Learning outcomes</b>	<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 fish and other aquatic organisms. The course prepares students for laboratory and field work in the field of biology and pathology of fish and other aquatic organisms.</p> <p>Learning outcomes:</p> <ol style="list-style-type: none"><li>1. Recognize fish species and other aquatic organisms important for breeding</li><li>2. Obtain general knowledge about breeding of aquatic organisms</li><li>3. Comprehend the importance and role of veterinarians in maintenance of fish health and human health</li><li>4. Perform routine diagnostic examination, recognize clinical signs of disease</li><li>5. Professional sampling and transport of samples for laboratory examinations</li><li>6. Apply therapeutic measures and measures for prevention of disease.</li></ol>



**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.